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(3GPP TS 38.133 version 16.12.0 Release 16)**



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## **Annex B (normative): Conditions for RRM requirements applicability for operating bands .2958**

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# Foreword

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

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

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where:

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

In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

---

# 1 Scope

The present document specifies requirements for support of Radio Resource Management for the FDD and TDD modes of New Radio (NR). These requirements include requirements on measurements in NR and the UE as well as requirements on node dynamical behaviour and interaction, in terms of delay and response characteristics.

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# 2 References

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

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

- [1] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in idle mode".
- [2] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".
- [3] 3GPP TS 38.213: "NR; Physical layer procedures for control".
- [4] 3GPP TS 38.215: "NR; Physical layer measurements".
- [5] 3GPP TS 38.533: "NR; User Equipment (UE) conformance specification; Radio Resource Management (RRM)".
- [6] 3GPP TS 38.211: "NR; Physical channels and modulation".
- [7] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".
- [8] 3GPP TS 38.212: "NR; Multiplexing and channel coding".
- [9] 3GPP TS 38.202: "NR; Physical layer services provided by the physical layer".
- [10] 3GPP TS 38.300: "NR; Overall description; Stage-2".
- [11] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [12] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".
- [13] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".
- [14] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".
- [15] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".
- [16] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".
- [17] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity", Stage 2.
- [18] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".
- [19] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

- [20] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".
- [21] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".
- [22] 3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".
- [23] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".
- [24] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA); Overall description".
- [25] 3GPP TS 36.101: "Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".
- [26] 3GPP TS 38.214: "NR; Physical layer procedures for data".
- [27] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".
- [28] Void.
- [29] 3GPP TS 25.133: "Requirements for Support of Radio Resource Management (FDD)".
- [30] 3GPP TS 25.302: "Services provided by the Physical Layer".
- [31] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA), Evolved Universal Terrestrial Radio Access (E-UTRA) and Next Generation Radio Access; Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".
- [32] 3GPP TS 25.214: "Physical layer procedures (FDD)".
- [33] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access"
- [34] 3GPP TS 37.355: "LTE Positioning Protocol (LPP) ".
- [35] 3GPP TS 38.455 : "NG-RAN; NR Positioning Protocol A (NRPPa) ".
- [36] 3GPP TS 37.106: "User Equipment (UE) requirements for shared spectrum channel access".

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [11] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [11].

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

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

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

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

**EN-DC:** E-UTRA-NR Dual Connectivity as defined in clause 4.1.2 of TS 37.340 [17].

**en-gNB:** As defined in TS 37.340 [17].

**FR1:** Frequency range 1 as defined in clause 5.1 of TS 38.104 [13].

**FR2:** Frequency range 2 as defined in clause 5.1 of TS 38.104 [13].

**gNB:** as defined in TS 38.300 [10].

**LMF:** as defined in TS 38.305 [22].

**Master Cell Group:** As defined in TS 38.331 [2].

**Multi-Radio Dual Connectivity:** Dual Connectivity between E-UTRA and NR nodes, or between two NR nodes, as defined in TS 37.340 [17].

**ng-eNB:** As defined in TS 38.300 [10].

**NE-DC:** NR-E-UTRA Dual Connectivity as defined in clause 4.1.3.2 of TS 37.340 [17].

**NGEN-DC:** NG-RAN E-UTRA-NR Dual Connectivity as defined in clause 4.1.3.1 of TS 37.340 [17].

**NR-DC:** NR-NR Dual Connectivity as defined in clause 4.1.3.3 of TS 37.340 [17].

**Primary Cell:** As defined in TS 38.331 [2].

**PRS resource instance:** An instance in time of a configured PRS resource as defined in TS 38.331 [2], which may or not overlap with a measurement gap occasion.

**Quasi Co-Location:** As defined in TS 38.214 [26].

**RLM-RS resource:** A resource out of the set of resources configured for RLM by higher layer parameter RLM-RS-List [2] as defined in TS 38.213 [3].

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

**Secondary Cell:** As defined in TS 38.331 [2].

**Secondary Cell Group:** As defined in TS 38.331 [2].

**Serving Cell:** As defined in TS 38.331 [2].

**SMTC:** An SSB-based measurement timing configuration configured by *SSB-MeasurementTimingConfiguration* as specified in TS 38.331 [2].

**Special Cell:** As defined in TS 38.331 [2].

**SSB:** SS/PBCH block as defined in clause 7.8.3 of TS 38.211 [6].

**Timing Advance Group:** As defined in TS 38.331 [2].

## 3.2 Symbols

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

|                       |  |
|-----------------------|--|
| [...]                 | Values included in square bracket must be considered for further studies, because it means that a decision about that value was not taken.   |
| $BW_{\text{Channel}}$ | Channel bandwidth, defined in TS 38.101-1, 38.101-2 and 38.101-3 subclause 3.2   |
| $\hat{E}_s$           | Received energy per RE (power normalized to the subcarrier spacing) during the useful part of the symbol, i.e. excluding the cyclic prefix, at the UE antenna connector or radiated interface boundary   |
| $F_c$                 | <i>RF reference frequency</i> on the channel raster, given in table 5.4.2.2-1 in TS 38.101-1 and 38.101-2  |
| $F_{c,\text{low}}$    | The $F_c$ of the lowest carrier, expressed in MHz  |
| $I_o$                 | The total received power density, including signal and interference, as measured at the UE antenna connector or radiated interface boundary.   |
| $I_{oc}$              | The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the UE antenna connector or radiated interface boundary. |

|                               |   |
|-------------------------------|---|
| $I_{ot}$                      | The received power spectral density of the total noise and interference for a certain RE (power integrated over the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector or radiated interface boundary                             |
| $N_{oc}$                      | The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector or radiated interface boundary |
| $n_{PRB}$                     | Physical Resource Block number as defined in clause 3.2 in TS 38.211.   |
| $N_{TA}$                      | Timing offset between uplink and downlink radio frames at the UE, as defined in clause 4.2 in TS 38.213.  |
| $N_{TA\ offset}$              | Fixed timing advance offset, as defined in clause 7.1.2.2 in TS 38.133.   |
| $P_{CMAX}$                    | Configured UE transmitted power as defined in clause 6.2.4 in TS 38.101-1, 38-101-2 and 38.101-3.   |
| $P_{CMAX,c}$                  | Configured UE transmitted power on a serving cell $c$ as defined in clause 6.2.4 in TS 38.101-1, 38-101-2 and 38.101-3  |
| $S$                           | Cell Selection Criterion defined in TS 38.304, subclause 5.2.3.2 for NR   |
| $SSB\_RP$                     | Received (linear) average power of the resource elements that carry NR synchronisation burst, measured at the UE antenna connector or radiated interface boundary   |
| $S_{rxlev}$                   | Cell selection RX level, defined in TS 38.304, subclause 5.2.3.2  |
| $S_{qual}$                    | Cell selection quality, defined in TS 38.304, subclause 5.2.3.2   |
| $S_{intrasearch}$             | Defined in TS 38.304 , subclause 5.2.4.7 for E-UTRAN amd 38.304 subclause 5.2.4.7 for NR  |
| $S_{nonintrasearch}$          | Defined in TS 38.304 , subclause 5.2.4.7  |
| $Thresh_{x, high}$            | Defined in TS 38.304 , subclause 5.2.4.7  |
| $Thresh_{x, low}$             | Defined in TS 38.304 , subclause 5.2.4.7  |
| $Thresh_{servng, low}$        | Defined in TS 38.304 , subclause 5.2.4.7  |
| $T_{RE-ESTABLISH-REQ}$        | The RRC Re-establishment delay requirement, the time between the moment when erroneous CRCs are applied, to when the UE starts to send preambles on the PRACH.  |
| $T_c$                         | Basic time unit, defined in clause 4.1 of TS 38.211 [6].  |
| $T_s$                         | Reference time unit, defined in clause 4.1 of TS 38.211 [6].  |
| $T_{reselection}$             | Defined in TS 25.304, subclause 5.2.6.1.5   |
| $T_{reselectionRAT}$          | Defined in TS 36.304 , subclause 5.2.4.7  |
| $T_{reselectionEUTRA}$        | Defined in TS 36.304 , subclause 5.2.4.7  |
| $T_{reselectionUTRA}$         | Defined in TS 36.304 , subclause 5.2.4.7  |
| $T_{reselectionGERAN}$        | Defined in TS 36.304 , subclause 5.2.4.   |
| $Thresh_{x, high}$            | Defined in TS 38.304 , subclause 5.2.4.7  |
| $Thresh_{x, low}$             | Defined in TS 38.304 , subclause 5.2.4.7  |
| $Thresh_{servng, low}$        | Defined in TS 38.304 , subclause 5.2.4.7  |
| $T_{UE\_re-establish\_delay}$ | Time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell.   |

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [11] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [11].

|        |                                  |
|--------|----------------------------------|
| AoA    | Angle of Arrival                 |
| AoD    | Angle of Departure               |
| BFD    | Beam Failure Detection           |
| BFD-RS | BFD Reference Signal             |
| BLER   | Block Error Rate                 |
| BM-RS  | Beam Management Reference Signal |
| BWP    | Bandwidth Part                   |
| CA     | Carrier Aggregation              |
| CBD    | Candidate Beam Detection         |
| CBW    | Channel Bandwidth                |
| CC     | Component Carrier                |
| CCA    | Clear Channel Assessment         |

|            |  |
|------------|--|
| CLI        | Cross Link Interference  |
| CMR        | Channel Measurement Resource   |
| CORESET    | Control Resource Set   |
| CP         | Cyclic Prefix  |
| CSI        | Channel-State Information  |
| CSI-RS     | CSI Reference Signal   |
| CSI-RSRP   | CSI Reference Signal based Reference Signal Received Power   |
| CSI-RSRQ   | CSI Reference Signal based Reference Signal Received Quality   |
| CSI-SINR   | CSI Reference Signal based Signal to Noise and Interference Ratio  |
| CSI_RP     | Received (linear) average power of the resource elements that carry NR CSI-RS signals and channels, measured at the UE antenna connector |
| DBT        | Discovery Burst Transmission   |
| DC         | Dual Connectivity  |
| DCI        | Downlink Control Information   |
| DL         | Downlink   |
| DL-AoD     | Downlink Angle-of-Departure  |
| DL-TDOA    | Downlink Time Difference Of Arrival  |
| DMRS       | Demodulation Reference Signal  |
| DRX        | Discontinuous Reception  |
| E-CID      | Enhanced Cell ID   |
| E-UTRA     | Evolved UTRA   |
| E-UTRAN    | Evolved UTRAN  |
| EN-DC      | E-UTRA-NR Dual Connectivity  |
| FDD        | Frequency Division Duplex  |
| FR         | Frequency Range  |
| HARQ       | Hybrid Automatic Repeat Request  |
| HO         | Handover   |
| IMR        | Interference Measurement Resource  |
| L1-RSRP    | Layer 1 RSRP   |
| L1 SL-RSRP | Layer 1 Sidelink RSRP which corresponds to PSCCH-RSRP and/or PSSCH-RSRP  |
| LMF        | Location Management Function   |
| LPP        | LTE Positioning Protocol   |
| MAC        | Medium Access Control  |
| MCG        | Master Cell Group  |
| MDT        | Minimization of Drive Tests  |
| MG         | Measurement Gap  |
| MGL        | Measurement Gap Length   |
| MGRP       | Measurement Gap Repetition Period  |
| MIB        | Master Information Block   |
| MN         | Master Node  |
| MR-DC      | Multi-Radio Dual Connectivity  |
| NE-DC      | NR-E-UTRA Dual Connectivity  |
| NGEN-DC    | NG-RAN E-UTRA-NR Dual Connectivity   |
| NR         | New Radio  |
| NR-DC      | NR-NR Dual Connectivity  |
| OFDM       | Orthogonal Frequency Division Multiplexing   |
| OFDMA      | Orthogonal Frequency Division Multiple Access  |
| OTDOA      | Observed Time Difference Of Arrival  |
| PBCH       | Physical Broadcast Channel   |
| PCC        | Primary Component Carrier  |
| PCell      | Primary Cell   |
| PDCCH      | Physical Downlink Control Channel  |
| PDSCH      | Physical Downlink Shared Channel   |
| PLMN       | Public Land Mobile Network   |
| PRACH      | Physical RACH  |
| PRP        | PRS Received Power   |
| PRS        | Positioning Reference Signal   |
| PRS-RSRP   | Positioning Reference Signal based Reference Signal Received Power   |
| PSBCH      | Physical Sidelink Broadcast Channel  |
| PSBCH-RSRP | Physical Sidelink Broadcast Channel DMRS based Reference Signal Received Power   |
| PSCCH      | Physical Sidelink Control Channel  |
| PSCCH-RSRP | Physical Sidelink Control Channel DMRS based Reference Signal Received Power   |



|                    |   |
|--------------------|---|
| PSCell             | Primary SCell   |
| PSS                | Primary Synchronization Signal  |
| PSSCH              | Physical Sidelink Shared Channel  |
| PSSCH-RSRP         | Physical Sidelink Shared Channel DMRS based Reference Signal Received Power   |
| pTAG               | Primary Timing Advance Group  |
| PUCCH              | Physical Uplink Control Channel   |
| PUSCH              | Physical Uplink Shared Channel  |
| QCL                | Quasi Co-Location   |
| RACH               | Random Access Channel   |
| RAT                | Radio Access Technology   |
| RLM                | Radio Link Monitoring   |
| RLM-RS             | Reference Signal for RLM  |
| RMSI               | Remaining Minimum System Information  |
| RRC                | Radio Resource Control  |
| RRM                | Radio Resource Management   |
| RSSI               | Received Signal Strength Indicator  |
| RSRP               | Reference Signal Received Power   |
| RSRQ               | Reference Signal Received Quality   |
| RSTD               | Reference Signal Time Difference  |
| RTT                | Round Trip Time   |
| S-SSB              | Sidelink Synchronization Signal Block   |
| S-SSB_RP           | Received (linear) average power of the resource elements that carry NR S-SSB signals and channels, measured at the UE antenna connector                               |
| SA                 | Standalone operation mode   |
| SCC                | Secondary Component Carrier   |
| SCell              | Secondary Cell  |
| SCG                | Secondary Cell Group  |
| SCS                | Subcarrier Spacing  |
| SCS <sub>SSB</sub> | SSB subcarrier spacing  |
| SDL                | Supplementary Downlink  |
| SFN                | System Frame Number   |
| SFTD               | SFN and Frame Timing DifferenceSI System Information  |
| SIB                | System Information Block  |
| SL-RSSI            | Sidelink Received Signal Strength Indicator   |
| SLSS               | Sidelink Synchronization Signal   |
| SMTC               | SSB-based Measurement Timing configuration  |
| SpCell             | Special Cell  |
| SRS                | Sounding Reference Signal   |
| SRS-RSRP           | Sounding Reference Signal based Reference Signal Received Power   |
| SS-RSRP            | Synchronization Signal based Reference Signal Received Power  |
| SS-RSRQ            | Synchronization Signal based Reference Signal Received Quality  |
| SS-SINR            | Synchronization Signal based Signal to Noise and Interference Ratio   |
| SSB                | Synchronization Signal Block  |
| SSB_RP             | Received (linear) average power of the resource elements that carry NR SSB signals and channels, measured at the UE antenna connector or radiated interface boundary. |
| SSS                | Secondary Synchronization Signal  |
| sTAG               | Secondary Timing Advance Group  |
| SUL                | Supplementary Uplink  |
| TA                 | Timing Advance  |
| TAG                | Timing Advance Group  |
| TCI                | Transmission Configuration Indicator  |
| TDD                | Time Division Duplex  |
| TDOA               | Time Difference Of Arrival  |
| TRP                | Transmission-Reception Point  |
| TTI                | Transmission Time Interval  |
| UE                 | User Equipment  |
| UL                 | Uplink  |

## 3.4 Test tolerances

The requirements given in the present document make no allowance for measurement uncertainty. The test specification 38.533 [5] defines the test tolerances.

## 3.5 Frequency bands grouping

### 3.5.1 Introduction

The intention with the frequency band grouping below is to increase the readability of the specification.

The frequency bands grouping is derived based on UE REFSENS requirements specified in [18, 19, 20] and assuming 0.5 dB step between the neighbour groups. The groups are defined in the order of increasing REFSENS, i.e., the group A has the smallest REFSENS among the groups. For the same SCS and a given bandwidth, the bands within the same group have the same  $I_0$  conditions in a corresponding requirement in this specification, provided the bands support this SCS. For different SCSs supported by a frequency band and the same bandwidth, different  $I_0$  conditions may apply for the frequency band in the requirements, while the band group is the same, based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported SCSs for this bandwidth. For the same SCS but different supported bandwidths, the group for a band is determined based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported bandwidths.

### 3.5.2 NR operating bands in FR1

NR frequency bands grouping for FR1 is specified in Table 3.5.2-1.

**Table 3.5.2-1: NR frequency band groups for FR1**

| Group | NR FDD              |   | NR TDD              |   | NR SDL              |                 | NR CCA <sup>10</sup> |                 |
|-------|---------------------|---|---------------------|---|---------------------|-----------------|----------------------|-----------------|
|       | Band group notation | Operating bands                                     | Band group notation | Operating bands                                 | Band group notation | Operating bands | Band group notation  | Operating bands |
| A     | NR_FDD_FR1_A        | n1, n18, n70, n74 <sup>4</sup> , n91, n92, n93, n94 | NR_TDD_FR1_A        | n34, n38 <sup>9</sup> , n39, n40, n50, n51, n53 | NR_SDL_FR1_A        | n75, n76        | NR_CCA_FR1_A         | -               |
| B     | NR_FDD_FR1_B        | n65, n66, n74 <sup>3</sup>                          | NR_TDD_FR1_B        | n38 <sup>7</sup>                                | NR_SDL_FR1_B        | -               | NR_CCA_FR1_B         | -               |
| C     | NR_FDD_FR1_C        | n30   | NR_TDD_FR1_C        | n48, n77 <sup>1</sup> , n78, n79                | NR_SDL_FR1_C        | -               | NR_CCA_FR1_C         | -               |
| D     | NR_FDD_FR1_D        | n28   | NR_TDD_FR1_D        | n77 <sup>2</sup>                                | NR_SDL_FR1_D        | -               | NR_CCA_FR1_D         | -               |
| E     | NR_FDD_FR1_E        | n2, n5, n7  | NR_TDD_FR1_E        | n41, n90  | NR_SDL_FR1_E        | -               | NR_CCA_FR1_E         | -               |
| F     | NR_FDD_FR1_F        | n26 <sup>6</sup>                                    | NR_TDD_FR1_F        | -   | NR_SDL_FR1_F        | -               | NR_CCA_FR1_F         | -               |
| G     | NR_FDD_FR1_G        | n3, n8, n12, n14, n20, n71                          | NR_TDD_FR1_G        | -   | NR_SDL_FR1_G        | n29             | NR_CCA_FR1_G         | -               |
| H     | NR_FDD_FR1_H        | n25   | NR_TDD_FR1_H        | -   | NR_SDL_FR1_H        | -               | NR_CCA_FR1_H         | -               |
| I     | NR_FDD_FR1_I        | -   | NR_TDD_FR1_I        | -   | NR_SDL_FR1_I        | -               | NR_CCA_FR1_I         | n46             |
| J     | NR_FDD_FR1_J        | -   | NR_TDD_FR1_J        | n47 <sup>8</sup>                                | NR_SDL_FR1_J        | -               | NR_CCA_FR1_J         | n96             |

NOTE 1: Except 3.8 GHz to 4.2 GHz.

NOTE 2: Only 3.8 GHz to 4.2 GHz.

NOTE 3: Except 1475.9 MHz to 1510.9 MHz.

NOTE 4: Only when the band is confined in 1475.9 MHz to 1510.9 MHz.

NOTE 5: These bands are used only in NR carrier aggregation with other NR bands according to NR CA band combinations specified in TS 38.101-1 [18] and TS 38.101-3 [20].

NOTE 6: The minimum  $I_0$  condition is reduced by 0.5 dB when the carrier frequency of the assigned NR channel bandwidth is within 865-894 MHz.

NOTE 7: When this band is only used for V2X SL service, the band is exclusively used for NR V2X in particular regions.

NOTE 8: This band is unlicensed band used for V2X service. There is no expected network deployment in this band.

NOTE 9: When this band is only used for WAN service.

NOTE 10: Operating bands where operation on carrier frequencies with CCA is supported.

### 3.5.3 NR operating bands in FR2

NR frequency bands grouping for FR2 is specified in Table 3.5.3-1.

**Table 3.5.3-1: NR frequency band groups for FR2**

| Group  | Band group notation | Operating bands   |
|--|---------------------|---|
| A  | NR_TDD_FR2_A        | n257 <sup>1</sup> , n258 <sup>1</sup> , n261 <sup>1</sup> |
| B  | NR_TDD_FR2_B        | n257 <sup>4</sup> , n258 <sup>4</sup> , n261 <sup>4</sup> |
| C  | NR_TDD_FR2_C        |   |
| D  | NR_TDD_FR2_D        |   |
| E  | NR_TDD_FR2_E        |   |
| F  | NR_TDD_FR2_F        | n260 <sup>4</sup>   |
| G  | NR_TDD_FR2_G        | n260 <sup>1</sup>   |
| H  | NR_TDD_FR2_H        |   |
| I  | NR_TDD_FR2_I        |   |
| J  | NR_TDD_FR2_J        |   |
| K  | NR_TDD_FR2_K        |   |
| L  | NR_TDD_FR2_L        | n257 <sup>2</sup> , n258 <sup>2</sup> , n261 <sup>2</sup> |
| M  | NR_TDD_FR2_M        |   |
| N  | NR_TDD_FR2_N        |   |
| O  | NR_TDD_FR2_O        |   |
| P  | NR_TDD_FR2_P        |   |
| Q  | NR_TDD_FR2_Q        |   |
| R  | NR_TDD_FR2_R        |   |
| S  | NR_TDD_FR2_S        |   |
| T  | NR_TDD_FR2_T        | n257 <sup>3</sup> , n258 <sup>3</sup> , n261 <sup>3</sup> |
| U  | NR_TDD_FR2_U        |   |
| V  | NR_TDD_FR2_V        |   |
| W  | NR_TDD_FR2_W        |   |
| X  | NR_TDD_FR2_X        |   |
| Y  | NR_TDD_FR2_Y        | n260 <sup>3</sup>   |
| Z  | NR_TDD_FR2_Z        |   |
| AA   | NR_TDD_FR2_AA       | n259 <sup>3</sup>   |
| NOTE 1: UE power class 1.<br>NOTE 2: UE power class 2.<br>NOTE 3: UE power class 3.<br>NOTE 4: UE power class 4. |                     |   |

## 3.6 Applicability of requirements in this specification version

In this specification,

- ‘cell’, ‘PCell’, ‘PSCell’ and ‘SCell’ refer to NR cell, NR PCell, NR PSCell, and NR SCell,
- E-UTRA cells are referred to as ‘E-UTRA cell’, ‘E-UTRA PCell’, ‘E-UTRA PSCell’, and ‘E-UTRA SCell’,
- E-UTRA-NR dual connectivity where E-UTRA is the master is referred to as ‘E-UTRA-NR dual connectivity’ or ‘EN-DC’.
- NR-NR dual connectivity which involves two gNB acting as Master gNB and Secondary gNB is referred to as “NR-NR dual connectivity” or “NR-DC”. NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.
- ‘active serving cell’ refers to PCell, PSCell and activated SCells

For UE configured with supplementary UL, the requirements in clause 7.1 and 7.3 shall also apply to uplink transmissions on supplementary UL.

Unless explicitly stated, requirements do not apply when CCA is used on serving or neighbour cells.

### 3.6.1 RRC connected state requirements in DRX

For the requirements in RRC connected state specified in this version of the specification, the UE shall assume that no DRX is used provided the following conditions are met:

- DRX parameters are not configured or
- DRX parameters are configured and
  - *drx-InactivityTimer* is running or
  - *drx-RetransmissionTimerDL* is running or
  - *drx-RetransmissionTimerUL* is running or
  - *ra-ContentionResolutionTimer* is running or
- a Scheduling Request sent on PUCCH is pending or
  - a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the preamble not selected by the MAC entity

Otherwise the UE shall assume that DRX is used.

### 3.6.2 Number of serving carriers

#### 3.6.2.1 Number of serving carriers for SA

Requirements for standalone NR with NR PCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 10 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PCell and up to 8 UL (or 9 UL if SUL is configured) in total for SCells.
- SUL may be configured together with one of the UL

#### 3.6.2.2 Number of serving carriers for EN-DC

Requirements for EN-DC operation of E-UTRA and NR with E-UTRA PCell and NR PSCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 9 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PSCell, up to 7 UL (or 8 UL if SUL is configured) in total for SCells in the FR of PSCell and up to 1 UL (or 2 UL if SUL is configured) in SCell in different FR with PSCell.
- SUL may be configured together with one of the UL

The applicable number of E-UTRA CC for EN-DC in the MCG for both UL and DL is specified in TS 36.133 [15].

#### 3.6.2.3 Number of serving carriers for NE-DC

Requirements for NE-DC operation of NR and E-UTRA with NR PCell and E-UTRA PSCell are applicable for the UE configured with the following number of serving NR CCs:

- up to 7 NR DL CCs in total, with 1 UL (or 2 UL if SUL is configured) in PCell and up to 1 UL (or 2 UL if SUL is configured) in SCell.
- SUL may be configured together with one of the UL

The applicable number of E-UTRA CC for NE-DC in the SCG for both UL and DL is specified in TS 36.133 [15].

### 3.6.2.4 Number of serving carriers for NR-DC

Requirements for NR-DC are applicable for the UE configured with the following number of serving NR CCs:

- up to 2 NR DL CCs in total in FR1, up to 8 NR DL CCs in total in FR2, with 1 UL in PCell, 1 UL in PSCell, and up to 1 UL in each SCell.

### 3.6.3 Applicability for intra-band FR2

For the requirements in RRC connected state specified in this version of the specification, UE shall assume that the transmitted signals from the serving cells should have the same downlink spatial domain transmission filter on one OFDM symbol in the same band in FR2. Otherwise, the UE is not supposed to satisfy any requirements for SCell.

### 3.6.4 Applicability for FR2 UE power classes

For the requirements of each FR2 power class specified in this version of the specification, certain UE types with specific device architectures are assumed. The UE types can be found in TS 38.101-2 [19].

### 3.6.5 Applicability for SDL bands

The measurements accuracy requirements for SDL bands in this version of specification in clause 10.1 shall apply for NR intra-frequency measurements on SCC (SS-RSRP, SS-RSRQ, SS-SINR, and L1-RSRP) and inter-frequency measurements (SS-RSRP, SS-RSRQ, and SS-SINR).

### 3.6.6 Applicability of requirements for NGEN-DC operation

All the requirements in this specification applicable for EN-DC are also applicable for NGEN-DC.

### 3.6.7 Applicability of QCL

For the requirements specified in this version of the specification, a reference signal is considered to be QCLed to another reference signal if it is in the same TCI chain as the other reference signal, provided that the number of Reference Signals in the chain is no more than 4. It is assumed there is single QCL type per TCI chain.

A TCI chain consists of an SSB, and one or more CSI-RS resources, and the TCI state of each Reference Signal includes another Reference Signal in the same TCI chain.

DMRS of PDCCH or PDSCH is QCLed with the reference signal in its active TCI state and any other reference signal that is QCLed, based on above criteria, with the reference signal in the active TCI state.

### 3.6.8 Applicability of 2-step RA and 4-step RA in RRM requirements

Unless explicitly stated otherwise the requirements under the following clauses, where the UE transmits random access (with requirements in clause 6.2.2) to NR serving cell or NR target cell, are applicable for both 2-step RA and 4-step RA procedures [3]:

- Handover requirements in clause 6.1, except for clauses 6.1.2 and 6.1B,
- RRC connection re-establishment requirements in clause 6.2.1,
- RRC connection release with redirection to NR requirements in clause 6.2.3.2.1,
- UE transmit timing requirements in clause 7.1,
- PSCell addition delay requirements in clause 8.9.2,
- PSCell change requirements in clause 8.11 and
- Conditional PSCell change requirements in clause 8.11B.

Unless explicitly stated otherwise the requirements under the following clauses, where the UE transmits random access (with requirements in clause 6.2.2A) to NR serving cell or NR target cell subject to uplink CCA, are applicable for both 2-step RA and 4-step RA procedures [3]:

- Handover requirements with CCA in clause 6.1B,
- RRC connection re-establishment requirements with CCA in clause 6.2.1A,
- RRC connection release with redirection to NR requirements with CCA in clause 6.2.3.2.3, and
- UE transmit timing requirements with CCA in clause 7.1.

### 3.6.9 Applicability of requirements for scheduling availability

The scheduling availability requirements in clause 8.1.7.3, 8.5.7.3, 8.5.8.3, 9.5.6.3 and 9.10.2.6.2 assumes that:

- The UE is not configured with simultaneous UL/DL between two FR2 bands if the UE does not have the capability of supporting *simultaneousRxTxInterBandCA*, and
- The UE is not configured with mixed numerology on two FR2 CCs if the UE does not have the capability of supporting simultaneous reception with two different numerologies between FR2 CCs in DL.

The scheduling availability requirements in clause 8.1.7.1, 8.1.7.2, 8.5.7.1, 8.5.7.2, 8.5.8.1, 8.5.8.2, 9.5.6.1, 9.5.6.2, 9.8.6.1, and 9.8.6.2 assumes that the UE is not configured with simultaneous UL/DL between two FR1 bands if the UE does not have the capability of supporting *simultaneousRxTxInterBandCA*.

The scheduling availability requirements in clause 8.1.7.4, 8.5.7.4, 8.5.8.4, 9.5.6.4 and 9.8.6.4 assumes that the UE is not configured with simultaneous UL/DL between FR1 and FR2 bands if the UE does not have the capability of supporting *simultaneousRxTxInterBandCA* on this band combination.

### 3.6.10 Applicability of requirements for measurement restrictions

The requirements for measurement restrictions in clause 8.1.2.3, 8.1.3.3, 8.5.2.3, 8.5.3.3, 8.5.5.3, 8.5.6.3, 9.5.5 and 9.8.5 are not applicable if the following condition is met:

- The network configures mixed numerology on two CCs if the UE does not have the capability of supporting simultaneous reception with different numerologies between the two CCs in DL.

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## 4 SA: RRC\_IDLE state mobility

### 4.1 Cell Selection

After a UE has switched on and a PLMN has been selected, the Cell selection process takes place, as described in TS 38.304 [1]. This process allows the UE to select a suitable cell where to camp on in order to access available services. In this process, the UE can use stored information (*Stored information cell selection*) or not (*Initial cell selection*).

### 4.2 Cell Re-selection

#### 4.2.1 Introduction

The cell reselection procedure allows the UE to select a more suitable cell and camp on it.

When the UE is in either *Camped Normally* state or *Camped on Any Cell* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. For intra-frequency and inter-frequency cells the serving cell may not provide explicit neighbour list but carrier frequency information and bandwidth information only. UE measurement activity is also controlled by measurement rules defined in TS 38.304 [1], allowing the UE to limit its measurement activity

In the requirements of clause 4.2, the exceptions for side conditions apply as follows:

- for the UE capable of CA, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1, B.3.2.3, or B.3.2.5 for UE supporting CA in FR1, CA in FR2 and CA between FR1 and FR2, respectively;
- for the UE capable of SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1.

## 4.2.2 Requirements

### 4.2.2.1 UE measurement capability

For idle mode cell re-selection purposes, and for UE supporting *IdleInactiveMeasurements-r16* or *idleInactiveEUTRA-MeasReport-r16*, for NR CA and MR-DC measurement purpose, the UE shall be capable of monitoring at least:

- Intra-frequency carrier, and
- Depending on UE capability, 7 NR inter-frequency carriers, and
- Depending on UE capability, 7 FDD E-UTRA inter-RAT carriers, and
- Depending on UE capability, 7 TDD E-UTRA inter-RAT carriers.

In addition to the requirements defined above, a UE supporting E-UTRA measurements in RRC\_IDLE state shall be capable of monitoring a total of at least 14 carrier frequency layers, which includes serving layer, comprising of any above defined combination of E-UTRA FDD, E-UTRA TDD and NR layers.

### 4.2.2.2 Measurement and evaluation of serving cell

The UE shall measure the SS-RSRP and SS-RSRQ level of the serving cell and evaluate the cell selection criterion S defined in TS 38.304 [1] for the serving cell at least once every  $M1 \cdot N1$  DRX cycle; where:

$M1=2$  if SMTC periodicity ( $T_{SMTC}$ ) > 20 ms and DRX cycle  $\leq$  0.64 second,

otherwise  $M1=1$ .

The UE shall filter the SS-RSRP and SS-RSRQ measurements of the serving cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by, at least DRX cycle/2.

If the UE has evaluated according to Table 4.2.2.2-1 in  $N_{serv}$  consecutive DRX cycles that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

If the UE in RRC\_IDLE has not found any new suitable cell based on searches and measurements using the intra-frequency, inter-frequency and inter-RAT information indicated in the system information for 10 s, the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1].

**Table 4.2.2.2-1:  $N_{serv}$**

| DRX cycle length [s]   | Scaling Factor ( $N1$ ) |                      | $N_{serv}$ [number of DRX cycles] |
|--|-------------------------|----------------------|-----------------------------------|
|  | FR1                     | FR2 <sup>Note1</sup> |                                   |
| 0.32   | 1                       | 8                    | $M1 \cdot N1 \cdot 4$             |
| 0.64   |                         | 5                    | $M1 \cdot N1 \cdot 4$             |
| 1.28   |                         | 4                    | $N1 \cdot 2$                      |
| 2.56   |                         | 3                    | $N1 \cdot 2$                      |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, $N1 = 8$ for all DRX cycle length. |                         |                      |                                   |

### 4.2.2.3 Measurements of intra-frequency NR cells

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [1] within  $T_{\text{detect,NR\_Intra}}$  when that  $T_{\text{reselection}}=0$ . An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every  $T_{\text{measure,NR\_Intra}}$  (see table 4.2.2.3-1 or table 4.2.2.3-2) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{\text{measure,NR\_Intra}}/2$ .

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS38.304 [1] within  $T_{\text{evaluate,NR\_Intra}}$  when  $T_{\text{reselection}}=0$  as specified in table 4.2.2.3-1 or table 4.2.2.3-2 provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS38.304 [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
  - if there are multiple such cells, the cell has the highest rank among them.
    - the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2 if the current serving cell is among them.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If  $T_{\text{reselection}}$  timer has a non zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [1], the UE shall evaluate this intra-frequency cell for the  $T_{\text{reselection}}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For UE not configured with *highSpeedMeasFlag-r16*,  $T_{\text{detect,NR\_Intra}}$ ,  $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_intra}}$  are specified in Table 4.2.2.3-1. For UE configured with *highSpeedMeasFlag-r16*,  $T_{\text{detect,NR\_Intra}}$ ,  $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_intra}}$  are specified in Table 4.2.2.3-2.

The requirements in Table 4.2.2.3-2 apply only when the UE supports *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 4.2.2.3-2.



**Table 4.2.2.3-1:  $T_{\text{detect,NR\_Intra}}$ ,  $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_Intra}}$** 

| DRX cycle length [s] | Scaling Factor (N1)   |                      | $T_{\text{detect,NR\_Intra}}$ [s]<br>(number of DRX cycles) | $T_{\text{measure,NR\_Intra}}$ [s]<br>(number of DRX cycles) | $T_{\text{evaluate,NR\_Intra}}$ [s] (number of DRX cycles) |
|----------------------|---|----------------------|---|--|--|
|                      | FR1   | FR2 <sup>Note1</sup> |   |  |  |
| 0.32                 | 1   | 8                    | $11.52 \times N1 \times M2$ (36 x N1 x M2)                  | $1.28 \times N1 \times M2$ (4 x N1 x M2)                     | $5.12 \times N1 \times M2$ (16 x N1 x M2)                  |
| 0.64                 |   | 5                    | $17.92 \times N1$ (28 x N1)                                 | $1.28 \times N1$ (2 x N1)                                    | $5.12 \times N1$ (8 x N1)                                  |
| 1.28                 |   | 4                    | $32 \times N1$ (25 x N1)                                    | $1.28 \times N1$ (1 x N1)                                    | $6.4 \times N1$ (5 x N1)                                   |
| 2.56                 |   | 3                    | $58.88 \times N1$ (23 x N1)                                 | $2.56 \times N1$ (1 x N1)                                    | $7.68 \times N1$ (3 x N1)                                  |
| Note 1:              | Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  |                      |   |  |  |
| Note 2:              | M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{\text{detect,NR\_intra}}$ is expected. |                      |   |  |  |

**Table 4.2.2.3-2:  $T_{\text{detect,NR\_Intra}}$ ,  $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_Intra}}$  for UE configured with *highSpeedMeasFlag-r16* (Frequency range FR1)**

| DRX cycle length [s] | $T_{\text{detect,NR\_Intra}}$ [s]<br>(number of DRX cycles)   | $T_{\text{measure,NR\_Intra}}$ [s]<br>(number of DRX cycles) | $T_{\text{evaluate,NR\_Intra}}$ [s] (number of DRX cycles) |
|----------------------|---|--|--|
| 0.32                 | $2.56 \times M2$ (8 x M2)   | $0.32 \times M3$ (1 x M3)                                    | $0.96 \times M4$ (3 x M4)                                  |
| 0.64                 | 5.12 (8)  | 0.64 (1)   | 1.92 (3)   |
| 1.28                 | 8.96 (7)  | 1.28 (1)   | 3.84 (3)   |
| 2.56                 | 58.88 (23)  | 2.56 (1)   | 7.68 (3)   |
| Note 1:              | when SMTC ≤ 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2   |  |  |
| Note 2:              | When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> . |  |  |

#### 4.2.2.4 Measurements of inter-frequency NR cells

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$  then the UE shall search for inter-frequency layers of higher priority at least every  $T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.7.

If  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$  then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [1] within  $K_{\text{carrier}} * T_{\text{detect,NR\_Inter}}$  if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when  $T_{\text{reselection}} = 0$  provided that the reselection criteria is met by a margin of at least 5 dB in FR1 or 6.5dB in FR2 for reselections based on ranking or 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities or 4dB in FR1 and 4dB in FR2 for SS-RSRQ reselections based on absolute priorities.

The parameter  $K_{\text{carrier}}$  is the number of NR inter-frequency carriers indicated by the serving cell. The parameter  $K_{\text{carrier}}$  for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements.

Note: combined total number means that if a carrier is an inter-frequency carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every  $T_{\text{measure,NR\_Inter}}$ . If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every  $K_{\text{carrier}} * T_{\text{measure,NR\_Inter}}$  (see table 4.2.2.4-1) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{\text{measure,NR\_Inter}}/2$ .

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [1] within  $K_{\text{carrier}} * T_{\text{evaluate,NR\_Inter}}$  when  $T_{\text{reselection}} = 0$  as specified in table 4.2.2.4-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and when *rangeToBestCell* is not configured:
  - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 or.
- when *rangeToBestCell* is configured:
  - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS38.304 [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them
    - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 if the current serving cell is among them. or
  - 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities or
  - 4dB in FR1 or 4dB in FR2 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If  $T_{\text{reselection}}$  timer has a non zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the  $T_{\text{reselection}}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2.2.4-1 under the following conditions:

- $T_{\text{SMTC\_intra}} = T_{\text{SMTC\_inter}} = 160$  ms; where
  - $T_{\text{SMTC\_intra}}$  is the periodicity of the SMTC configured for the intra-frequency carrier if no identified intra-frequency cell is in the PCI list of *smtc2-LP* on this intra-frequency carrier;  $T_{\text{SMTC\_intra}}$  is the periodicity of the

*smtc2-LP* configured for the intra-frequency carrier if at least one identified intra-frequency cell is in the PCI list of *smtc2-LP* on this intra-frequency carrier. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed for  $T_{\text{SMTC\_intra}}$ . If the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer  $T_{\text{detect, NR\_intra}}$  is expected.

- $T_{\text{SMTC\_inter}}$  is the actual SMTC periodicity used by the inter-frequency cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the inter-frequency carrier is assumed for  $T_{\text{SMTC\_inter}}$ . If the actual SSB transmission periodicity is greater than the SMTC configured for the inter-frequency carrier, longer  $T_{\text{detect, NR\_inter}}$  is expected.
- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion in TS38.304 [1].

**Table 4.2.2.4-1:  $T_{\text{detect, NR\_Inter}}$ ,  $T_{\text{measure, NR\_Inter}}$  and  $T_{\text{evaluate, NR\_Inter}}$**

| DRX cycle length [s]   | Scaling Factor (N1) |                      | $T_{\text{detect, NR\_Inter}}$ [s]<br>(number of DRX cycles) | $T_{\text{measure, NR\_Inter}}$ [s]<br>(number of DRX cycles) | $T_{\text{evaluate, NR\_Inter}}$ [s]<br>(number of DRX cycles) |
|--|---------------------|----------------------|--|---|--|
|  | FR1                 | FR2 <sup>Note1</sup> |  |   |  |
| 0.32   | 1                   | 8                    | $11.52 \times N1 \times 1.5$ (36 x N1 x 1.5)                 | $1.28 \times N1 \times 1.5$ (4 x N1 x 1.5)                    | $5.12 \times N1 \times 1.5$ (16 x N1 x 1.5)                    |
| 0.64   |                     | 5                    | $17.92 \times N1$ (28 x N1)                                  | $1.28 \times N1$ (2 x N1)                                     | $5.12 \times N1$ (8 x N1)                                      |
| 1.28   |                     | 4                    | $32 \times N1$ (25 x N1)                                     | $1.28 \times N1$ (1 x N1)                                     | $6.4 \times N1$ (5 x N1)                                       |
| 2.56   |                     | 3                    | $58.88 \times N1$ (23 x N1)                                  | $2.56 \times N1$ (1 x N1)                                     | $7.68 \times N1$ (3 x N1)                                      |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. |                     |                      |  |   |  |

#### 4.2.2.5 Measurements of inter-RAT E-UTRAN cells

If  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$  then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every  $T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.

If  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$  then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this clause apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this clause.

The parameter  $N_{\text{EUTRA\_carrier}}$  is the total number of configured E-UTRA carriers indicated to meet non high speed requirements in the neighbour frequency list. The parameter  $N_{\text{EUTRA\_carrier\_HST}}$  is the total number of configured E-UTRA carriers indicated to meet high speed requirements in the neighbour frequency list. If  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$ , an inter-RAT E-UTRAN layer is indicated to meet high speed requirements if `highSpeedMeasFlag-r16` is configured and the carrier to be measured is configured with `highSpeedEUTRACarrier-r16` and UE supports the enhanced inter-RAT E-UTRAN measurement requirements. If  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$ , UE is required to meet non high speed requirements no matter whether `highSpeedMeasFlag-r16` or `highSpeedEUTRACarrier-r16` is configured or not.

The parameter  $N_{\text{EUTRA\_carrier}}$  for a UE configured with idle mode DC measurements (while T331 is running), is the combined number of configured E-UTRA carriers in the neighbour frequency list and E-UTRA carriers configured for idle mode DC measurements, excluding the configured E-UTRA carriers indicated to meet high speed requirements in the neighbour frequency list.

- Note: combined total number means that if a carrier is an E-UTRA carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least half the minimum specified measurement period.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band, and
- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.
- SCH conditions specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 [1] within  $N_{\text{EUTRA\_carrier\_HST}} * T_{\text{detect,EUTRAN\_HST}} + N_{\text{EUTRA\_carrier}} * T_{\text{detect,EUTRAN}}$  when  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$  when  $T_{\text{reselection}} = 0$  provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

Cells which have been detected shall be measured at least every  $N_{\text{EUTRA\_carrier\_HST}} * T_{\text{measure,EUTRAN\_HST}} + N_{\text{EUTRA\_carrier}} * T_{\text{measure,EUTRAN}}$  when  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$ .

When higher priority cells are found by the higher priority search, they shall be measured at least every  $T_{\text{measure,EUTRAN}}$ . If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [1] within  $N_{\text{EUTRA\_carrier\_HST}} * T_{\text{evaluate,EUTRAN\_HST}} + N_{\text{EUTRA\_carrier}} * T_{\text{evaluate,EUTRAN}}$  when  $T_{\text{reselection}} = 0$  as specified in table 4.2.2.5-1 and 4.2.2.5-2 provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

If  $T_{\text{reselection}}$  timer has a non zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [1], the UE shall evaluate this E-UTRA cell for the  $T_{\text{reselection}}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

**Table 4.2.2.5-1:  $T_{\text{detect,EUTRAN}}$ ,  $T_{\text{measure,EUTRAN}}$ , and  $T_{\text{evaluate,EUTRAN}}$**

| DRX cycle length [s] | $T_{\text{detect,EUTRAN}}$ [s] (number of DRX cycles) | $T_{\text{measure,EUTRAN}}$ [s] (number of DRX cycles) | $T_{\text{evaluate,EUTRAN}}$ [s] (number of DRX cycles) |
|----------------------|---|--|---|
| 0.32                 | 11.52 (36)  | 1.28 (4)   | 5.12 (16)   |
| 0.64                 | 17.92 (28)  | 1.28 (2)   | 5.12 (8)  |
| 1.28                 | 32(25)  | 1.28 (1)   | 6.4 (5)   |
| 2.56                 | 58.88 (23)  | 2.56 (1)   | 7.68 (3)  |

**Table 4.2.2.5-2:  $T_{\text{detect,EUTRAN\_HST}}$ ,  $T_{\text{measure,EUTRAN\_HST}}$ , and  $T_{\text{evaluate,EUTRAN\_HST}}$  for UE configured with highSpeedMeasFlag-r16**

| DRX cycle length [s]   | $T_{\text{detect,EUTRAN\_HST}}$ [s] (number of DRX cycles) | $T_{\text{measure,EUTRAN\_HST}}$ [s] (number of DRX cycles) | $T_{\text{evaluate,EUTRAN\_HST}}$ [s] (number of DRX cycles) |
|--|--|---|--|
| 0.32   | 4.16 (13)  | 0.64 (2)  | 0.96 (3)   |
| 0.64   | 7.68 (12)  | 1.28 (2)  | 1.92 (3)   |
| 1.28   | 8.96 (7)   | 1.28 (1)  | 3.84 (3)   |
| 2.56   | 58.88 (23)   | 2.56 (1)  | 7.68 (3)   |
| Note 1: When highSpeedMeasFlag-r16 is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or [ <i>interRAT-MeasurementEnhancement-r16</i> ]. |  |   |  |

The requirements in Table 4.2.2.5-2 apply only when the UE supports *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 4.2.2.5-2.

#### 4.2.2.6 Maximum interruption in paging reception

UE shall perform the cell re-selection with minimum interruption in monitoring downlink channels for paging reception.

At intra-frequency and inter-frequency cell re-selection, the UE shall monitor the downlink of serving cell for paging reception until the UE is capable to start monitoring downlink channels of the target intra-frequency and inter-frequency cell for paging reception. The interruption time shall not exceed  $T_{\text{SI-NR}} + 2 * T_{\text{target\_cell\_SMTC\_period}}$  ms.  $T_{\text{target\_cell\_SMTC\_period}}$  is the periodicity of the SMTC occasions configured for the target NR cell. If the target cell is in the PCI list of *smtc2-LP*, the SMTC periodicity follows *smtc2-LP*; otherwise, the SMTC periodicity follows *smtc*.

At inter-RAT cell re-selection, the UE shall monitor the downlink of serving cell for paging reception until the UE is capable to start monitoring downlink channels for paging reception of the target inter-RAT cell. For NR to E-UTRAN cell re-selection the interruption time must not exceed  $T_{\text{SI-EUTRA}} + 55$  ms.

$T_{\text{SI-NR}}$  is the time required for receiving all the relevant system information data according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for an NR cell.

$T_{\text{SI-EUTRA}}$  is the time required for receiving all the relevant system information data according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 36.331 [16] for an E-UTRAN cell.

These requirements assume sufficient radio conditions, so that decoding of system information can be made without errors and does not take into account cell re-selection failure.

#### 4.2.2.7 General requirements

The UE shall search every layer of higher priority at least every  $T_{\text{higher\_priority\_search}} = (60 * N_{\text{layers}})$  seconds, where  $N_{\text{layers}}$  is the total number of higher priority NR and E-UTRA carrier frequencies broadcasted in system information.

For a UE configured with early measurement reporting, while T331 is running,  $N_{\text{layers}}$  is the combined total number of higher priority NR and E-UTRA carrier frequencies broadcasted in system information and carriers configured for idle mode CA measurements.

Note: combined total number means that if a carrier is a high priority carrier and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

#### 4.2.2.8 Minimum requirement at transitions

When switching from low mobility scenario or not-at-cell-edge scenario to low mobility and not-at-cell-edge scenario during cell-reselection period, the UE shall fulfill the requirements corresponding to low mobility scenario or not-at-cell-edge scenario over measurement period ( $T_{\text{relaxed}}$ ) and thereafter switch to requirements corresponding to low mobility and not-at-cell-edge scenario. The measurement period,  $T_{\text{relaxed}}$ , is any of:

- $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_Intra}}$ , defined in section 4.2.2.9 for intra-frequency measurements on NR cells,

- $T_{\text{measure,NR\_Inter}}$  and  $T_{\text{evaluate,NR\_Inter}}$  defined in section 4.2.2.10 for inter-frequency measurements on NR cells and
- $T_{\text{measure,EUTRAN}}$  and  $T_{\text{evaluate,EUTRAN}}$  defined in sections 4.2.2.11 for inter-RAT E-UTRAN measurements.

When switching from low mobility and not-at-cell-edge scenario to low mobility scenario or not-at-cell-edge scenario during cell-reselection period, the UE shall fulfill the requirements corresponding to low mobility scenario or not-at-cell-edge scenario upon fulfilling the switching criteria.

When switching from normal mode to low mobility scenario or not-at-cell-edge scenario or low mobility and not-at-cell-edge scenario during cell-reselection period, the UE shall fulfill the requirements corresponding to normal mode over measurement period ( $T_{\text{normal}}$ ) and thereafter switch to requirements corresponding to low mobility scenario or not-at-cell-edge scenario or low mobility and not-at-cell-edge scenario. The measurement period,  $T_{\text{normal}}$ , is any of:

- $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_Intra}}$ , defined in section 4.2.2.3 for intra-frequency measurements on NR cells,
- $T_{\text{measure,NR\_Inter}}$  and  $T_{\text{evaluate,NR\_Inter}}$  defined in section 4.2.2.4 for inter-frequency measurements on NR cells and
- $T_{\text{measure,EUTRAN}}$  and  $T_{\text{evaluate,EUTRAN}}$  defined in sections 4.2.2.5 for inter-RAT E-UTRAN measurements.

When switching from low mobility scenario or not-at-cell-edge scenario or low mobility and not-at-cell-edge scenario to normal mode during cell-reselection period, the UE shall fulfill the requirements corresponding to normal mode upon fulfilling the switching criteria.

No requirement is defined for multiple transitions of scenarios within one measurement period.

#### 4.2.2.9 Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterion

##### 4.2.2.9.1 Introduction

This clause contains the requirements for measurements on intra-frequency NR cells when  $S_{\text{rxlev}} \leq S_{\text{IntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{IntraSearchQ}}$  and when the UE is configured any of the following relaxed measurement criteria:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in [1],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in [1],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in [1] respectively.

##### 4.2.2.9.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *lowMobilityEvaluation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [2] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- $T_{\text{detect,NR\_Intra}}$  as specified in Table 4.2.2.9.2-1.
- $T_{\text{measure,NR\_Intra}}$  as specified in Table 4.2.2.9.2-1.
- $T_{\text{evaluate,NR\_Intra}}$  as specified in Table 4.2.2.9.2-1.

**Table 4.2.2.9.2-1:  $T_{\text{detect,NR\_Intra}}$ ,  $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_Intra}}$** 

| DRX cycle length [s]   | Scaling Factor (N1) |                      | $T_{\text{detect,NR\_Intra}}$ [s]<br>(number of DRX cycles)                     | $T_{\text{measure,NR\_Intra}}$ [s]<br>(number of DRX cycles)            | $T_{\text{evaluate,NR\_Intra}}$ [s]<br>(number of DRX cycles)            |
|--|---------------------|----------------------|---|---|--|
|  | FR1                 | FR2 <sup>Note1</sup> |   |   |  |
| 0.32   | 1                   | 8                    | $11.52 \times N1 \times M2 \times K1$<br>( $36 \times N1 \times M2 \times K1$ ) | $1.28 \times N1 \times M2 \times K1$ (4 x<br>$N1 \times M2 \times K1$ ) | $5.12 \times N1 \times M2 \times K1$ (16<br>x $N1 \times M2 \times K1$ ) |
| 0.64   |                     | 5                    | $17.92 \times N1 \times K1$ (28 x<br>$N1 \times K1$ )                           | $1.28 \times N1 \times K1$ (2 x $N1 \times$<br>$K1$ )                   | $5.12 \times N1 \times K1$ (8 x $N1 \times$<br>$K1$ )                    |
| 1.28   |                     | 4                    | $32 \times N1 \times K1$ (25 x $N1$<br>x $K1$ )                                 | $1.28 \times N1 \times K1$ (1 x $N1 \times$<br>$K1$ )                   | $6.4 \times N1 \times K1$ (5 x $N1 \times$<br>$K1$ )                     |
| 2.56   |                     | 3                    | $58.88 \times N1 \times K1$ (23 x<br>$N1 \times K1$ )                           | $2.56 \times N1 \times K1$ (1 x $N1 \times$<br>$K1$ )                   | $7.68 \times N1 \times K1$ (3 x $N1 \times$<br>$K1$ )                    |
| <p>Note 1: Applies for UE supporting power class 2&amp;3&amp;4. For UE supporting power class 1, <math>N1 = 8</math> for all DRX cycle length.</p> <p>Note 2: <math>M2 = 1.5</math> if SMTC periodicity of measured intra-frequency cell &gt; 20 ms; otherwise <math>M2=1</math>. If high layer signalling <i>smtc2-LP-r16</i> is configured, for cells indicated in the <i>pci-List</i> parameter in <i>smtc2-LP-r16</i>, the SMTC periodicity corresponds to the value of higher layer parameter <i>smtc2-LP-r16</i>; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter <i>smtc</i>.</p> <p>Note 3: <math>K1 = 3</math> is the measurement relaxation factor applicable for UE fulfilling the <i>lowMobilityEvaluation</i> [2] criterion.</p> |                     |                      |   |   |  |

#### 4.2.2.9.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *cellEdgeEvaluation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criteria and *combineRelaxedMeasCondition* [2] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [2] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- $T_{\text{detect,NR\_Intra}}$  as specified in Table 4.2.2.9.3-1.
- $T_{\text{measure,NR\_Intra}}$  as specified in Table 4.2.2.9.3-1.
- $T_{\text{evaluate,NR\_Intra}}$  as specified in Table 4.2.2.9.3-1.

**Table 4.2.2.9.3-1:  $T_{\text{detect,NR\_Intra}}$ ,  $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_Intra}}$** 

| DRX cycle length [s]  | Scaling Factor (N1) |                      | $T_{\text{detect,NR\_Intra}}$ [s]<br>(number of DRX cycles)                     | $T_{\text{measure,NR\_Intra}}$ [s]<br>(number of DRX cycles)            | $T_{\text{evaluate,NR\_Intra}}$ [s]<br>(number of DRX cycles)            |
|---|---------------------|----------------------|---|---|--|
|   | FR1                 | FR2 <sup>Note1</sup> |   |   |  |
| 0.32  | 1                   | 8                    | $11.52 \times N1 \times M2 \times K1$<br>( $36 \times N1 \times M2 \times K1$ ) | $1.28 \times N1 \times M2 \times K1$ (4 x<br>$N1 \times M2 \times K1$ ) | $5.12 \times N1 \times M2 \times K1$ (16<br>x $N1 \times M2 \times K1$ ) |
| 0.64  |                     | 5                    | $17.92 \times N1 \times K1$ (28 x<br>$N1 \times K1$ )                           | $1.28 \times N1 \times K1$ (2 x $N1 \times$<br>$K1$ )                   | $5.12 \times N1 \times K1$ (8 x $N1 \times$<br>$K1$ )                    |
| 1.28  |                     | 4                    | $32 \times N1 \times K1$ (25 x $N1$<br>x $K1$ )                                 | $1.28 \times N1 \times K1$ (1 x $N1 \times$<br>$K1$ )                   | $6.4 \times N1 \times K1$ (5 x $N1 \times$<br>$K1$ )                     |
| 2.56  |                     | 3                    | $58.88 \times N1 \times K1$ (23 x<br>$N1 \times K1$ )                           | $2.56 \times N1 \times K1$ (1 x $N1 \times$<br>$K1$ )                   | $7.68 \times N1 \times K1$ (3 x $N1 \times$<br>$K1$ )                    |
| <p>Note 1: Applies for UE supporting power class 2&amp;3&amp;4. For UE supporting power class 1, <math>N1 = 8</math> for all DRX cycle length.</p> <p>Note 2: <math>M2 = 1.5</math> if SMTC periodicity of measured intra-frequency cell &gt; 20 ms; otherwise <math>M2=1</math>. If high layer signalling <i>smtc2-LP-r16</i> is configured, for cells indicated in the <i>pci-List</i> parameter in <i>smtc2-LP-r16</i>, the SMTC periodicity corresponds to the value of higher layer parameter <i>smtc2-LP-r16</i>; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter <i>smtc</i>.</p> <p>Note 3: <math>K1 = 3</math> is the measurement relaxation factor applicable for UE fulfilling the <i>cellEdgeEvaluation</i> [2] criterion.</p> |                     |                      |   |   |  |

#### 4.2.2.9.4 Measurements for UE fulfilling low mobility and not-at-cell edge criteria

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion, and
- has also fulfilled both criteria, and
- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet  $T_{\text{detect,NR\_Intra}}$ ,  $T_{\text{measure,NR\_Intra}}$  and  $T_{\text{evaluate,NR\_Intra}}$  as defined in Table 4.2.2.3-1.

#### 4.2.2.10 Measurements of inter-frequency NR cells for UE configured with relaxed measurement criterion

##### 4.2.2.10.1 Introduction

This clause contains the requirements for measurements on inter-frequency NR cells when the UE is configured with any of following relaxed measurement criteria:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in [1],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4. 9.2 in [1],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4. 9.1 and 5.2.4.9.2 in [1] respectively.

##### 4.2.2.10.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- UE is configured with *lowMobilityEvaluation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [2] and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and
- UE has fulfilled only the *lowMobilityEvaluation* [2] criterion.

The UE shall not relax measurements on NR inter-frequency carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

When  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$  then the requirements are defined as follows: :

- $T_{\text{detect,NR\_Inter\_Relax}}$  as specified in Table 4.2.2.10.2-1.
- $T_{\text{measure,NR\_Inter\_Relax}}$  as specified in Table 4.2.2.10.2-1.
- $T_{\text{evaluate,NR\_Inter\_Relax}}$  as specified in Table 4.2.2.10.2-1.
- The UE shall be able to evaluate whether a newly detectable inter-frequency NR cell meets the reselection criteria defined in TS38.304 [1] within  $N_{\text{carrier\_Relax}} * T_{\text{detect,NR\_Inter\_Relax}} + N_{\text{carrier\_Non\_relax}} * T_{\text{detect,NR\_Inter}}$ . Cells which have been detected shall be measured at least every  $N_{\text{carrier\_Relax}} * T_{\text{measure,NR\_Inter\_Relax}} + N_{\text{carrier\_Non\_relax}} * T_{\text{measure,NR\_Inter}}$ . The UE shall be able to evaluate that an already identified inter-frequency NR cell has met reselection criterion defined in TS 38.304 [1] within  $N_{\text{carrier\_Relax}} * T_{\text{evaluate,NR\_Inter\_Relax}} + N_{\text{carrier\_Non\_relax}} * T_{\text{evaluate,NR\_Inter}}$ .
- When T331 is running,
  - The parameter  $N_{\text{carrier\_Relax}}$  is the total number of NR inter-frequency carriers not configured for idle mode CA/DC measurements.



- The parameter  $N_{\text{carrier\_Non\_relax}}$  is the total number of NR inter-frequency carriers configured for idle mode CA/DC measurements.
- When T331 is not running,
  - The parameter  $N_{\text{carrier\_Relax}}$  is the total number of inter-frequency carriers configured for mobility measurements only and the number of inter-frequency carriers configured for both mobility measurement and idle mode CA/DC measurements.
- The parameter  $N_{\text{carrier\_Non\_relax}} = 0$ .

When  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$  and the UE is configured with *highPriorityMeasRelax* [2] then the UE shall search for inter-frequency layers of higher priority at least every  $K2 \cdot T_{\text{higher\_priority\_search}}$  seconds where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.7 and,  $K2 = 60$ . Otherwise if the UE is not configured with *highPriorityMeasRelax* [2] then the UE shall search for inter-frequency layers of higher priority at least every  $T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.7.

**Table 4.2.2.10.2-1:  $T_{\text{detect,NR\_Inter\_Relax}}$ ,  $T_{\text{measure,NR\_Inter\_Relax}}$  and  $T_{\text{evaluate,NR\_Inter\_Relax}}$**

| DRX cycle length [s]   | Scaling Factor (N1) |                      | $T_{\text{detect,NR\_Inter\_Relax}}$ [s]<br>(number of DRX cycles)                | $T_{\text{measure,NR\_Inter\_Relax}}$ [s]<br>(number of DRX cycles)       | $T_{\text{evaluate,NR\_Inter\_Relax}}$ [s]<br>(number of DRX cycles)       |
|--|---------------------|----------------------|---|---|--|
|  | FR1                 | FR2 <sup>Note1</sup> |   |   |  |
| 0.32   | 1                   | 8                    | $11.52 \times N1 \times 1.5 \times K1$<br>( $36 \times N1 \times 1.5 \times K1$ ) | $1.28 \times N1 \times 1.5 \times K1$ (4 x<br>$N1 \times 1.5 \times K1$ ) | $5.12 \times N1 \times 1.5 \times K1$ (16 x<br>$N1 \times 1.5 \times K1$ ) |
| 0.64   |                     | 5                    | $17.92 \times N1 \times K1$ (28 x<br>$N1 \times K1$ )                             | $1.28 \times N1 \times K1$ (2 x $N1 \times$<br>$K1$ )                     | $5.12 \times N1 \times K1$ (8 x $N1 \times$<br>$K1$ )                      |
| 1.28   |                     | 4                    | $32 \times N1 \times K1$ (25 x $N1 \times$<br>$K1$ )                              | $1.28 \times N1 \times K1$ (1 x $N1 \times$<br>$K1$ )                     | $6.4 \times N1 \times K1$ (5 x $N1 \times$<br>$K1$ )                       |
| 2.56   |                     | 3                    | $58.88 \times N1 \times K1$ (23 x<br>$N1 \times K1$ )                             | $2.56 \times N1 \times K1$ (1 x $N1 \times$<br>$K1$ )                     | $7.68 \times N1 \times K1$ (3 x $N1 \times$<br>$K1$ )                      |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, $N1 = 8$ for all DRX cycle length. |                     |                      |   |   |  |
| Note 2: $K1 = 3$ is the measurement relaxation factor applicable for UE fulfilling the low mobility.                     |                     |                      |   |   |  |

#### 4.2.2.10.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- UE is configured with *cellEdgeEvaluation* [2] criterion, and UE has fulfilled or
- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and
- UE has fulfilled only the *cellEdgeEvaluation* [2] criterion.

The UE shall not relax measurements on NR inter-frequency carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

When  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$  then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- $T_{\text{detect,NR\_Inter\_Relax}}$  as specified in Table 4.2.2.10.3-1.
- $T_{\text{measure,NR\_Inter\_Relax}}$  as specified in Table 4.2.2.10.3-1.
- $T_{\text{evaluate,NR\_Inter\_Relax}}$  as specified in Table 4.2.2.10.3-1.- The UE shall be able to evaluate whether a newly detectable inter-frequency NR cell meets the reselection criteria defined in TS38.304 [1] within  $N_{\text{carrier\_Relax}} \cdot T_{\text{detect,NR\_Inter\_Relax}} + N_{\text{carrier\_Non\_relax}} \cdot T_{\text{detect,NR\_Inter}}$ . Cells which have been detected shall be measured at least every  $N_{\text{carrier\_Relax}} \cdot T_{\text{measure,NR\_Inter\_Relax}} + N_{\text{carrier\_Non\_relax}} \cdot T_{\text{measure,NR\_Inter}}$ . The UE shall be able to evaluate that an already identified inter-frequency NR cell has met reselection criterion defined in TS 38.304 [1] within  $N_{\text{carrier\_Relax}} \cdot T_{\text{evaluate,NR\_Inter\_Relax}} + N_{\text{carrier\_Non\_relax}} \cdot T_{\text{evaluate,NR\_Inter}}$ .

- When T331 is running,
  - The parameter  $N_{\text{carrier\_Relax}}$  is the total number of NR inter-frequency carriers not configured for idle mode CA/DC measurements.
  - The parameter  $N_{\text{carrier\_Non\_relax}}$  is the total number of NR inter-frequency carriers configured for idle mode CA/DC measurements.
- When T331 is not running,
  - The parameter  $N_{\text{carrier\_Relax}}$  is the total number of inter-frequency carriers configured for mobility measurements only and the number of inter-frequency carriers configured for both mobility measurement and idle mode CA/DC measurements.
  - The parameter  $N_{\text{carrier\_Non\_relax}} = 0$ .

When  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$  and regardless of whether the UE is configured with *highPriorityMeasRelax* [2] or not, the UE shall search for inter-frequency layers of higher priority at least every  $T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.7

**Table 4.2.2.10.3-1:  $T_{\text{detect,NR\_Inter\_Relax}}$ ,  $T_{\text{measure,NR\_Inter\_Relax}}$  and  $T_{\text{evaluate,NR\_Inter\_Relax}}$**

| DRX cycle length [s] | Scaling Factor (N1)   |                      | $T_{\text{detect,NR\_Inter\_Relax}}$ [s]<br>(number of DRX cycles) | $T_{\text{measure,NR\_Inter\_Relax}}$ [s]<br>(number of DRX cycles) | $T_{\text{evaluate,NR\_Inter\_Relax}}$ [s]<br>(number of DRX cycles) |
|----------------------|---|----------------------|--|---|--|
|                      | FR1   | FR2 <sup>Note1</sup> |  |   |  |
| 0.32                 | 1   | 8                    | $11.52 \times N1 \times 1.5 \times K1$ (36 x N1 x 1.5 x K1)        | $1.28 \times N1 \times 1.5 \times K1$ (4 x N1 x 1.5 x K1)           | $5.12 \times N1 \times 1.5 \times K1$ (16 x N1 x 1.5 x K1)           |
| 0.64                 |   | 5                    | $17.92 \times N1 \times K1$ (28 x N1 x K1)                         | $1.28 \times N1 \times K1$ (2 x N1 x K1)                            | $5.12 \times N1 \times K1$ (8 x N1 x K1)                             |
| 1.28                 |   | 4                    | $32 \times N1 \times K1$ (25 x N1 x K1)                            | $1.28 \times N1 \times K1$ (1 x N1 x K1)                            | $6.4 \times N1 \times K1$ (5 x N1 x K1)                              |
| 2.56                 |   | 3                    | $58.88 \times N1 \times K1$ (23 x N1 x K1)                         | $2.56 \times N1 \times K1$ (1 x N1 x K1)                            | $7.68 \times N1 \times K1$ (3 x N1 x K1)                             |
| Note 1:              | Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.        |                      |  |   |  |
| Note 2:              | K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the <i>cellEdgeEvaluation</i> [2] criterion. |                      |  |   |  |

#### 4.2.2.10.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion, and
- Has also fulfilled both criteria

In this case the UE is not required to meet  $T_{\text{detect,NR\_Inter}}$ ,  $T_{\text{measure,NR\_Inter}}$  and  $T_{\text{evaluate,NR\_Inter}}$  as defined in Table 4.2.2.4-1.

When  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$ , the UE shall search for, measure and evaluate inter-frequency layers of higher, equal or lower priority at least every 1 hour.

When  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$ , the UE shall search for inter-frequency layers of higher priority at least every  $K2 \cdot T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.7 and  $K2=60$ .

#### 4.2.2.11 Measurements of inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion

##### 4.2.2.11.1 Introduction

This clause contains the requirements for measurements on inter-RAT E-UTRAN cells when the UE is configured with any of following relaxed measurement criteria:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in [1],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in [1],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in [1] respectively.

##### 4.2.2.11.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with *lowMobilityEvaluation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and
- UE has fulfilled only the *lowMobilityEvaluation* [2] criterion.

The UE shall not relax measurements on inter-RAT E-UTRAN carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

When  $S_{rxlev} \leq S_{nonIntraSearchP}$  and  $S_{qual} \leq S_{nonIntraSearchQ}$  then the requirements defined in clause 4.2.2.5 apply for this clause except that:

- $T_{detect,EUTRAN\_Relax}$  as specified in Table 4.2.2.11.2-1.
- $T_{measure,EUTRAN\_Relax}$  as specified in Table 4.2.2.11.2-1.
- $T_{evaluate,EUTRAN\_Relax}$  as specified in Table 4.2.2.11.2-1.
- The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 [1] within  $N_{carrier\_Relax} * T_{detect,EUTRAN\_Relax} + N_{carrier\_Non\_relax} * T_{detect,EUTRAN}$ . Cells which have been detected shall be measured at least every  $N_{carrier\_Relax} * T_{measure,EUTRAN\_Relax} + N_{carrier\_Non\_relax} * T_{measure,EUTRAN}$ . The UE shall be able to evaluate that an already identified inter-RAT E-UTRAN cell has met reselection criterion defined in TS 38.304 [1] within  $N_{EUTRAN\_carrier\_Relax} * T_{evaluate,EUTRAN\_Relax} + N_{EUTRAN\_carrier\_Non\_relax} * T_{evaluate,EUTRAN}$ .
- When T331 is running,
  - The parameter  $N_{carrier\_Relax}$  is the total number of inter-RAT E-UTRAN carriers not configured for idle mode CA/DC measurements.
  - The parameter  $N_{carrier\_Non\_relax}$  is the total number of inter-RAT E-UTRAN carriers configured for idle mode CA/DC measurements.
- When T331 is not running,
  - The parameter  $N_{carrier\_Relax}$  is the total number of inter-RAT E-UTRAN carriers configured for mobility measurements only and the number of inter-RAT E-UTRAN carriers configured for both mobility measurement and idle mode CA/DC measurements.
  - The parameter  $N_{carrier\_Non\_relax} = 0$ .

When  $S_{rxlev} > S_{nonIntraSearchP}$  and  $S_{qual} > S_{nonIntraSearchQ}$  and the UE is configured with *highPriorityMeasRelax* [2] then the UE shall search for E-UTRA inter-RAT frequency layers of higher priority at least every  $K2 \cdot T_{higher\_priority\_search}$  seconds where  $T_{higher\_priority\_search}$  is described in clause 4.2.2.7 and,  $K2 = 60$ . Otherwise if the UE is not configured with *highPriorityMeasRelax* [2] then the UE shall search for E-UTRA inter-RAT frequency layers of higher priority at least every  $T_{higher\_priority\_search}$  where  $T_{higher\_priority\_search}$  is described in clause 4.2.2.7.

**Table 4.2.2.11.2-1:  $T_{detect,EUTRAN\_Relax}$ ,  $T_{measure,EUTRAN\_Relax}$ , and  $T_{evaluate,EUTRAN\_Relax}$**

| DRX cycle length [s]   | $T_{detect,EUTRAN\_Relax}$ [s]<br>(number of DRX cycles) | $T_{measure,EUTRAN\_Relax}$ [s]<br>(number of DRX cycles) | $T_{evaluate,EUTRAN\_Relax}$ [s]<br>(number of DRX cycles) |
|--|--|---|--|
| 0.32   | $11.52 \times K1$ ( $36 \times K1$ )                     | $1.28 \times K1$ ( $4 \times K1$ )                        | $5.12 \times K1$ ( $16 \times K1$ )                        |
| 0.64   | $17.92 \times K1$ ( $28 \times K1$ )                     | $1.28 \times K1$ ( $2 \times K1$ )                        | $5.12 \times K1$ ( $8 \times K1$ )                         |
| 1.28   | $32 \times K1$ ( $25 \times K1$ )                        | $1.28 \times K1$ ( $1 \times K1$ )                        | $6.4 \times K1$ ( $5 \times K1$ )                          |
| 2.56   | $58.88 \times K1$ ( $23 \times K1$ )                     | $2.56 \times K1$ ( $1 \times K1$ )                        | $7.68 \times K1$ ( $3 \times K1$ )                         |
| Note 1: $K1 = 3$ is the measurement relaxation factor applicable for UE fulfilling the <i>lowMobilityEvaluation</i> [2] criterion. |  |   |  |

#### 4.2.2.11.3 Measurements for UE fulfilling with not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with *cellEdgeEvaluation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and
- UE has fulfilled only the *cellEdgeEvaluation* [2] criterion.

The UE shall not relax measurements on inter-RAT E-UTRAN carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

When  $S_{rxlev} \leq S_{nonIntraSearchP}$  and  $S_{qual} \leq S_{nonIntraSearchQ}$  then the requirements defined in clause 4.2.2.5 apply for this clause except that:

- $T_{detect,EUTRAN\_Relax}$  as specified in Table 4.2.2.11.3-1.
- $T_{measure,EUTRAN\_Relax}$  as specified in Table 4.2.2.11.3-1.
- $T_{evaluate,EUTRAN\_Relax}$  as specified in Table 4.2.2.11.3-1.
- The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 [1] within  $N_{carrier\_Relax} \cdot T_{detect,EUTRAN\_Relax} + N_{carrier\_Non\_relax} \cdot T_{detect,EUTRAN}$ . Cells which have been detected shall be measured at least every  $N_{carrier\_Relax} \cdot T_{measure,EUTRAN\_Relax} + N_{carrier\_Non\_relax} \cdot T_{measure,EUTRAN}$ . The UE shall be able to evaluate that an already identified inter-RAT E-UTRAN cell has met reselection criterion defined in TS 38.304 [1] within  $N_{EUTRAN\_carrier\_Relax} \cdot T_{evaluate,EUTRAN\_Relax} + N_{EUTRAN\_carrier\_Non\_relax} \cdot T_{evaluate,EUTRAN}$ .
- When T331 is running,
  - The parameter  $N_{carrier\_Relax}$  is the total number of inter-RAT E-UTRAN carriers not configured for idle mode CA/DC measurements.
  - The parameter  $N_{carrier\_Non\_relax}$  is the total number of inter-RAT E-UTRAN carriers configured for idle mode CA/DC measurements.
- When T331 is not running,
  - The parameter  $N_{carrier\_Relax}$  is the total number of inter-RAT E-UTRAN carriers configured for mobility measurements only and the number of inter-RAT E-UTRAN carriers configured for both mobility measurement and idle mode CA/DC measurements.

- The parameter  $N_{\text{carrier\_Non\_relax}} = 0$ .

When  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$  and regardless of whether the UE is configured with *highPriorityMeasRelax* [2] or not, the UE shall search for inter-RAT E-UTRAN frequency layers of higher priority at least every  $T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.7.

**Table 4.2.2.11.3-1:  $T_{\text{detect,EUTRAN\_Relax}}$ ,  $T_{\text{measure,EUTRAN\_Relax}}$ , and  $T_{\text{evaluate,EUTRAN\_Relax}}$**

| DRX cycle length [s]  | $T_{\text{detect,EUTRAN}}$ [s] (number of DRX cycles) | $T_{\text{measure,EUTRAN}}$ [s] (number of DRX cycles) | $T_{\text{evaluate,EUTRAN}}$ [s] (number of DRX cycles) |
|---|---|--|---|
| 0.32  | $11.52 \times K1$ (36 x K1)                           | $1.28 \times K1$ (4 x K1)                              | $5.12 \times K1$ (16 x K1)                              |
| 0.64  | $17.92 \times K1$ (28 x K1)                           | $1.28 \times K1$ (2 x K1)                              | $5.12 \times K1$ (8 x K1)                               |
| 1.28  | $32 \times K1$ (25 x K1)                              | $1.28 \times K1$ (1 x K1)                              | $6.4 \times K1$ (5 x K1)                                |
| 2.56  | $58.88 \times K1$ (23 x K1)                           | $2.56 \times K1$ (1 x K1)                              | $7.68 \times K1$ (3 x K1)                               |
| Note 1: $K1 = 3$ is the measurement relaxation factor applicable for UE fulfilling the <i>cellEdgeEvaluation</i> [2] criterion. |   |  |   |

#### 4.2.2.11.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with both *lowMobilityEvaluation* [2] criterion and *cellEdgeEvaluation* [2] criterion, and
- has also fulfilled both criteria

In this case the UE is not required to meet  $T_{\text{detect,EUTRAN}}$ ,  $T_{\text{measure,EUTRAN}}$  and  $T_{\text{evaluate,EUTRAN}}$  as defined in Table 4.2.2.5-1.

When  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$ , the UE shall search for, measure and evaluate inter-RAT E-UTRAN layers of higher or lower priority at least every 1 hour.

When  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$ , the UE shall search for inter-RAT E-UTRAN of higher priority at least every  $K2 \cdot T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2.2.7 and  $K2=60$ .

## 4.2A Cell Re-selection when subject to CCA

### 4.2A.1 Introduction

The cell reselection procedure allows the UE to select a more suitable cell and camp on it. The requirements in clauses 4.2A.2.3, 4.2A.2.4, and 4.2A.2.6, apply when at least the target cell is on a carrier frequency subject to CCA, and the requirements in clauses 4.2A.2.2, and 4.2A.2.5 apply when at least the camping cell is on a carrier frequency subject to CCA.

When the UE is in either *Camped Normally* state or *Camped on Any Cell* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. For intra-frequency and inter-frequency cells the serving cell may not provide explicit neighbour list but carrier frequency information and bandwidth information only. UE measurement activity is also controlled by measurement rules defined in TS 38.304, allowing the UE to limit its measurement activity.

In the requirements of clause 4.2A, the exceptions for side conditions apply as follows:

- for the UE capable of CA, the applicable exceptions for side conditions are specified in Annex B, clause B.x.y for UE supporting CA in FR1.

In the requirements of clause 4.2A.2, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but  $N$  candidate SSB positions for the same SS/PBCH block index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding detection, measurement, or evaluation period, where:

- For the cell detection procedure:  $N$  is at least one candidate SSB position (NOTE: the one candidate SSB position for the cell detection shall not be impacted by the set of candidate SSB positions which are already being measured by the UE within the current measurement period of the on-going measurements), and
- For other procedures in clause 4.2A.2:  $N$  are the first two successive candidate SSB positions when two or more candidate SSB positions are configured for this SSB index in one discovery burst transmission window, otherwise  $N$  is one candidate SSB position;

otherwise the SMTC occasion is considered as available at the UE.

## 4.2A.2 Requirements

### 4.2A.2.1 UE measurement capability

For idle mode cell re-selection purposes, the UE shall be capable of monitoring at least:

- Intra-frequency carrier, and
- Depending on UE capability, 7 NR inter-frequency carriers, and
- Depending on UE capability, 7 FDD E-UTRA inter-RAT carriers, and
- Depending on UE capability, 7 TDD E-UTRA inter-RAT carriers.

In addition to the requirements defined above, a UE supporting E-UTRA measurements in RRC\_IDLE state shall be capable of monitoring a total of at least 14 carrier frequency layers, which includes serving layer, comprising of any above defined combination of E-UTRA FDD, E-UTRA TDD and NR layers. The inter-frequency carriers include carriers on unlicensed band and/or licensed band.

### 4.2A.2.2 Measurement and evaluation when subject to CCA on the serving cell

The UE shall measure the SS-RSRP and SS-RSRQ level of the serving cell and evaluate the cell selection criterion  $S$  defined in TS 38.304 [1] for the serving cell at least once every  $(1+M_n)*M_1*$  DRX cycles in  $N_{\text{serv\_CCA}}$  consecutive DRX cycles; where:

$M_1=2$  if SMTC periodicity ( $T_{\text{SMTC}}$ ) > 20 ms and DRX cycle  $\leq$  0.64 second,

otherwise  $M_1=1$ .

$M_n$  is the maximum separation in DRX cycles between two measurements that are used for filtering.

The UE shall filter the SS-RSRP and SS-RSRQ measurements of the serving cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by, at least DRX cycle/2 but not separated in time by more than  $M_n$ , where  $M_n=2$ .

If the UE has evaluated according to Table 4.2A.2.2-1 in  $N_{\text{serv\_CCA}}$  consecutive DRX cycles that the serving cell does not fulfil the cell selection criterion  $S$ , the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

UE shall initiate measurements on neighbour cells indicated by the serving cell if it is unable to measure on the serving cell for at least  $M_p$  consecutive number of DRX cycles each with at least one SMTC occasion not available at the UE, where  $M_p=4$  when DRX cycle length < 1.28 s,  $M_p=2$  when DRX cycle length  $\geq$  1.28 s.

UE shall initiate the measurements on neighbour cells of any intra-frequency or inter-frequency if it is unable to measure on serving cell during at least consecutive  $M_q$  number of DRX cycles each with at least one SMTC occasion not available at the UE, regardless of any condition of  $S_{\text{nonIntraSearchP}}$  and  $S_{\text{nonIntraSearchQ}}$ , where  $M_q=8$  when DRX cycle length  $< 1.28$  s,  $M_q=4$  when DRX cycle length  $\geq 1.28$  s.

If the UE in RRC\_IDLE has not found any new suitable cell based on searches and measurements using the intra-frequency, inter-frequency and inter-RAT information indicated in the system information for 10 s, the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1].

**Table 4.2A.2.2-1:  $N_{\text{serv\_CCA}}$**

| DRX cycle length [s] | $N_{\text{serv\_CCA}}$ [number of DRX cycles]   |
|----------------------|---|
| 0.32                 | $M1*4+M1*M_s$   |
| 0.64                 | $M1*4+M1*M_s$   |
| 1.28                 | $2+M_s$   |
| 2.56                 | $2+M_s$   |
| Note 1:              | $M_s$ is the number of DRX cycles each with at least one SMTC occasion not available at the UE during $N_{\text{serv\_CCA}}$ , and $M_s < M_{s,\text{max}}$ |
| Note 2:              | $M_{s,\text{max}}=8$ for DRX cycle length $< 1.28$ s, $M_{s,\text{max}} = 4$ for DRX cycle length $\geq 1.28$ s.  |

The UE shall restart the measurements used for serving cell evaluation if  $M_s$  exceeds  $M_{s,\text{max}}$ .

#### 4.2A.2.3 Measurements of intra-frequency NR cells when subject to CCA on the serving cell and target cell

The UE shall be able to identify new intra-frequency cells with CCA and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 within  $T_{\text{detect,NR\_Intra\_CCA}}$  when that  $T_{\text{reselection}} = 0$ . An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.2.8 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every  $T_{\text{measure,NR\_Intra\_CCA}}$  (see table 4.2A.2.3-1) for intra-frequency cells that are identified and measured according to the measurement rules. For a cell that is already identified, after 2 unsuccessful measurement attempts due to exceeding the maximum number of SMTC occasions not available at the UE, the UE shall detect cells on any of the configured serving- and/or non-serving carriers.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{\text{measure,NR\_Intra\_CCA}}/2$ .

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within  $T_{\text{evaluate,NR\_Intra\_CCA}}$  when  $T_{\text{reselection}} = 0$  as specified in table 4.2A.2.3-1 provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
- if there are multiple such cells, the cell has the highest rank among them.

- the cell is at least 3dB better ranked in FR1 if the current serving cell is among them.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If  $T_{\text{reselection}}$  timer has a non-zero value and the intra-frequency cell is satisfied with the reselection criteria, which are defined in TS38.304 [1], the UE shall evaluate this intra-frequency cell for the  $T_{\text{reselection}}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

**Table 4.2A.2.3-1:  $T_{\text{detect,NR\_Intra\_CCA}}$ ,  $T_{\text{measure,NR\_Intra\_CCA}}$  and  $T_{\text{evaluate,NR\_Intra\_CCA}}$**

| DRX cycle length [s] | $T_{\text{detect,NR\_Intra\_CCA}}$ [s] (number of DRX cycles)  | $T_{\text{measure,NR\_Intra\_CCA}}$ [s] (number of DRX cycles)     | $T_{\text{evaluate,NR\_Intra\_CCA}}$ [s] (number of DRX cycles)    |
|----------------------|--|--|--|
| 0.32                 | $0.32 \times (36 + M_d) \times M_2$<br>$\{([36] + M_d) \times M_2\}$   | $0.32 \times (4 + M_m) \times M_2$<br>$\{([4] + M_m) \times M_2\}$ | $0.32 \times (16 + M_e) \times M_2$<br>$\{(16 + M_e) \times M_2\}$ |
| 0.64                 | $0.64 \times (28 + M_d)$<br>$\{28 + M_d\}$   | $0.64 \times (2 + M_m)$<br>$\{2 + M_m\}$                           | $0.64 \times (8 + M_e)$<br>$\{8 + M_e\}$                           |
| 1.28                 | $1.28 \times (25 + M_d)$<br>$\{25 + M_d\}$   | $1.28 \times (1 + M_m)$<br>$\{1 + M_m\}$                           | $1.28 \times (5 + M_e)$<br>$\{5 + M_e\}$                           |
| 2.56                 | $2.56 \times (23 + M_d)$<br>$\{23 + M_d\}$   | $2.56 \times (1 + M_m)$<br>$\{1 + M_m\}$                           | $2.56 \times (3 + M_e)$<br>$\{3 + M_e\}$                           |
| Note 1:              | $M_2 = 1.5$ if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise $M_2 = 1$ .  |  |  |
| Note 2:              | $M_d$ , $M_m$ , $M_e$ are the number of DRX cycles each with at least one SMTC occasion not available during the $T_{\text{detect,NR\_Intra\_CCA}}$ , $T_{\text{measure,NR\_Intra\_CCA}}$ and $T_{\text{evaluate,NR\_Intra\_CCA}}$ , and $M_m \leq M_{m,\text{max}}$ , $M_d \leq M_{d,\text{max}}$ and $M_e \leq M_{e,\text{max}}$ |  |  |
| Note 3:              | $M_{m,\text{max}} = 16$ for DRX cycle length = 0.32s; $M_{m,\text{max}} = 8$ for DRX cycle length = 0.64s; $M_{m,\text{max}} = 4$ for DRX cycle length = 1.28s; $M_{m,\text{max}} = 4$ for DRX cycle length = 2.56 s.  |  |  |
| Note 4:              | $M_{d,\text{max}} = 4 * M_{m,\text{max}}$ , $M_{e,\text{max}} = 2 * M_{m,\text{max}}$ .  |  |  |

The UE shall restart the measurements upon exceeding  $M_{m,\text{max}}$ ,  $M_{d,\text{max}}$ , or  $M_{e,\text{max}}$ .

#### 4.2A.2.4 Measurements of inter-frequency NR cells when subject to CCA on the target cell

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If  $S_{\text{rxlev}} > S_{\text{nonIntraSearchP}}$  and  $S_{\text{qual}} > S_{\text{nonIntraSearchQ}}$  then the UE shall search for inter-frequency layers of higher priority at least every  $T_{\text{higher\_priority\_search}}$  where  $T_{\text{higher\_priority\_search}}$  is described in clause 4.2A.2.7.

If  $S_{\text{rxlev}} \leq S_{\text{nonIntraSearchP}}$  or  $S_{\text{qual}} \leq S_{\text{nonIntraSearchQ}}$  then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 within  $K_{\text{carrier}} * T_{\text{detect,NR\_Inter}} + K_{\text{carrier\_CCA}} * T_{\text{detect,NR\_Inter\_CCA}}$  if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when  $T_{\text{reselection}} = 0$  provided that the reselection criteria is met by a margin of at least 5 dB in FR1 for reselections based on ranking or 6dB in FR1 for SS-RSRP reselections based on absolute priorities or 4dB in FR1 for SS-RSRQ reselections based on absolute priorities. The parameter  $K_{\text{carrier}}$  is the number of NR inter-frequency carriers on licensed band and  $K_{\text{carrier\_CCA}}$  is the number of NR inter-frequency carriers on unlicensed band indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.2.9 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every  $T_{\text{measure,NR\_Inter\_CCA}}$ . If after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose



physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every  $K_{\text{carrier}} * T_{\text{measure,NR\_Inter}} + K_{\text{carrier\_CCA}} * T_{\text{measure,NR\_Inter\_CCA}}$  for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

For a cell that is already identified, after 2 unsuccessful measurement attempts due to exceeding the maximum number of SMTC occasions not available at the UE, the UE shall detect cells on any of the configured serving- and/or non-serving carriers.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{\text{measure,NR\_Inter\_CCA}}/2$ .

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 within  $K_{\text{carrier}} * T_{\text{evaluate,NR\_Inter}} + K_{\text{carrier\_CCA}} * T_{\text{evaluate,NR\_Inter\_CCA}}$  when  $T_{\text{reselection}} = 0$  as specified in table 4.2A.2.4-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and when *rangeToBestCell* is not configured:
  - the cell is at least 5dB better ranked in FR1 or
- when *rangeToBestCell* is configured:
  - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them
    - the cell is at least 5dB better ranked in FR1 if the current serving cell is among them. or
  - 6dB in FR1 for SS-RSRP reselections based on absolute priorities or
  - 4dB in FR1 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If  $T_{\text{reselection}}$  timer has a non zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the  $T_{\text{reselection}}$  time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2A.2.4-1 under the following conditions:

- $T_{\text{SMTC\_intra}} = T_{\text{SMTC\_inter}} = 160$  ms; where  $T_{\text{SMTC\_intra}}$  and  $T_{\text{SMTC\_inter}}$  are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and
- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion [1].

**Table 4.2A.2.4-1:  $T_{\text{detect,NR\_Inter\_CCA}}$ ,  $T_{\text{measure,NR\_Inter\_CCA}}$  and  $T_{\text{evaluate,NR\_Inter\_CCA}}$** 

| DRX cycle length [s] | $T_{\text{detect,NR\_Inter\_CCA}}$ [s] (number of DRX cycles)  | $T_{\text{measure,NR\_Inter\_CCA}}$ [s] (number of DRX cycles)     | $T_{\text{evaluate,NR\_Inter\_CCA}}$ [s] (number of DRX cycles)      |
|----------------------|--|--|--|
| 0.32                 | $0.32 \times (36 + M_d) \times M_2$<br>{(36 + $M_d$ ) $\times M_2$ }   | $0.32 \times (4 + M_m) \times M_2$<br>{(4 + $M_m$ ) $\times M_2$ } | $0.32 \times (16 + M_e) \times M_2$<br>{(16 + $M_e$ ) $\times M_2$ } |
| 0.64                 | $0.64 \times (28 + M_d)$<br>{28 + $M_d$ }  | $0.64 \times (2 + M_m)$<br>{2 + $M_m$ }                            | $0.64 \times (8 + M_e)$<br>{8 + $M_e$ }                              |
| 1.28                 | $1.28 \times (25 + M_d)$<br>{25 + $M_d$ }  | $1.28 \times (1 + M_m)$<br>{1 + $M_m$ }                            | $1.28 \times (5 + M_e)$<br>{5 + $M_e$ }                              |
| 2.56                 | $2.56 \times (23 + M_d)$<br>{23 + $M_d$ }  | $2.56 \times (1 + M_m)$<br>{1 + $M_m$ }                            | $2.56 \times (3 + M_e)$<br>{3 + $M_e$ }                              |
| Note 1:              | $M_2 = 1.5$ if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise $M_2 = 1$ .  |  |  |
| Note 2:              | $M_d$ , $M_m$ , $M_e$ are the number of DRX cycles with at least one SMTC where there are no SSBs available at the UE during $T_{\text{detect,NR\_Inter\_CCA}}$ , $T_{\text{measure,NR\_Inter\_CCA}}$ and $T_{\text{evaluate,NR\_Inter\_CCA}}$ , and $M_m \leq M_{m,\text{max}}$ , $M_d \leq M_{d,\text{max}}$ and $M_e \leq M_{e,\text{max}}$ |  |  |
| Note 3:              | $M_{m,\text{max}} = 16$ for DRX cycle length = 0.32s;<br>$M_{m,\text{max}} = 8$ for DRX cycle length = 0.64s;<br>$M_{m,\text{max}} = 4$ for DRX cycle length = 1.28s;<br>$M_{m,\text{max}} = 4$ for DRX cycle length = 2.56s.  |  |  |
| Note 4:              | $M_{d,\text{max}} = 4 * M_{m,\text{max}}$ , $M_{e,\text{max}} = 2 * M_{m,\text{max}}$ .  |  |  |

The UE shall restart the measurements upon exceeding  $M_{m,\text{max}}$ ,  $M_{d,\text{max}}$ , Or  $M_{e,\text{max}}$ .

#### 4.2A.2.5 Measurements of inter-RAT E-UTRAN cells when subject to CCA on the serving cell

The requirements in clause 4.2.2.5 shall apply.

#### 4.2A.2.6 Maximum interruption in paging reception when subject to CCA on the target cell

UE shall perform the cell re-selection with minimum interruption in monitoring downlink channels for paging reception.

At intra-frequency and inter-frequency cell re-selection, the UE shall monitor the downlink of serving cell for paging reception until the UE is capable to start monitoring downlink channels of the target intra-frequency and inter-frequency cell for paging reception. The interruption time shall not exceed  $T_{\text{SI,CCA}} + 2 * T_{\text{target\_cell\_SMTC\_period}}$ .

At inter-RAT cell re-selection, the UE shall monitor the downlink of serving cell for paging reception until the UE is capable to start monitoring downlink channels for paging reception of the target inter-RAT cell. For NR to E-UTRAN cell re-selection the interruption time shall not exceed  $T_{\text{SI-EUTRA}} + 55$  ms.

$T_{\text{SI,CCA}}$  is the time required for receiving all the relevant system information data according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for an NR cell.

$T_{\text{SI-EUTRA}}$  is the time required for receiving all the relevant system information data according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 36.331 [16] for an E-UTRAN cell.

These requirements assume sufficient radio conditions, so that decoding of system information can be made without errors and does not take into account cell re-selection failure.

#### 4.2A.2.7 General requirements

The requirements in clause 4.2.2.7 shall apply.

## 4.3 Minimization of Drive Tests (MDT)

### 4.3.1 Introduction

UE supporting minimisation of drive tests in RRC\_IDLE shall be capable of:

- logging measurements in RRC\_IDLE, reporting the logged measurements and meeting requirements in clause 4.3;
- logging of RRC connection establishment failure, reporting the logged failure and meeting requirements in clause 4.3;
- logging of radio link failure and handover failure, reporting the logged failure and meeting requirements in clause 4.3.

The logged MDT requirements consist of measurement requirements as specified in clause 4.3.2 and relative time stamp accuracy requirements as specified in clause 4.3.3. Both sets of requirements are applicable for intra-frequency, inter-frequency and inter-RAT cases in RRC\_IDLE state. The MDT procedures are described in TS 37.320 [31].

For RRC connection establishment failure logging and reporting, the MDT requirements consist of requirements for measurements performed and logged in RRC\_IDLE state specified in clause 4.3.2 and relative time stamp accuracy requirement for RRC connection establishment failure log reporting as specified in clause 4.3.4.

### 4.3.2 Measurement Requirements

The requirements specified in this clause apply for the following measurements performed and logged by the UE for MDT in RRC\_IDLE:

- inter-RAT E-UTRA FDD and TDD RSRP,
- inter-RAT E-UTRA FDD and TDD RSRQ,
- SS-RSRP per cell,
- SS-RSRQ per cell,
- SS-RSRP per SSB index of the serving cell,
- SS-RSRQ per SSB index of the serving cell,
- best SSB index of the serving cell,
- the number of SSBs with different SSB index which are above the threshold *absThreshSS-BlocksConsolidation* for all detected cells whose cell-ranking criterion R value is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

The requirements apply for the measurements included in logged MDT reports and RRC connection establishment failure reports.

The measurement values that are used to meet

- serving cell and reselection requirements as specified in clauses 4.2.2.2–4.2.2.7

shall also apply to values logged for MDT measurements in RRC\_IDLE state.

### 4.3.3 Requirements for Relative Time Stamp Accuracy

The relative time stamp for a logged measurement is defined as the time from the moment the MDT configuration was received at the UE until the measurement was logged, see TS 38.331 [2].

The accuracy of the relative time stamping is such that the drift of the time stamping shall be not more than  $\pm 2$  seconds per hour.

### 4.3.4 Requirements for Relative Time Stamp Accuracy for RRC Connection Establishment Failure Log Reporting

Relative time stamp for RRC connection establishment failure log reporting is defined as the time elapsed from the last RRC connection establishment failure to the time when the log is included in the report TS 38.331 [2]. The UE shall report the RRC connection establishment failure log, while meeting the accuracy requirement specified in this clause.

The accuracy of the relative time stamping for RRC connection establishment failure log reporting is such that the drift of the time stamping shall not be larger than  $\pm 0.72$  seconds per hour and  $\pm 10$  seconds over 48 hours. The relative time stamp accuracy requirements shall apply provided that:

- no power off or detach occurs after the RRC connection establishment failure had been detected and until the log is time-stamped.

### 4.3.5 Requirements for Relative Time Stamp Accuracy for Radio Link Failure and Handover Failure Log Reporting

The UE shall report the radio link and handover failure log, while meeting the accuracy requirements specified in this clause.

Relative time stamp accuracy requirements for *timeSinceFailure* reported for MDT in a radio link failure or handover failure log are specified in this clause. *timeSinceFailure* determines the time elapsed from the last radio link failure or handover failure in NR to the time when the log is included in the report TS 38.331 [2].

The accuracy of the relative time stamping for *timeSinceFailure* is such that the drift of the time stamping shall not be larger than  $\pm 0.72$  seconds per hour and  $\pm 10$  seconds over 48 hours. These relative time stamp accuracy requirements shall apply provided that:

- no power off or detach occurs after the RLF or handover failure had been detected and until the log is time-stamped.

## 4.4 Idle Mode CA/DC Measurements

### 4.4.1 Introduction

A UE supporting *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16* shall perform the idle mode measurement on the inter-frequency CA and DC candidate frequencies/cells and E-UTRAN inter-RAT DC candidate frequencies/cells indicated by higher layers and meet the requirement specified in this clause. The UE shall perform idle mode measurements provided that the serving cell support early measurement and is within the validity area. The idle mode measurement requirements apply to a configured carrier frequency and the serving cell are among the supported band combination of the UE.

### 4.4.2 Measurement Requirements

For a UE which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16* the UE shall support the idle mode CA measurements on the serving cell, and carriers configured for idle mode CA/DC measurement reporting provided T331 has not expired, the serving cell is supporting idle mode CA/DC measurement reporting and the serving cell is in the validity area.

#### 4.4.2.1 Detected cell requirement during state transition and Idle mode

This subclause defines the requirements for the detected cell status for the idle mode CA/DC measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode. The requirements are applicable to an NE-DC and NR carrier aggregation capable UE which has been configured with one or more of following, one or more SCells, one E-UTRAN PSCell or one or more downlink E-UTRAN SCells during the Connected mode and which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16*. The requirements are applicable for SCell(s) and E-UTRAN FDD and TDD PSCell and SCells.

Upon releasing the connection and if the UE has been configured with idle mode CA measurement reporting, following requirements apply concerning the detected cells in Connected mode upon state transitioning to Idle mode and during Idle mode:

- A cell which is detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle mode and during Idle mode, provided that the following conditions are met:
  - The UE has been provided with a list of cells and/or carrier frequencies for early measurement reporting by dedicated RRC signaling and
  - The detected cell is among the list of cells or on a carrier frequency provided for early measurement reporting, and
  - The UE is provided with a valid timer T331 by dedicated RRC signaling, and
  - The detected cell and SSBs remains detectable until UE reconnect to the network and transmits the early measurement report, and
  - The carrier frequency of the detected cell and the carrier frequency of the serving cell are among the supported band combination of the UE.

An inter-RAT E-UTRAN cell is considered detectable according to RSRP,  $RSRP \hat{E}_s/Iot$ , SCH\_RP and  $SCH \hat{E}_s/Iot$  defined in Annex B.1.1 and Annex B.1.2 in [15] for a corresponding Band. An inter-frequency cell is considered detectable according to the conditions in Annex B.1.2 and B.1.3 for a corresponding band. An SSB of an inter-frequency cell is considered detectable according to SSB\_RP and  $SSB \hat{E}_s/Iot$  defined in Annex B.1.2 and B.1.3 for a corresponding Band.

#### 4.4.2.2 Measurements of inter-frequency CA/DC candidate cells

While T331 is running, the UE shall perform measurement on the configured inter-frequency carriers for idle mode CA/DC measurement reporting according to the UE measurement capability.

A UE which supports *idleInactiveNR-MeasReport-r16* shall support idle mode CA/DC measurements of:

- at least 7 inter-frequency carriers which are also configured for inter-frequency mobility measurements, and
- at least 7 inter-frequency carriers which are not configured for inter-frequency mobility measurements.

The UE shall be capable of monitoring a total of at least 7 inter-frequency carriers for idle mode CA/DC measurements comprising of carriers configured for inter-frequency mobility measurements and carriers not configured for inter-frequency mobility measurements.

For inter-frequency carriers configured for idle mode CA/DC measurements, if  $Srxlev \leq S_{nonIntraSearchP}$  or  $Squal \leq S_{nonIntraSearchQ}$  the inter-frequency measurement requirements in clause 4.2.2.4 shall apply, where UE shall search for and measure inter-frequency layers configured for idle mode CA/DC measurements in preparation for possible reporting. If  $Srxlev > S_{nonIntraSearchP}$  and  $Squal > S_{nonIntraSearchQ}$  the UE shall search for inter-frequency layers configured for idle mode CA/DC measurements at least every  $T_{higher\_priority\_search}$  where  $T_{higher\_priority\_search}$  is described in clause 4.2.2.7, where UE shall search for and measure inter-frequency layers configured for idle mode CA/DC measurements in preparation for possible reporting.

For UE supporting *idleInactiveNR-MeasBeamReport-r16*, if the UE is configured with *beamMeasConfigIdle-r16* on one or more carrier for idle mode CA/DC measurement, the UE, on each carrier, shall be able to:

- detect a newly detectable inter-frequency NR cell and perform RSRP/RSRQ measurement in preparation for reporting, and
- acquire the SSB index for a newly detectable inter-frequency NR cell if *beamMeasConfigIdle-r16* if configured on this carrier and perform RSRP/RSRQ measurement in preparation for reporting,

within the requirements defined in clause 4.2.2.4 plus  $k \cdot T_{SSB\_index, NR}$ , where k is the number of carriers configured for idle mode CA measurement with *beamMeasConfigIdle-r16*, and  $T_{SSB\_index, NR}$  is the additional time period used to acquire the index of the SSB being measured as defined in table 4.4.2.2-1.

Table 4.4.2.2-1:  $T_{SSB\_index,NR\_Inter}$ 

| DRX cycle length [s]  | Scaling Factor (N1) |                      | $T_{SSB\_index,NR\_Inter}$ [s]<br>(number of DRX cycles)                        |
|---|---------------------|----------------------|---|
|   | FR1                 | FR2 <sup>Note1</sup> |   |
| 0.32  | 1                   | 8                    | $N2 \times 1.28 \times N1 \times 1.5$<br>( $N2 \times 4 \times N1 \times 1.5$ ) |
| 0.64  |                     | 5                    | $N2 \times 1.28 \times N1$ ( $N2 \times 2 \times N1$ )                          |
| 1.28  |                     | 4                    | $N2 \times 1.28 \times N1$ ( $N2 \times 1 \times N1$ )                          |
| 2.56  |                     | 3                    | $N2 \times 2.56 \times N1$ ( $N2 \times 1 \times N1$ )                          |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, $N1 = 8$ for all DRX cycle length.<br>NOTE 2: $N2 = 3$ if the NR inter-frequency carrier for idle mode CA/DC measurement reporting is in FR1, and $N2 = 5$ if the NR inter-frequency carrier for idle mode CA/DC measurement reporting is in FR2. |                     |                      |   |

In the absence or expiration of T331, it is up to UE implementation to perform the idle mode CA/DC measurement.

For inter-frequency carriers configured for idle mode CA/DC measurements, the UE shall be capable of performing SS-RSRP and SS-RSRQ measurements of the carriers, and the UE physical layer shall be capable of reporting SS-RSRP and SS-RSRQ measurements of the carriers configured for idle mode CA/DC measurements to higher layers, with measurement accuracy as specified in clauses 10.1.4B and 10.1.5B and 10.1.9B and 10.1.10B, respectively.

The UE shall be able to report idle mode CA/DC measurements when idle mode CA/DC measurement reporting is requested by the network.

#### 4.4.2.3 Measurements on serving cell

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in clause 4.2.2.2 and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the serving cell to higher layers, with measurement accuracy as specified in 10.1.2B, 10.1.3B, 10.1.7B and 10.1.8B.

#### 4.4.2.4 Measurements of E-UTRAN inter-RAT DC candidate cells

While T331 is running, the UE shall perform measurement on the configured inter-RAT carriers for idle mode CA/DC measurement reporting according to the UE measurement capability.

A UE which supports *idleInactiveEUTRA-MeasReport-r16* shall support idle mode DC measurements of:

- at least 7 E-UTRAN inter-RAT carriers which are also configured for E-UTRAN inter-RAT mobility measurements, and
- at least 1 E-UTRAN inter-RAT carrier which is not configured for E-UTRAN inter-RAT mobility measurements.

The UE shall be capable of monitoring a total of at least 7 inter-RAT carriers for idle mode CA/DC measurements comprising of carriers configured for inter-RAT mobility measurements and carriers not configured for inter-RAT mobility measurements.

For inter-RAT carriers configured for idle mode CA/DC measurements, if  $S_{rxlev} \leq S_{nonIntraSearchP}$  or  $S_{qual} \leq S_{nonIntraSearchQ}$  the inter-RAT measurement requirements in clause 4.2.2.5 shall apply, where UE shall search for and measure inter-RAT layers configured for idle mode CA/DC measurements in preparation for possible reporting. If  $S_{rxlev} > S_{nonIntraSearchP}$  and  $S_{qual} > S_{nonIntraSearchQ}$  the UE shall search for inter-RAT layers configured for idle mode CA/DC measurements at least every  $T_{higher\_priority\_search}$  where  $T_{higher\_priority\_search}$  is described in clause 4.2.2, where UE shall search for and measure inter-RAT layers configured for idle mode CA/DC measurements in preparation for possible reporting.

For overlapping inter-RAT carriers configured for idle mode CA/DC measurements, the UE shall be capable of performing RSRP and RSRQ measurements of the carriers, and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the carriers configured for idle mode CA/DC measurements to higher layers, with measurement accuracy as specified in clauses in 9.1.3B.3 and 9.1.6B.2 [15], respectively.

The UE shall be able to report idle mode CA measurements when idle mode CA measurement reporting is requested by the network.

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## 5 SA: RRC\_INACTIVE state mobility

### 5.1 Cell Re-selection

#### 5.1.1 Introduction

The cell reselection procedure allows the UE to select a more suitable cell and camp on it.

When the UE is in *Camped Normally* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. For intra-frequency and inter-frequency cells the serving cell may not provide explicit neighbour list but carrier frequency information and bandwidth information only. UE measurement activity is also controlled by measurement rules defined in TS38.304 [1], allowing the UE to limit its measurement activity.

#### 5.1.2 Requirements

##### 5.1.2.1 UE measurement capability

The requirements in clause 4.2.2.1 shall apply.

##### 5.1.2.2 Measurement and evaluation of serving cell

The requirements in clause 4.2.2.2 shall apply.

##### 5.1.2.3 Measurements of intra-frequency NR cells

The requirements in clause 4.2.2.3 shall apply. The requirements in clause 4.2.2.9 apply for UE configured with relaxed measurement criterion.

##### 5.1.2.4 Measurements of inter-frequency NR cells

The requirements in clause 4.2.2.4 shall apply regardless of whether the serving cell is subject to CCA or not. The requirements in clause 4.2.2.10 shall apply regardless of whether the serving cell is subject to CCA or not for UE configured with relaxed measurement criterion.

##### 5.1.2.5 Measurements of inter-RAT E-UTRAN cells

The requirements in clause 4.2.2.5 shall apply. The requirements in clause 4.2.2.11 shall apply for UE configured with relaxed measurement criterion.

##### 5.1.2.6 Maximum interruption in paging reception

The requirements in clause 4.2.2.6 shall apply.

##### 5.1.2.7 General requirements

The requirements in clause 4.2.2.7 shall apply.

### 5.1A Cell Re-selection with CCA

#### 5.1A.1 Introduction

The cell reselection procedure allows the UE to select a more suitable cell and camp on it. The requirements in subclauses 5.1A.2.3, 5.1A.2.4, and 5.1A.2.6 apply when at least the target cell is on a carrier frequency with CCA, and



the requirements in subclauses 5.1A.2.2 and 5.1A.2.5 apply when at least the camping cell is on a carrier frequency with CCA.

When the UE is in *Camped Normally* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. For intra-frequency and inter-frequency cells the serving cell may not provide explicit neighbour list but carrier frequency information and bandwidth information only. UE measurement activity is also controlled by measurement rules defined in TS38.304, allowing the UE to limit its measurement activity.

## 5.1A.2 Requirements

### 5.1A.2.1 UE measurement capability

The requirements in clause 4.2A.2.1 shall apply.

### 5.1A.2.2 Measurement and evaluation when CCA is used on the serving cell

The requirements in clause 4.2A.2.2 shall apply.

### 5.1A.2.3 Measurements of intra-frequency NR cells when CCA is used on the serving cell and target cell

The requirements in clause 4.2A.2.3 shall apply.

### 5.1A.2.4 Measurements of inter-frequency NR cells when CCA is used on the target cell

The requirements in clause 4.2A.2.4 shall apply.

### 5.1A.2.5 Measurements of inter-RAT E-UTRAN cells when CCA is used on the serving cell

The requirements in clause 4.2.2.5 shall apply.

### 5.1A.2.6 Maximum interruption in paging reception when CCA is used on the target cell

The requirements in clause 4.2A.2.6 shall apply.

### 5.1A.2.7 General requirements

The requirements in clause 4.2.2.7 shall apply.

## 5.2 Void

## 5.3 Minimization of Drive Tests (MDT)

### 5.3.1 Introduction

UE supporting minimisation of drive tests in RRC\_INACTIVE shall be capable of:

- logging measurements in RRC\_INACTIVE, reporting the logged measurements and meeting requirements in clause 5.3.1;
- logging of RRC connection establishment failure, reporting the logged failure and meeting requirements in clause 5.3.1;

- logging of radio link failure and handover failure, reporting the logged failure and meeting requirements in clause 5.3.1.

The logged MDT requirements consist of measurement requirements as specified in clause 5.3.2 and relative time stamp accuracy requirements as specified in clause 5.3.3. Both sets of requirements are applicable for intra-frequency, inter-frequency and inter-RAT cases in RRC\_INACTIVE state. The MDT procedures are described in TS 37.320 [31].

For RRC connection establishment failure logging and reporting, the MDT requirements consist of requirements for measurements performed and logged in RRC\_INACTIVE state specified in clause 5.3.2 and relative time stamp accuracy requirement for RRC connection establishment failure log reporting as specified in clause 5.3.4.

## 5.3.2 Measurement Requirements

The measurements and measurement requirements applicable for MDT in RRC\_INACTIVE are the same as specified for MDT in RRC\_IDLE in clause 4.3.2.

## 5.3.3 Requirements for Relative Time Stamp Accuracy

The requirements for relative time stamp accuracy applicable for MDT in RRC\_INACTIVE are the same as specified for MDT in RRC\_IDLE in clause 4.3.3.

## 5.3.4 Requirements for Relative Time Stamp Accuracy for RRC Connection Establishment Failure Log Reporting

The requirements for relative time stamp accuracy for RRC connection establishment failure applicable for MDT in RRC\_INACTIVE are the same as specified for MDT in RRC\_IDLE in clause 4.3.4.

## 5.3.5 Requirements for Relative Time Stamp Accuracy for Radio Link Failure and Handover Failure Log Reporting

The requirements for relative time stamp accuracy for RRC link failure and handover failure applicable for MDT in RRC\_INACTIVE are the same as specified for MDT in RRC\_IDLE in clause 4.3.5.

## 5.3.6 Requirements for Relative Time Stamp Accuracy for RRC Resume Failure Log Reporting

The requirements for relative time stamp accuracy for RRC resume failure applicable for MDT in RRC\_INACTIVE are the same as specified for MDT in RRC\_IDLE in clause 4.3.4.

# 5.4 Idle Mode CA/DC Measurements

## 5.4.1 Introduction

A UE supporting *IdleInactiveMeasurements-r16* or *idleInactiveEUTRA-MeasReport-r16* shall perform the idle mode measurement on the inter-frequency CA and DC candidate frequencies/cells and E-UTRAN inter-RAT DC candidate frequencies/cells indicated by higher layers and meet the requirement specified in this clause. The UE shall perform idle mode measurements provided that the serving cell support early measurement and is within the validity area. The idle mode measurement requirements apply to a configured carrier frequency and the serving cell are among the supported band combination of the UE.

## 5.4.2 Measurement Requirements

The requirements in clause 4.4.2 shall apply.

#### 5.4.2.1 Detected cell requirement during state transition and Idle mode

The requirements in clause 4.4.2.1 shall apply.

#### 5.4.2.2 Measurements of inter-frequency CA/DC candidate cells

The requirements in clause 4.4.2.2 shall apply.

#### 5.4.2.3 Measurements on serving cell

The requirements in clause 4.4.2.3 shall apply.

#### 5.4.2.4 Measurements on E-UTRAN inter-RAT DC candidate cells

The requirements in clause 4.4.2.4 shall apply.

## 6 RRC\_CONNECTED state mobility

### 6.1 Handover

#### 6.1.1 NR Handover

##### 6.1.1.1 Introduction

The purpose of NR handover is to change the NR PCell to another NR cell. The requirements in this clause are applicable to SA NR, NE-DC and NR-DC.

##### 6.1.1.2 NR FR1 - NR FR1 Handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR1 cell to NR FR1 cell, and to inter-frequency handover from NR FR1 cell in a carrier frequency with CCA to NR FR1 cell.

###### 6.1.1.2.1 Handover delay

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover}}$  msec from the end of the last TTI containing the RRC command.

Where:

$D_{\text{handover}}$  equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.2.2.

###### 6.1.1.2.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than  $T_{\text{interrupt}}$

$$T_{\text{interrupt}} = T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{search}}$  is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then  $T_{\text{search}} = 0$  ms. If the target cell is an unknown intra-frequency cell and the target cell  $E_s/I_{\text{ot}} \geq -2$  dB, then  $T_{\text{search}} = T_{\text{rs}}$  ms. If the target cell is an unknown inter-

frequency cell and the target cell  $E_s/I_{ot} \geq -2$  dB, then  $T_{\text{search}} = 3 * T_{\text{rs}}$  ms. Regardless of whether DRX is in use by the UE,  $T_{\text{search}}$  shall still be based on non-DRX target cell search times.

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{\text{rs}}$ .

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 20ms.

$T_{\text{margin}}$  is time for SSB post-processing.  $T_{\text{margin}}$  can be up to 2ms.

$T_{\text{IU}}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{\text{IU}}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$T_{\text{rs}}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise  $T_{\text{rs}}$  is the SMTC configured in the `measObjectNR` having the same SSB frequency and subcarrier spacing. If the `measObjectNRs` having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC,  $T_{\text{rs}}$  is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{\text{rs}}=5$ ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of `smtc2` prior to the handover command,  $T_{\text{rs}}$  follows `smtc1` or `smtc2` according to the physical cell ID of the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2.5 for intra-frequency handover and Clause 9.3.4 for inter-frequency handover.

### 6.1.1.3 NR FR2- NR FR1 Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR2 cell to NR FR1 cell.

#### 6.1.1.3.1 Handover delay

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover}}$  ms from the end of the last TTI containing the RRC command.

Where:

$D_{\text{handover}}$  equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.3.2.

#### 6.1.1.3.2 Interruption time

The interruption time is the time between the end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When inter-frequency handover is commanded, the interruption time shall be less than  $T_{\text{interrupt}}$

$$T_{\text{interrupt}} = T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{search}}$  is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then  $T_{\text{search}} = 0$  ms. If the target cell is an unknown inter-frequency cell and the target cell  $E_s/I_{ot} \geq -2$  dB, then  $T_{\text{search}} = 3 * T_{\text{rs}}$  ms. Regardless of whether DRX is in use by the UE,  $T_{\text{search}}$  shall still be based on non-DRX target cell search times.

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{\text{rs}}$ .

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 40ms.

$T_{\text{margin}}$  is time for SSB post-processing.  $T_{\text{margin}}$  can be up to 2ms.

$T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise  $T_{rs}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC,  $T_{rs}$  is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{rs}=5\text{ms}$  assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2.5 for intra-frequency handover and Clause 9.3.4 for inter-frequency handover.

#### 6.1.1.4 NR FR2- NR FR2 Handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR2 cell to NR FR2 cell.

##### 6.1.1.4.1 Handover delay

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover}}$  ms from the end of the last TTI containing the RRC command.

Where:

$D_{\text{handover}}$  equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.4.2.

##### 6.1.1.4.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than  $T_{\text{interrupt}}$

$$T_{\text{interrupt}} = T_{\text{search}} + T_{IU} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{search}}$  is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then  $T_{\text{search}} = 0$  ms. If the target cell is an unknown intra-frequency cell and the target cell  $E_s/I_{ot} \geq -2$  dB, then  $T_{\text{search}} = 8 * T_{rs}$  ms. If the target cell is an unknown inter-frequency cell and the target cell  $E_s/I_{ot} \geq -2$  dB, then  $T_{\text{search}} = 8 * 3 * T_{rs}$  ms. Regardless of whether DRX is in use by the UE,  $T_{\text{search}}$  shall still be based on non-DRX target cell search times.

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 20ms.

$T_{\text{margin}}$  is time for SSB post-processing.  $T_{\text{margin}}$  can be up to 2ms.

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{rs}$  for both known and unknown target cell.

$T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise  $T_{rs}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC,  $T_{rs}$  is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{rs}=5\text{ms}$  assuming the SSB

transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the handover command,  $T_{rs}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the handover command:
  - the UE has sent a valid measurement report for the target cell and
  - One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3,
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3.

otherwise it is unknown.

### 6.1.1.5 NR FR1- NR FR2 Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR1 cell to NR FR2 cell.

#### 6.1.1.5.1 Handover delay

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{handover}$  ms from the end of the last TTI containing the RRC command.

Where:

$D_{handover}$  equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.5.2.

#### 6.1.1.5.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When in inter-frequency handover is commanded, the interruption time shall be less than  $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{search}$  is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then  $T_{search} = 0$  ms. If the target cell is an unknown inter-frequency cell and the target cell  $E_s/I_{ot} \geq -2$  dB, then  $T_{search} = 8 \cdot 3 \cdot T_{rs}$  ms. Regardless of whether DRX is in use by the UE,  $T_{search}$  shall still be based on non-DRX target cell search times.

$T_{processing}$  is time for UE processing.  $T_{processing}$  can be up to 40ms.

$T_{margin}$  is time for SSB post-processing.  $T_{margin}$  can be up to 2ms.

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{rs}$  for both known and unknown target cell.

$T_{IU}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{IU}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise  $T_{rs}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC,  $T_{rs}$  is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{rs}=5$ ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

In FR2, the target cell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the handover command:

- the UE has sent a valid measurement report for the target cell and
- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3,
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3.

otherwise it is unknown.

## 6.1.2 NR Handover to other RATs

### 6.1.2.1 NR – E-UTRAN Handover

#### 6.1.2.1.1 Introduction

The purpose of inter-RAT handover from NR to E-UTRAN is to change the radio access mode of PCell from NR to E-UTRAN. The handover procedure is initiated from NR with a RRC message that implies a handover as described in TS 38.331 [2]. The requirements in this clause are applicable to SA NR, NE-DC and NR-DC, and to handover from SA NR cell in a carrier frequency with CCA to E-UTRAN.

#### 6.1.2.1.2 Handover delay

When the UE receives a RRC message implying handover to E-UTRAN the UE shall be ready to start the transmission of the uplink PRACH channel in E-UTRA within  $D_{\text{handover}}$  ms from the end of the last TTI containing the RRC command.  $D_{\text{handover}}$  is defined as

$$D_{\text{handover}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{interrupt}}$$

Where:

$T_{\text{RRC\_procedure\_delay}}$ : it is the RRC procedure delay, which is 50ms

$T_{\text{interrupt}}$ : it is the time between end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission of the PRACH in E-UTRAN, excluding  $T_{\text{RRC\_procedure\_delay}}$ .  $T_{\text{interrupt}}$  is defined in clause 6.1.2.1.3.

#### 6.1.2.1.3 Interruption time

When the inter-RAT handover to E-UTRAN is commanded, the interruption time shall be less than  $T_{\text{interrupt}}$

$$T_{\text{interrupt}} = T_{\text{search}} + T_{\text{IU}} + 20 \text{ ms}$$

Where:

$T_{\text{search}}$  is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then  $T_{\text{search}} = 0$  ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then  $T_{\text{search}} = 80$  ms. Regardless of whether DRX is in use by the UE,  $T_{\text{search}}$  shall still be based on non-DRX target cell search times.

$T_{\text{IU}}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{\text{IU}}$  can be up to 30 ms.

NOTE: The actual value of  $T_{\text{IU}}$  shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant E-UTRAN cell identification requirements are described in clause 9.4.1.

## 6.1.2.2 NR – UTRAN Handover

### 6.1.2.2.1 Introduction

The purpose of inter-RAT handover from NR to UTRAN is to change the radio access mode from NR to UTRAN. The handover procedure is initiated from NR with a RRC message that implies a hard handover as described in TS 38.331 [2].

#### 6.1.2.2.2 Handover delay

When the UE receives a RRC message implying handover to UTRAN the UE shall be ready to start the transmission of the new UTRA uplink DPCH within  $D_{\text{handover}}$  ms from the end of the last NR TTI containing the RRC *MobilityfromNRCommand* command.

where:

- $D_{\text{handover}}$  equals the RRC procedure delay, which is 50 ms plus the interruption time stated in clause 6.1.2.2.3.

#### 6.1.2.2.3 Interruption time

The interruption time is the time between the end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission on the uplink DPCH in UTRAN, excluding the RRC procedure delay. The interruption time depends on whether the target cell is known to the UE or not.

The target cell is known if it has been measured by the UE during the last 5 seconds otherwise it is unknown. The UE shall always perform a UTRA synchronisation procedure as part of the handover procedure.

If the target cell is known the interruption time shall be less than  $T_{\text{interrupt1}}$

$$T_{\text{interrupt1}} = T_{\text{IU}} + T_{\text{sync}} + 50 + 10 * F_{\text{max}} + T_{\text{MC}} \text{ ms}$$

If the target cell is unknown the interruption time shall be less than  $T_{\text{interrupt2}}$

$$T_{\text{interrupt2}} = T_{\text{IU}} + T_{\text{sync}} + 150 + 10 * F_{\text{max}} + T_{\text{MC}} \text{ ms}$$

This requirement shall be met, provided that there is one target cell in the *MobilityfromNRCommand* command. Performance requirements for E-UTRA to UTRA soft handover are not specified. When UE is connected to an NR cell, UTRA SFN timing measurements are not reported. This implies that the timing of the DPCH of the UTRA target cells in the active set cannot be configured by UTRAN to guarantee that all target cells fall within the UE reception window of  $T_0 \pm 148$  chips.

Where:

- $T_{\text{IU}}$  is the interruption uncertainty when changing the timing from the NR to the new UTRAN cell.  $T_{\text{IU}}$  can be up to one UTRA frame (10 ms).
- $F_{\text{max}}$  denotes the maximum number of radio frames within the transmission time intervals of all transport channels that are multiplexed into the same CCTrCH on the UTRA target cell. If HS-PDSCH is configured in the UTRA target cell,  $F_{\text{max}}$  is 4 radio frames.
- $T_{\text{sync}}$  is the time required for measuring the downlink DPCH channel as stated in TS 25.214 [32], clause 4.3.1.2. In case higher layers indicate the usage of a post-verification period  $T_{\text{sync}}=0$  ms. Otherwise  $T_{\text{sync}}=40$  ms.
- $T_{\text{MC}}$  is 0ms if a single UTRA cell is configured as the handover target, otherwise 20ms if handover to UTRA with 1, 2 or 3 UTRA carriers with secondary HS-PDSCH is configured.

The phase reference is the primary CPICH.

The requirements in this clause assume that N312 has the smallest possible value i.e. only one insync is required.



## 6.1.3 NR DAPS Handover

### 6.1.3.1 Introduction

The requirements in this clause are applicable to DAPS handover to change the NR PCell to another NR cell.

Note: requirements only apply if

- the UE indicates 'no-gap' via *intraFreq-needForGap* for intra-frequency measurement of source cell and intra-frequency measurement of target cell, or
- the SSB of source cell is completely contained in the active DL BWP of the source cell, and the SSB of target cell is completely contained in the active DL BWP of the target cell, or
- the initial DL and UL BWP of source cell is confined within the active DL and UL BWP of the source cell respectively, and the initial DL and UL BWP of target cell is confined within the active DL and UL BWP of the target cell respectively.

### 6.1.3.2 NR FR1 - NR FR1 DAPS Handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR1 cell to NR FR1 cell. A DAPS handover is intra-frequency if the centre frequency of the SSB of the source cell and the centre frequency of the SSB of the target cell are the same, and the subcarrier spacing of the two SSBs are also the same.

Note: For intra-frequency DAPS handover, no requirement applies if active DL and UL BWP of target cell is not confined within the active DL and UL BWP of the source cell respectively.

Note: For inter-frequency DAPS handover, no requirement applies if the BWP of target cell is overlapped with the BWP of source cell in frequency domain.

An FR1 DAPS handover is synchronous if it meets the conditions in table 6.1.3.2-1, otherwise it is asynchronous

**Table 6.1.3.2-1: Sync conditions for FR1 DAPS handover**

| Type of handover  | Maximum receive timing difference between source and target cell ( $\mu\text{s}$ ) for sync DAPS handover | Maximum transmit timing difference between source and target cell ( $\mu\text{s}$ ) for sync DAPS handover |
|---|---|--|
| Intra-frequency <sup>Note 1,2,3</sup>   | 6 $\mu\text{s}$   | 7.6 $\mu\text{s}$  |
| Intra-band inter-frequency <sup>Note 1,2,3</sup>  | 6 $\mu\text{s}$   | 7.6 $\mu\text{s}$  |
| Inter-band inter-frequency  | 33 $\mu\text{s}$  | 34.6 $\mu\text{s}$   |
| <p>Note 1: For synchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot. For asynchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, interruptions may occur depending on UE implementation. The duration and frequency of occurrence of such interruptions is not specified.</p> <p>Note 2: For DAPS handover on a TDD band, after starting RACH procedure, a UE is not required to transmit in the uplink to any of source and target cells earlier than <math>N_{\text{RX-TX}}</math> after the end of the last received downlink symbol from any of source and target cells in the same TDD band where <math>N_{\text{RX-TX}}=25600T_c</math>.</p> <p>Note 3: For DAPS handover on a TDD band, after starting RACH procedure, a UE is not required to receive in the downlink from any of source and target cells earlier than <math>N_{\text{TX-RX}}</math> after the end of the last transmitted uplink symbol to any of source and target cells in the same TDD band where <math>N_{\text{TX-RX}}=25600T_c</math>.</p> |   |  |

#### 6.1.3.2.1 DAPS handover delay

Procedure delays for the procedure that can command a DAPS handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying handover, the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover1}}$  seconds from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

$$D_{\text{handover1}} = T_{\text{RRC\_procedure}} + T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{RRC\_procedure}}$  is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [2].

$T_{\text{search}}$ ,  $T_{\text{IU}}$ ,  $T_{\text{processing}}$ ,  $T_{\Delta}$  and  $T_{\text{margin}}$  are defined in clause 6.1.1.2.2.

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [2] within  $D_{\text{handover2}}$ .

$$D_{\text{handover2}} = T_{\text{RRC\_procedure}} + T_{\text{interrupt2}}$$

Where:

$T_{\text{RRC\_procedure}}$  is the RRC procedure delay as specified in clause 12 in TS 38.331 [2].

$T_{\text{interrupt2}}$  is defined in clause 6.1.3.2.2.

### 6.1.3.2.2 Interruption time

During  $D_{\text{handover1}}$ , the UE is allowed an interruption of up to  $T_{\text{interrupt1}}$  on source cell.

For FR1-to-FR1 intra-frequency handover,  $T_{\text{interrupt1}}$  is specified in Table 6.1.3.2.2-1.

**Table 6.1.3.2.2-1:  $T_{\text{interrupt1}}$  for FR1-to-FR1 intra-frequency DAPS HO**

| $\mu$   | NR Slot length (ms) | Interruption length $T_{\text{interrupt1}}$ (slots <sup>Note 1</sup> ), synchronous DAPS HO | Interruption length $T_{\text{interrupt1}}$ (slots <sup>Note 1</sup> ), asynchronous DAPS HO |
|---|---------------------|---|--|
| 0   | 1                   | 1   | 2  |
| 1   | 0.5                 | 2   | 3  |
| 2   | 0.25                | 4   | 5  |
| Note 1: The same SCS of source cell and target cell is assumed.<br>Note 2: It is assumed that the BWP of target cell is not larger than the BWP of source cell. It is assumed that the CBW of target cell is not larger than the CBW of source cell<br>Note 3: Void |                     |   |  |

For FR1-to-FR1 intra-band inter-frequency handover,  $T_{\text{interrupt1}}$  is specified in Table 6.1.3.2.2-2.

**Table 6.1.3.2.2-2:  $T_{\text{interrupt1}}$  for FR1-to-FR1 intra-band inter-frequency DAPS HO**

| $\mu$  | NR Slot length (ms) | $T_{\text{interrupt1}}$ (slots <sup>Note 1</sup> ), synchronous DAPS HO  | $T_{\text{interrupt1}}$ (slots <sup>Note 1</sup> ), asynchronous DAPS HO |
|--|---------------------|--|--|
| 0  | 1                   | $1 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$ | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$ |
| 1  | 0.5                 | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$ | $3 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$ |
| 2  | 0.25                | $4 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$ | $5 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$ |
| Note 1: The same SCS of source cell and target cell is assumed.<br>Note 2: $T_{\text{SMTC\_duration}}$ measured in subframes is the longest SMTC duration between source cell and target cell.<br>Note 3: Void<br>Note 4: $N_{\text{slot}}^{\text{subframe}, \mu}$ is as defined in TS 38.211 [6]. |                     |  |  |

For FR1-to-FR1 inter-band handover,  $T_{\text{interrupt1}}$  is specified in Table 6.1.3.2.2-3.

**Table 6.1.3.2.2-3:  $T_{\text{interrupt1}}$  for FR1-to-FR1 inter-band DAPS HO**

| $\mu$ | NR Slot length (ms)<br>of source cell | $T_{\text{interrupt1}}$ (slots) |       |
|-------|---------------------------------------|---------------------------------|-------|
|       |                                       | Sync                            | Async |
| 0     | 1                                     | 1                               | 2     |
| 1     | 0.5                                   | 2                               | 3     |
| 2     | 0.25                                  | 5                               | 5     |

During  $D_{\text{handover2}}$ , the UE is allowed an interruption of up to  $T_{\text{interrupt2}}$  on target cell.

For FR1-to-FR1 intra-frequency handover,  $T_{\text{interrupt2}}$  is specified in Table 6.1.3.2.2-4 when the BWP of target cell is smaller than the BWP of source cell, and  $T_{\text{interrupt2}}$  is specified in Table 6.1.3.2.2-5 when the same BWP is used for target cell and source cell.

**Table 6.1.3.2.2-4:  $T_{\text{interrupt2}}$  for FR1-to-FR1 intra-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots <sup>Note 1</sup> ) | $T_{\text{interrupt2}}$ (slots <sup>Note 1</sup> ) for asynchronous DAPS HO |
|-------|---------------------|--|---|
| 0     | 1                   | 2  | 3   |
| 1     | 0.5                 | 4  | 5   |
| 2     | 0.25                | 8  | 9   |

Note 1: The same SCS of source cell and target cell is assumed.  
Note 2: It is assumed that the BWP of target cell is smaller than the BWP of source cell.

**Table 6.1.3.2.2-5:  $T_{\text{interrupt2}}$  for FR1-to-FR1 intra-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots <sup>Note 1</sup> ) | $T_{\text{interrupt2}}$ (slots <sup>Note 1</sup> ) for asynchronous DAPS HO |
|-------|---------------------|--|---|
| 0     | 1                   | 1  | 2   |
| 1     | 0.5                 | 2  | 3   |
| 2     | 0.25                | 4  | 5   |

Note 1: The same SCS of source cell and target cell is assumed.  
Note 2: It is assumed that the BWP of target cell is the same as the BWP of source cell.  
Note 3: Void

For FR1-to-FR1 intra-band inter-frequency handover,  $T_{\text{interrupt2}}$  is specified in Table 6.1.3.2.2-6.

**Table 6.1.3.2.2-6:  $T_{\text{interrupt2}}$  for FR1-to-FR1 intra-band inter-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | $T_{\text{interrupt2}}$ (slots <sup>Note 1</sup> ) for synchronous DAPS HO | $T_{\text{interrupt2}}$ (slots <sup>Note 1</sup> ) for asynchronous DAPS HO |
|-------|---------------------|--|---|
| 0     | 1                   | $1 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$   | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$    |
| 1     | 0.5                 | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$   | $3 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$    |
| 2     | 0.25                | $4 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$   | $5 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe}, \mu}$    |

Note 1: The same SCS of source cell and target cell is assumed.  
Note 2:  $T_{\text{SMTC\_duration}}$  measured in subframes is the longest SMTC duration between source cell and target cell.  
Note 3: Void.  
Note 4:  $N_{\text{slot}}^{\text{subframe}, \mu}$  is as defined in TS 38.211 [6].

For FR1-to-FR1 inter-band handover,  $T_{\text{interrupt2}}$  is specified in Table 6.1.3.2.2-7.

**Table 6.1.3.2.2-7:  $T_{\text{interrupt2}}$  for FR1-to-FR1 inter-band DAPS HO**

| $\mu$ | NR slot length (ms)<br>of target cell | $T_{\text{interrupt2}}$ (slots) |       |
|-------|---------------------------------------|---------------------------------|-------|
|       |                                       | Sync                            | Async |
| 0     | 1                                     | 1                               | 2     |
| 1     | 0.5                                   | 2                               | 3     |
| 2     | 0.25                                  | 5                               | 5     |

### 6.1.3.3 NR FR2- NR FR1 DAPS Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR2 cell to NR FR1 cell.

An FR2-FR1 DAPS handover is synchronous if it meets the conditions in table 6.1.3.3-1, otherwise it is asynchronous

**Table 6.1.3.3-1: Sync condition for FR2-FR1 DAPS handover**

| Frequency Range of the pair of carriers | Maximum receive timing difference between source and target cell ( $\mu\text{s}$ ) for sync DAPS handover | Maximum transmit timing difference between source and target cell ( $\mu\text{s}$ ) for sync DAPS handover |
|---|---|--|
| Between FR1 and FR2                     | 25  | 26.1   |

#### 6.1.3.3.1 DAPS handover delay

Procedure delays for the procedure that can command a DAPS handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying handover, the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover1}}$  ms from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

$$D_{\text{handover1}} = T_{\text{RRC\_procedure}} + T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{RRC\_procedure}}$  is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [2].

$T_{\text{search}}$ ,  $T_{\text{IU}}$ ,  $T_{\text{processing}}$ ,  $T_{\Delta}$  and  $T_{\text{margin}}$  are defined in clause 6.1.1.3.2.

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [2] within  $D_{\text{handover2}}$ .

$$D_{\text{handover2}} = T_{\text{RRC\_procedure}} + T_{\text{interrupt2}}$$

Where:

$T_{\text{RRC\_procedure}}$  is the RRC procedure delay as specified in clause 12 in TS 38.331 [2].

$T_{\text{interrupt2}}$  is defined in clause 6.1.3.3.2.

#### 6.1.3.3.2 Interruption time

During  $D_{\text{handover1}}$ , the UE is allowed an interruption of up to  $T_{\text{interrupt1}}$  on source cell.

For FR2-to-FR1 inter-band handover,  $T_{\text{interrupt1}}$  is specified in Table 6.1.3.3.2-1.

**Table 6.1.3.3.2-1:  $T_{\text{interrupt1}}$  for FR2-to-FR1 inter-band DAPS HO**

| $\mu$ | NR slot length (ms)<br>of source cell | $T_{\text{interrupt1}}$ (slots) |       |
|-------|---------------------------------------|---------------------------------|-------|
|       |                                       | Sync                            | Async |
| 2     | 0.25                                  | 5                               | 5     |
| 3     | 0.125                                 | 9                               | 9     |

During  $D_{\text{handover}2}$ , the UE is allowed an interruption of up to  $T_{\text{interrupt}2}$  on target cell.

For FR2-to-FR1 inter-band handover,  $T_{\text{interrupt}2}$  is specified in Table 6.1.3.3.2-2.

**Table 6.1.3.3.2-2:  $T_{\text{interrupt}2}$  for FR2-to-FR1 inter-band DAPS HO**

| $\mu$ | NR slot length (ms)<br>of target cell | $T_{\text{interrupt}2}$ (slots) |       |
|-------|---------------------------------------|---------------------------------|-------|
|       |                                       | Sync                            | Async |
| 0     | 1                                     | 1                               | 2     |
| 1     | 0.5                                   | 2                               | 3     |
| 2     | 0.25                                  | 5                               | 5     |

#### 6.1.3.4 NR FR1- NR FR2 DAPS Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR1 cell to NR FR2 cell.

An FR1-FR2 DAPS handover is synchronous if it meets the conditions in table 6.1.3.4-1, otherwise it is asynchronous

**Table 6.1.3.4-1, : Sync condition for FR1-FR2 DAPS handover**

| Frequency Range of the pair of carriers | Maximum receive timing difference between source and target cell ( $\mu\text{s}$ ) for sync DAPS handover | Maximum transmit timing difference between source and target cell ( $\mu\text{s}$ )<br>Note 1 sync DAPS handover |
|---|---|--|
| Between FR1 and FR2                     | 25  | 26.1   |

##### 6.1.3.4.1 DAPS handover delay

Procedure delays for the procedure that can command a DAPS handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying handover, the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover}1}$  ms from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

$$D_{\text{handover}1} = T_{\text{RRC\_procedure}} + T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{RRC\_procedure}}$  is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [2].

$T_{\text{search}}$ ,  $T_{\text{IU}}$ ,  $T_{\text{processing}}$ ,  $T_{\Delta}$  and  $T_{\text{margin}}$  are defined in clause 6.1.1.5.2.

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [2] within  $D_{\text{handover}2}$ .

$$D_{\text{handover}2} = T_{\text{RRC\_procedure}} + T_{\text{interrupt}2}$$

Where:

$T_{\text{RRC\_procedure}}$  is the RRC procedure delay as specified in clause 12 in TS 38.331 [2].

$T_{\text{interrupt}2}$  is defined in clause 6.1.3.4.2.

##### 6.1.3.4.2 Interruption time

During  $D_{\text{handover}1}$ , the UE is allowed an interruption of up to  $T_{\text{interrupt}1}$  on source cell.

For FR1-to-FR2 inter-band handover,  $T_{\text{interrupt}1}$  is specified in Table 6.1.3.4.2-1.

**Table 6.1.3.4.2-1:  $T_{\text{interrupt1}}$  for FR1-to-FR2 inter-band DAPS HO**

| $\mu$ | NR slot length (ms)<br>of source cell | $T_{\text{interrupt1}}$ (slots) |       |
|-------|---------------------------------------|---------------------------------|-------|
|       |                                       | Sync                            | Async |
| 0     | 1                                     | 1                               | 2     |
| 1     | 0.5                                   | 2                               | 3     |
| 2     | 0.25                                  | 5                               | 5     |

During  $D_{\text{handover2}}$ , the UE is allowed an interruption of up to  $T_{\text{interrupt2}}$  on target cell.

For FR1-to-FR2 inter-band handover,  $T_{\text{interrupt2}}$  is specified in Table 6.1.3.4.2-2.

**Table 6.1.3.4.2-2:  $T_{\text{interrupt2}}$  for FR1-to-FR2 inter-band DAPS HO**

| $\mu$ | NR slot length (ms)<br>of target cell | $T_{\text{interrupt2}}$ (slots) |       |
|-------|---------------------------------------|---------------------------------|-------|
|       |                                       | Sync                            | Async |
| 2     | 0.25                                  | 5                               | 5     |
| 3     | 0.125                                 | 9                               | 9     |

## 6.1.4 NR Conditional Handover

### 6.1.4.1 Introduction

The requirements in this clause are applicable to conditional handover to change the NR PCell to another NR cell.

### 6.1.4.2 NR FR1 – NR FR1 conditional handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency conditional handover from NR FR1 cell to NR FR1 cell.

#### 6.1.4.2.1 Handover delay

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover}}$  seconds from the end of the last TTI containing the RRC command.

$$D_{\text{CHO}} = T_{\text{RRC}} + T_{\text{Event\_DU}} + T_{\text{measure}} + T_{\text{interrupt}} + T_{\text{CHO\_execution}}$$

Where:

$T_{\text{RRC}}$  is the RRC procedure delay defined in clause 12 in TS 38.331 [2].

$T_{\text{Event\_DU}}$  is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{\text{measure}}$  is the measurements time stated in clause 6.1.4.2.2.

$T_{\text{CHO\_execution}}$  is the conditional execution preparation time in clause 6.1.4.2.3.

$T_{\text{interrupt}}$  is the interruption time stated in clause 6.1.4.2.4.

#### 6.1.4.2.2 Measurement time

The measurement time delay is defined from the end of  $T_{\text{Event\_DU}}$  until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than  $T_{\text{identify\_intra\_with\_index}}$  or  $T_{\text{identify\_intra\_without\_index}}$  defined in clause 9.2.5.1 or clause 9.2.6.2.

For inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than  $T_{\text{identify\_inter\_with\_index}}$  Or  $T_{\text{identify\_inter\_without\_index}}$  defined in clause 9.3.4.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period  $T_{\text{identify\_intra\_without\_index}}$  Or  $T_{\text{identify\_intra\_with\_index}}$  for intra-frequency handover or  $T_{\text{identify\_inter\_without\_index}}$  for inter-frequency handover. If a cell which has been detectable at least for the time period  $T_{\text{identify\_intra\_without\_index}}$  Or  $T_{\text{identify\_intra\_with\_index}}$  for intra-frequency handover or  $T_{\text{identify\_inter\_without\_index}}$  for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than  $T_{\text{SSB\_measurement\_period\_intra}}$  Or  $T_{\text{SSB\_measurement\_period\_inter}}$  provided the timing to that cell has not changed more than  $\pm 3200/2^\mu T_c$  while the measurement gap has not been available and the L3 filter has not been used, where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

#### 6.1.4.2.3 Preparation time

$T_{\text{CHO\_execution}}$  is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined.  $T_{\text{CHO\_execution}}$  can be up to 10ms.

#### 6.1.4.2.4 Interruption time

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional handover, the measurement time shall be less than

$$T_{\text{interrupt}} = T_{\text{processing}} + T_{\text{IU}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 20ms.

$T_{\text{IU}}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{\text{IU}}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3]

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{\text{rs}}$ .

$T_{\text{margin}}$  is time for SSB post-processing.  $T_{\text{margin}}$  can be up to 2ms.

$T_{\text{rs}}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise  $T_{\text{rs}}$  is the SMTC configured in the `measObjectNR` having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{\text{rs}}=5\text{ms}$  assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of `smtc2` prior to the handover command,  $T_{\text{rs}}$  follows `smtc1` or `smtc2` according to the physical cell ID of the target cell.

NOTE 1: The actual value of  $T_{\text{IU}}$  shall depend upon the PRACH configuration used in the target cell.

#### 6.1.4.3 NR FR2 – NR FR1 conditional handover

The requirements in this clause are applicable to inter-frequency conditional handover from NR FR2 cell to NR FR1 cell.

The requirements defined in clause 6.1.4.2 applies assuming inter-frequency handover and:

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 40ms.

#### 6.1.4.4 NR FR2 – NR FR2 conditional handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency conditional handover from NR FR2 cell to NR FR2 cell.

##### 6.1.4.4.1 Handover delay

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [2].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover}}$  seconds from the end of the last TTI containing the RRC command.

$$D_{\text{CHO}} = T_{\text{RRC}} + T_{\text{Event\_DU}} + T_{\text{measure}} + T_{\text{interrupt}} + T_{\text{CHO\_execution}}$$

Where:

$T_{\text{RRC}}$  is the RRC procedure delay defined in clause 12 in TS 38.331 [2].

$T_{\text{Event\_DU}}$  is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{\text{measure}}$  is the measurements time stated in clause 6.1.4.4.2.

$T_{\text{CHO\_execution}}$  is the conditional execution preparation time in clause 6.1.4.4.3.  $T_{\text{interrupt}}$  is the interruption time stated in clause 6.1.4.4.4.

##### 6.1.4.4.2 Measurement time

The measurement time delay is defined from the end of  $T_{\text{Event\_DU}}$  until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than  $T_{\text{identify\_intra\_with\_index}}$  Or  $T_{\text{identify\_intra\_without\_index}}$  defined in clause 9.2.5.1 or clause 9.2.6.2.

For inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than  $T_{\text{identify\_inter\_with\_index}}$  Or  $T_{\text{identify\_inter\_without\_index}}$  defined in clause 9.3.4.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period  $T_{\text{identify\_intra\_without\_index}}$  Or  $T_{\text{identify\_intra\_with\_index}}$  for intra-frequency handover or  $T_{\text{identify\_inter\_without\_index}}$  for inter-frequency handover. If a cell which has been detectable at least for the time period  $T_{\text{identify\_intra\_without\_index}}$  Or  $T_{\text{identify\_intra\_with\_index}}$  for intra-frequency handover or  $T_{\text{identify\_inter\_without\_index}}$  for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than  $T_{\text{SSB\_measurement\_period\_intra}}$  Or  $T_{\text{SSB\_measurement\_period\_inter}}$  provided the timing to that cell has not changed more than  $\pm 3200/2^\mu T_c$  while the measurement gap has not been available and the L3 filter has not been used, where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

##### 6.1.4.4.3 Preparation time

$T_{\text{CHO\_execution}}$  is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined.  $T_{\text{CHO\_execution}}$  can be up to 10ms.

##### 6.1.4.4.4 Interruption time

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional handover, the measurement time shall be less than

$$T_{\text{interrupt}} = T_{\text{processing}} + T_{\text{IU}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$



Where:

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 20ms.

$T_{\text{IU}}$  is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.  $T_{\text{IU}}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3]

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = T_{\text{rs}}$ .

$T_{\text{margin}}$  is time for SSB post-processing.  $T_{\text{margin}}$  can be up to 2ms.

$T_{\text{rs}}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise  $T_{\text{rs}}$  is the SMTC configured in the `measObjectNR` having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{\text{rs}}=5\text{ms}$  assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of `smtc2` prior to the handover command,  $T_{\text{rs}}$  follows `smtc1` or `smtc2` according to the physical cell ID of the target cell.

NOTE 1: The actual value of  $T_{\text{IU}}$  shall depend upon the PRACH configuration used in the target cell.

#### 6.1.4.5 NR FR1 – NR FR2 conditional handover

The requirements in this clause are applicable to inter-frequency conditional handover from NR FR1 cell to NR FR2 cell.

The requirements defined in clause 6.1.4.4 applies assuming inter-frequency handover and:

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 40ms.

### 6.1A Void

#### 6.1A.1 Void

##### 6.1A.1.1 Void

##### 6.1A.1.2 Void

##### 6.1A.1.2.1 Void

##### 6.1A.1.2.2 Void

### 6.1B Handover to target cell using CCA

#### 6.1B.1 NR Handover

##### 6.1B.1.1 Introduction

The purpose of NR handover to target cell using CCA is to change the NR PCell to a target NR cell in a carrier frequency with CCA. The requirements in this clause are applicable to NR SA.

In the requirements of clause 6.1B.1, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due

to DL CCA failures at gNB during the corresponding detection or time tracking period; otherwise the SMTC occasion is considered as available at the UE.

In the requirements of clause 6.1B.1, the term PRACH occasion unavailable for transmission refers to when the PRACH occasion is configured by gNB but not transmitted by the UE during the corresponding period due to UL CCA failure at the UE.

## 6.1B.1.2 NR FR1 - NR FR1 Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR1 cell to NR FR1 cell in carrier frequencies with CCA, and to both intra-frequency and inter-frequency handovers from NR FR1 cell in carrier frequencies with CCA to NR FR1 cell in carrier frequencies with CCA.

### 6.1B.1.2.1 Handover delay

When the UE receives an RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within  $D_{\text{handover}}$  ms from the end of the last TTI containing the RRC command.

Where:

$D_{\text{handover}}$  equals the applicable RRC procedure delay to be defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1B.1.2.2.

### 6.1B.1.2.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than  $T_{\text{interrupt}}$

$$T_{\text{interrupt}} = T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}} \text{ ms}$$

Where:

$T_{\text{search}}$  is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then  $T_{\text{search}} = 0$  ms. If the target cell is an unknown intra-frequency cell and the target cell  $E_s/I_{\text{ot}} \geq -2$  dB, then  $T_{\text{search}} = (1+L_1) * T_{\text{rs}}$ . If the target cell is an unknown inter-frequency cell and the target cell  $E_s/I_{\text{ot}} \geq -2$  dB, then  $T_{\text{search}} = (3+L_1) * T_{\text{rs}}$  where  $L_1$  and  $L_1'$  are the number of SMTC occasions not available at the UE during the intra-frequency and inter-frequency detection period, respectively. Regardless of whether DRX is in use by the UE,  $T_{\text{search}}$  shall still be based on non-DRX target cell search times.

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = (1+L_2) * T_{\text{rs}}$  ms, where  $L_2$  is the number of SMTC occasions not available at the UE during the time tracking period.

$T_{\text{processing}}$  is time for UE processing.  $T_{\text{processing}}$  can be up to 20ms.

$T_{\text{margin}}$  is time for SSB post-processing.  $T_{\text{margin}}$  can be up to 2ms.

$T_{\text{IU}}$  is the interruption uncertainty due to the random access procedure when sending PRACH to the new cell.  $T_{\text{IU}}$  can be up to:  $(1+L_3) * T_{\text{SSB,RO}} + 10$  ms where  $T_{\text{SSB,RO}}$  is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [3] and  $L_3$  is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure.  $L_3 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [33]. When the UE is configured with both the UL BWP with PRACH occasion on the target cell and UL CCA failure detection/recovery, the interruption can be longer.

$T_{\text{rs}}$  is the SMTC periodicity of the target NR cell in a carrier frequency with CCA if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise  $T_{\text{rs}}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{\text{rs}}=5$ ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

NOTE 1: The interruption time considering the potential extensions caused by  $L_1, L_1', L_2, L_3$  and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [2].

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2A.5 for intra-frequency handover and Clause 9.3A.4 for inter-frequency handover to a carrier frequency with CCA.

## 6.2 RRC Connection Mobility Control

### 6.2.1 SA: RRC Re-establishment

#### 6.2.1.1 Introduction

This clause contains requirements on the UE regarding RRC connection re-establishment procedure. RRC connection re-establishment is initiated when a UE in RRC\_CONNECTED state on the carrier without CCA or on the carrier with CCA loses RRC connection due to any of failure cases, including radio link failure, handover failure, and RRC connection reconfiguration failure. The RRC connection re-establishment procedure is specified in clause 5.3.7 of TS 38.331 [2].

The requirements in this clause are applicable for RRC connection re-establishment to NR cell.

#### 6.2.1.2 Requirements

In RRC\_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within  $T_{re-establish\_delay}$  seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ( $T_{re-establish\_delay}$ ) shall be less than:

$$T_{re-establish\_delay} = T_{UE\_re-establish\_delay} + T_{UL\_grant}$$

$T_{UL\_grant}$ : It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ( $T_{UE\_re-establish\_delay}$ ) is specified in clause 6.2.1.2.1.

##### 6.2.1.2.1 UE Re-establishment delay requirement

The UE re-establishment delay ( $T_{UE\_re-establish\_delay}$ ) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ( $T_{UE\_re-establish\_delay}$ ) requirement shall be less than:

$$T_{UE\_re-establish\_delay} = 50 \text{ ms} + T_{identify\_intra\_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable if each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in clause 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and
- the conditions of SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.2 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and
- the conditions of SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.3 for a corresponding NR Band are fulfilled.

$T_{identify\_intra\_NR}$ : It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the FR of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then  $T_{identify\_intra\_NR}=0$ ; otherwise  $T_{identify\_intra\_NR}$  shall not exceed the values defined in Table 6.2.1.2.1-1.

$T_{\text{identify\_inter\_NR},i}$ : It is the time to identify the target inter-frequency NR cell on inter-frequency carrier  $i$  configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the FR of the target NR cell.  $T_{\text{identify\_inter\_NR},i}$  shall not exceed the values defined in Table 6.2.1.2.1-2.

$T_{\text{SMTC}}$ : It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signaling of  $\text{smtc2}$ ,  $T_{\text{smtc}}$  follows  $\text{smtc1}$  or  $\text{smtc2}$  according to the physical cell ID of the target cell.

$T_{\text{SMTC},i}$ : It is the periodicity of the SMTC occasion configured for the inter-frequency carrier  $i$ . If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

$T_{\text{SI-NR}}$ : It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

$T_{\text{PRACH}}$ : It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell.  $T_{\text{PRACH}}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$N_{\text{freq}}$ : It is the total number of NR frequencies to be monitored for RRC re-establishment;  $N_{\text{freq}} = 1$  if the target intra-frequency NR cell is known, else  $N_{\text{freq}} = 2$  and  $T_{\text{identify\_intra\_NR}} = 0$  if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

**Table 6.2.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell**

| Serving cell SSB $\hat{E}_s/\text{lot}$ (dB) | FR of target NR cell | $T_{\text{identify\_intra\_NR}}$ [ms]     |   |
|--|----------------------|---|---|
|  |                      | Known NR cell                             | Unknown NR cell                             |
| $\geq -8$                                    | FR1                  | MAX (200 ms, $5 \times T_{\text{SMTC}}$ ) | MAX (800 ms, $10 \times T_{\text{SMTC}}$ )  |
| $\geq -8$                                    | FR2                  | N/A                                       | MAX (1000 ms, $80 \times T_{\text{SMTC}}$ ) |
| $< -8$                                       | FR1                  | N/A                                       | 800 <sup>Note1</sup>                        |
| $< -8$                                       | FR2                  | N/A                                       | 3520 <sup>Note1</sup>                       |

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when  $T_{\text{SMTC}} > 20$  ms and serving cell SSB  $\hat{E}_s/\text{lot} < -8$  dB.

**Table 6.2.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell**

| Serving cell SSB $\hat{E}_s/\text{lot}$ (dB) | FR of target NR cell | $T_{\text{identify\_inter\_NR},i}$ [ms]     |  |
|--|----------------------|---|--|
|  |                      | Known NR cell                               | Unknown NR cell                                |
| $\geq -8$                                    | FR1                  | MAX (200 ms, $6 \times T_{\text{SMTC},i}$ ) | MAX (800 ms, $13 \times T_{\text{SMTC},i}$ )   |
| $\geq -8$                                    | FR2                  | N/A   | MAX (1000 ms, $104 \times T_{\text{SMTC},i}$ ) |
| $< -8$                                       | FR1                  | N/A   | 800 <sup>Note1</sup>                           |
| $< -8$                                       | FR2                  | N/A   | 4000 <sup>Note1</sup>                          |

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when  $T_{\text{SMTC},i} > 20$  ms and serving cell SSB  $\hat{E}_s/\text{lot} < -8$  dB.

## 6.2.1A RRC Re-establishment with CCA

### 6.2.1A.1 Introduction

This clause contains requirements on the UE regarding RRC connection re-establishment procedure on the carrier with CCA. RRC connection re-establishment on the carrier with CCA is initiated when a UE in RRC\_CONNECTED state on the carrier w/o or with CCA loses RRC connection due to any of failure cases, including radio link failure, handover failure, and RRC connection reconfiguration failure. The RRC connection re-establishment procedure is specified in clause 5.3.7 of TS 38.331 [2].

In the requirements of clause 6.2.1A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding RRC re-establishment period; otherwise the SMTC occasion is considered as available at the UE.

In the requirements of clause 6.2.1A, the term PRACH occasion unavailable for transmission refers to when the PRACH occasion is configured by gNB but not transmitted by the UE during the corresponding period due to UL CCA failure at the UE; otherwise the PRACH occasion is considered as available for transmission.

The requirements in this clause are applicable for RRC connection re-establishment to NR cell on the carrier with CCA.

## 6.2.1A.2 Requirements

In RRC\_CONNECTED state on the carrier w/o or with CCA the UE shall be capable of sending *RRCReestablishmentRequest* message within  $T_{\text{re-establish\_delay\_CCA}}$  seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ( $T_{\text{re-establish\_delay\_CCA}}$ ) shall be less than:

$$T_{\text{re-establish\_delay\_CCA}} = T_{\text{UE\_re-establish\_delay\_CCA}} + T_{\text{UL\_grant}}$$

$T_{\text{UL\_grant}}$ : It is the time required to acquire and process uplink grant from the target PCell with CCA. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ( $T_{\text{UE\_re-establish\_delay\_CCA}}$ ) is specified in clause 6.2.1A.2.1.

### 6.2.1A.2.1 UE Re-establishment with CCA delay requirement

The UE re-establishment on the carrier with CCA delay ( $T_{\text{UE\_re-establish\_delay\_CCA}}$ ) is the time between the moments when any of the conditions requiring RRC re-establishment on the carrier with CCA as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell on the carrier with CCA. The UE re-establishment delay requirement ( $T_{\text{UE\_re-establish\_delay\_CCA}}$ ) on the carrier with CCA shall be less than:

$$T_{\text{UE\_re-establish\_delay\_CCA}} = 50 \text{ ms} + T_{\text{identify\_intra\_NR\_CCA}} + \sum_{i=1}^{N_{\text{freq}}-1} T_{\text{identify\_inter\_NR\_CCA},i} + T_{\text{SI-NR\_CCA}} + T_{\text{PRACH\_CCA}}$$

The intra-frequency target NR cell with CCA shall be considered detectable if each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in clause 10.1.2 are fulfilled for a corresponding NR Band for FR1, and
- the conditions of SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.3 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell on the carrier with CCA shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.4 are fulfilled for a corresponding NR Band for FR1, and
- the conditions of SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.2 for a corresponding NR Band are fulfilled.

$T_{\text{identify\_intra\_NR\_CCA}}$ : If the target intra-frequency carrier is the carrier without CCA, it is the time to identify the target intra-frequency NR cell which is defined in clause 6.2.1; otherwise it is the time to identify the target intra-frequency NR cell on the carrier with CCA and it depends on whether the target NR cell on the carrier with CCA is known cell or unknown cell and on the frequency range (FR) of the target NR cell on the carrier with CCA. If the UE is not configured with intra-frequency NR carrier with CCA for RRC re-establishment then  $T_{\text{identify\_intra\_NR\_CCA}}=0$ ; otherwise  $T_{\text{identify\_intra\_NR\_CCA}}$  shall not exceed the values defined in Table 6.2.1A.2.1-1.

$T_{\text{identify\_inter\_NR\_CCA},i}$ : If the target inter-frequency carrier is the carrier without CCA, it is the time to identify the target inter-frequency NR cell which is defined in clause 6.2.1; otherwise it is the time to identify the target inter-frequency NR cell on inter-frequency carrier  $i$  with CCA configured for RRC re-establishment and it depends on whether the target NR cell on the inter-frequency carrier with CCA is known or unknown.  $T_{\text{identify\_inter\_NR\_CCA},i}$  shall not exceed the values defined in Table 6.2.1A.2.1-2.

$T_{\text{SMTC}}$ : It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*,  $T_{\text{smtc}}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{\text{SMTC},i}$ : It is the periodicity of the SMTC occasion configured for the inter-frequency carrier  $i$ . If it is not configured, the UE may assume that the target SSB periodicity is not larger than 20 ms.

$T_{\text{SI-NR\_CCA}}$ : It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell on the carrier with CCA.

*Editor's note: The actual value for  $T_{\text{SI-NR\_CCA}}$  is to be discussed in the performance part, considering LBT failures and receiver assumptions, etc.*

$T_{\text{PRACH\_CCA}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the target NR Cell on the carrier with CCA:

$T_{\text{PRACH\_CCA}} = (1 + K_3) * T_{\text{SSB,RO}} + 10$  ms, where:

- $T_{\text{SSB,RO}}$  is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [39].
- $K_3$  is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure.  $K_3 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [57].

$N_{\text{freq}}$ : It is the total number of NR frequencies to be monitored for RRC re-establishment;  $N_{\text{freq}} = 1$  if the target NR cell on the intra-frequency carrier with CCA is known, else  $N_{\text{freq}} = 2$  and  $T_{\text{identify\_intra\_NR\_CCA}} = 0$  if the target NR cell on the inter-frequency carrier with CCA is known.

There is no requirement if the target cell on the carrier with CCA does not contain the UE context.

In the requirement defined in the below tables, the target cell on the carrier with CCA is known if it has been meeting the relevant cell identification requirement during the last 8 seconds otherwise it is unknown.

**Table 6.2.1A.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell with CCA**

| Serving cell SSB $\hat{E}_s/\text{lot}$ (dB)  | Frequency range (FR) of target NR cell | $T_{\text{identify\_intra\_NR\_CCA}}$ [ms]      |   |
|---|--|---|---|
|   |  | Known NR cell                                   | Unknown NR cell                                   |
| $\geq -8$   | FR1                                    | MAX (200 ms, $(5+K_1) \times T_{\text{SMTC}}$ ) | MAX (800 ms, $(10+ K_1) \times T_{\text{SMTC}}$ ) |
| $< -8$  | FR1                                    | N/A   | $(800+20 \times K_1)^{\text{Note1}}$              |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer with CCA when $T_{\text{SMTC}} > 20$ ms and serving cell SSB $\hat{E}_s/\text{lot} < -8$ dB. |  |   |   |
| Note 2: $K_1$ is the number of SMTC occasions not available at the UE due during RRC re-establishment period on the carrier with CCA.   |  |   |   |

**Table 6.2.1A.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell on the carrier with CCA**

| Serving cell SSB $\hat{E}_s/\text{lot}$ (dB)  | Frequency range (FR) of target NR cell | $T_{\text{identify\_inter\_NR\_CCA}, i}$ [ms]            |   |
|---|--|--|---|
|   |  | Known NR cell  | Unknown NR cell   |
| $\geq -8$   | FR1                                    | MAX (200 ms, $([6]+K_{2,i}) \times T_{\text{SMTC}, i}$ ) | MAX (800 ms, $([13]+K_{2,i}) \times T_{\text{SMTC}, i}$ ) |
| $< -8$  | FR1                                    | N/A  | $(800+20 \times K_{2,i})^{\text{Note1}}$                  |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer with CCA when $T_{\text{SMTC},i} > 20$ ms and serving cell SSB $\hat{E}_s/\text{lot} < -8$ dB. |  |  |   |
| Note 2: $K_{2,i}$ is the number of SMTC occasions not available at the UE during RRC re-establishment period on the "i" th carrier with CCA,  |  |  |   |

## 6.2.2 Random access

### 6.2.2.1 Introduction

This clause contains requirements on the UE regarding random access procedure. The random access procedure is initiated to establish uplink time synchronization for a UE which either has not acquired or has lost its uplink synchronization, or to convey UE's request Other SI, or for beam failure recovery. The random access is specified in clause 8 of TS 38.213 [3] and the control of the RACH transmission is specified in clause 5.1 of TS 38.321 [7]. Two types of procedure are defined for the random access, the 4-step RA type, and the 2-step RA type [7]. The decision on which type of procedure to adopt is as described in clause 5.1.1 of TS 38.321 [7]. The requirements for the 4-step RA type procedure are described in clause 6.2.2.2, whereas the requirements for the 2-step RA type procedure are described in the clause 6.2.2.3 of this specification.

### 6.2.2.2 Requirements for 4-step RA type

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [7].

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [18] for FR1 and in Table 6.3.4.2-1 of TS 38.101-2 [19] for FR2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [18] for FR1 and clause 6.3.4.3 of TS38.101-2 [19] for FR2.

The UE shall indicate a random access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4 in TS 38.321 [7].

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

#### 6.2.2.2.1 Contention based random access

##### 6.2.2.2.1.1 Correct behaviour when transmitting Random Access Preamble

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SSB is configured, as specified in clause 5.1.2 in TS 38.321 [7].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

##### 6.2.2.2.1.2 Correct behaviour when receiving Random Access Response

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

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

##### 6.2.2.2.1.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [7].

#### 6.2.2.2.1.4 Correct behaviour when receiving an UL grant for msg3 retransmission

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

#### 6.2.2.2.1.5 SA: Correct behaviour when receiving a message over Temporary C-RNTI

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### 6.2.2.2.1.6 Correct behaviour when contention Resolution timer expires

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

### 6.2.2.2.2 Non-Contention based random access

#### 6.2.2.2.2.1 Correct behaviour when transmitting Random Access Preamble

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

If the random access procedure is initialized for beam failure recovery and if the contention-free Random Access Resources and the contention-free PRACH occasions for beam failure recovery request associated with any of the SSBs and/or CSI-RSs is configured, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs or the selected CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the associated CSI-RSs, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, or from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions or the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

#### 6.2.2.2.2.2 Correct behaviour when receiving Random Access Response

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

The UE may stop monitoring for Random Access Response(s) and shall monitor the Other SI transmission if the Random Access Response only contains a Random Access Preamble identifier which is corresponding to the transmitted Random Access Preamble and the random access procedure is initialized for SI request from UE, as specified in clause 5.1.4 in TS 38.321 [7].



The UE may stop monitoring for Random Access Response(s), if the contention-free Random Access Preamble for beam failure recovery request was transmitted and if the PDCCH addressed to UE's C-RNTI is received, as specified in clause 5.1.4 in TS 38.321 [7].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 6.2.2.2.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [7].

#### 6.2.2.2.3 UE behaviour when configured with supplementary UL

In addition to the requirements defined in clause 6.2.2.2.1 and 6.2.2.2.2, a UE configured with supplementary UL carrier shall use RACH configuration for the supplementary UL carrier contained in RMSI and RRC dedicated signalling. If the cell for the random access procedure is configured with supplementary UL, the UE shall transmit or re-transmit PRACH preamble on the supplementary UL carrier if the SS-RSRP measured by the UE on the DL carrier is lower than the *rsrp-ThresholdSSB-SUL* as defined in TS 38.331 [2].

#### 6.2.2.3 Requirements for 2-step RA type

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [7].

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [3] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [18] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [19] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [18] for frequency range 1 and clause 6.3.4.3 of TS 38.101-2 [19] for frequency range 2.

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [7]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [7].

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

#### 6.2.2.3.1 Contention based random access

##### 6.2.2.3.1.1 Correct behaviour when transmitting MsgA

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, the UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2a in TS 38.321 [7].

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

The PRACH preamble and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [7].

In association with the MsgA PRACH, the UE should have the capability to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [3].

#### 6.2.2.3.1.2 Correct behaviour when receiving MsgB

The UE shall stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [3] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [7].

The UE shall send ACK if Success RAR is received in MsgB and the Contention Resolution is successful, as defined in clause 5.1.4a in TS 38.321 [7].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH and monitor contention resolution as described in clause 8.2A in TS 38.213 [3].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [7].

#### 6.2.2.3.1.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [7].

### 6.2.2.3.2 Non-Contention based random access

#### 6.2.2.3.2.1 Correct behaviour when transmitting MsgA

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [7].

In association with the MsgA PRACH, the UE should have the capability to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [3].

#### 6.2.2.3.2.2 Correct behaviour when receiving MsgB

The UE may stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [3] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [7].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH as described in clause 8.2A in TS 38.213 [3].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7] for the next available PRACH occasion, and transmit the preamble with the calculated MsgA PRACH and MsgA PUSCH transmission power if all received MsgBs contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 6.2.2.3.2.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7] for the next available PRACH occasion, and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power, if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA* and the Random Access Response Reception has not been considered as successful as defined in clause 5.1.4a in TS 38.321 [7].

#### 6.2.2.3.3 UE behaviour when configured with supplementary UL

In addition to the requirements defined in clause 6.2.2.3.1 and 6.2.2.3.2, a UE configured with supplementary UL carrier shall use RACH configuration for the supplementary UL carrier contained in RMSI and RRC dedicated signalling. If the cell for the random access procedure is configured with supplementary UL, the UE shall transmit or retransmit PRACH preamble on the supplementary UL carrier if the SS-RSRP measured by the UE on the DL carrier is lower than the *rsrp-ThresholdSSB-SUL* as defined in TS 38.321 [7].

### 6.2.2A Random access when CCA is used on target frequency

#### 6.2.2A.1 Introduction

This clause contains requirements on the UE regarding random access procedure when CCA is used on the target frequency. The random access procedure is initiated to establish uplink time synchronization for a UE which either has not acquired or has lost its uplink synchronization, or to convey UE's request Other SI, or for beam failure recovery. The random access is specified in clause 8 of TS 38.213 [3] and the control of the RACH transmission is specified in clause 5.1 of TS 38.321 [7]. Two types of procedure are defined for the random access, the 4-step RA type, and the 2-step RA type [7]. The decision on which type of procedure to adopt is as described in clause 5.1.1 of TS 38.321 [7]. The requirements for the 4-step RA type procedure are described in clause 6.2.2A.2, whereas the requirements for the 2-step RA type procedure are described in the clause 6.2.2A.3 of this specification.

#### 6.2.2A.2 Requirements for 4-step RA type

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [7].

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [18].

The UE shall indicate a random access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4 in TS 38.321 [7].

The requirements in this clause apply for UE operating in a carrier frequency with CCA in SA operation mode or any MR-DC operation mode, in a carrier frequency with CCA.

#### 6.2.2A.2.1 Contention based random access

##### 6.2.2A.2.1.1 Correct behaviour when transmitting Random Access Preamble

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SSB is configured, as specified in clause 5.1.2 in TS 38.321 [7].

If the UL CCA is successful on the next available PRACH occasion, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH

occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall perform the Random Access Resource selection procedure again, as specified in clause 5.1.3 in TS 38.321 [7].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall increment `PREAMBLE_TRANSMISSION_COUNTER` by 1. The UE shall again perform the Random Access Resource selection procedure if `PREAMBLE_TRANSMISSION_COUNTER` < *preambleTransMax* + 1, as specified in clause 5.1.3 in TS 38.321 [7].

#### 6.2.2A.2.1.2 Correct behaviour when receiving Random Access Response

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

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 6.2.2A.2.1.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], if the UL CCA is successful, and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [7].

#### 6.2.2A.2.1.4 Correct behaviour when receiving an UL grant for msg3 retransmission

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission, if the UL CCA is successful,

#### 6.2.2A.2.1.5 Correct behaviour when receiving a message over Temporary C-RNTI

If the UL CCA is successful, The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires and the UL CCA is successful, unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### 6.2.2A.2.1.6 Correct behaviour when contention Resolution timer expires

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

### 6.2.2A.2.2 Non-Contention based random access

#### 6.2.2A.2.2.1 Correct behaviour when transmitting Random Access Preamble

If the UL CCA is successful on the next available PRACH occasion and if the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with *SS-RSRP* above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal

probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

If the UL CCA is successful, and if the random access procedure is initialized for beam failure recovery and if the contention-free Random Access Resources and the contention-free PRACH occasions for beam failure recovery request associated with SSBs configured, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [7].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall perform the Random Access Resource selection procedure again, as specified in clause 5.1.3 in TS 38.321 [7].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall increment *PREAMBLE\_TRANSMISSION\_COUNTER* by 1. The UE shall again perform the Random Access Resource selection procedure if *PREAMBLE\_TRANSMISSION\_COUNTER* < *preambleTransMax* + 1, as specified in clause 5.1.3 in TS 38.321 [7].

#### 6.2.2A.2.2.2 Correct behaviour when receiving Random Access Response

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

The UE may stop monitoring for Random Access Response(s) and shall monitor the Other SI transmission if the Random Access Response only contains a Random Access Preamble identifier which is corresponding to the transmitted Random Access Preamble and the random access procedure is initialized for SI request from UE, as specified in clause 5.1.4 in TS 38.321 [7].

The UE may stop monitoring for Random Access Response(s), if the contention-free Random Access Preamble for beam failure recovery request was transmitted and if the PDCCH addressed to UE's C-RNTI is received, as specified in clause 5.1.4 in TS 38.321 [7].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7] for the next available PRACH occasion if the UL CCA is successful, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 6.2.2A.2.2.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [7] for the next available PRACH occasion if the UL CCA is successful, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [7].

### 6.2.2A.3 Requirements for 2-step RA type

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [7].

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [3] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [18].

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [7]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [7].

The requirements in this clause apply for UE operating in a carrier frequency with CCA in SA operation mode or any MR-DC operation mode, in a carrier frequency with CCA.

### 6.2.2A.3.1 Contention based random access

#### 6.2.2A.3.1.1 Correct behaviour when transmitting MsgA

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, the UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2a in TS 38.321 [7].

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

The PRACH preamble and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [7].

In association with the MsgA PRACH, if the UL CCA is successful, the UE should have the capability to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [3].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and perform the Random Access Resource selection procedure, as specified in clause 5.1.3a in TS 38.321 [7].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and increment PREAMBLE\_TRANSMISSION\_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE\_TRANSMISSION\_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3a in TS 38.321 [7]. If the Random Access Procedure is not complete and the UE is configured with *msgA-TransMax* then, as specified in clause 5.1.3a in TS 38.321 [7], the UE shall perform the Random Access Resource selection procedure with 4-step RA type provided that PREAMBLE\_TRANSMISSION\_COUNTER = *msgA-TransMax* + 1.

#### 6.2.2A.3.1.2 Correct behaviour when receiving MsgB

The UE shall stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [3] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [7].

If the UL CCA is successful, the UE shall send ACK if Success RAR is received in MsgB and the Contention Resolution is successful, as defined in clause 5.1.4a in TS 38.321 [7].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH if the UL CCA is successful, and monitor contention resolution as described in clause 8.2A in TS 38.213 [3].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power, if the UL CCA is successful on the next available PRACH occasion, when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [7].

### 6.2.2A.3.1.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7], and if the UL CCA is successful, transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful on the next available PRACH occasion when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [7].

### 6.2.2A.3.2 Non-Contention based random access

#### 6.2.2A.3.2.1 Correct behaviour when transmitting MsgA

If the UL CCA is successful, if the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with *SS-RSRP* above *msgA-RSRP-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [7].

In association with the MsgA PRACH, the UE should have the capability to transmit MsgA PUSCH, if the UL CCA is successful, on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [3].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall have cancel the transmission of the MsgA payload on the associated PUSCH resource and perform the Random Access Resource selection procedure, as specified in clause 5.1.3a in TS 38.321 [7].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [7], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and increment *PREAMBLE\_TRANSMISSION\_COUNTER* by 1. The UE shall again perform the Random Access Resource selection procedure if *PREAMBLE\_TRANSMISSION\_COUNTER* < *preambleTransMax* + 1, as specified in clause 5.1.3a in TS 38.321 [7]. If the Random Access Procedure is not complete and the UE is configured with *msgA-TransMax* then, as specified in clause 5.1.3a in TS 38.321 [7], the UE shall perform the Random Access Resource selection procedure with 4-step RA type provided that *PREAMBLE\_TRANSMISSION\_COUNTER* = *msgA-TransMax* + 1.

#### 6.2.2A.3.2.2 Correct behaviour when receiving MsgB

The UE may stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [3] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [7].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH if the UL CCA is successful, as described in clause 8.2A in TS 38.213 [3].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7] for the next available PRACH occasion, and transmit the preamble with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful, if all received MsgBs contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 6.2.2A.3.2.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [7] for the next available PRACH occasion, and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful on the next available PRACH occasion, if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA* and the Random Access Response Reception has not been considered as successful as defined in clause 5.1.4a in TS 38.321 [7].

## 6.2.3 SA: RRC Connection Release with Redirection

### 6.2.3.1 Introduction

This clause contains requirements on the UE regarding RRC connection release with redirection procedure. RRC connection release with redirection is initiated by the *RRCRelease* message with redirection to E-UTRAN or NR from NR specified in TS 38.331 [2]. The RRC connection release with redirection procedure is specified in clause 5.3.8 of TS 38.331 [2].

In the requirements of clause 6.2.3.2, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding identification period; otherwise the SMTC occasion is considered as available at the UE.

In the requirements of clause 6.2.3.2, the term PRACH occasion unavailable for transmission refers to when the PRACH occasion is configured by gNB but not transmitted by the UE during the corresponding period due to UL CCA failure at the UE.

### 6.2.3.2 Requirements

#### 6.2.3.2.1 RRC connection release with redirection to NR

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within  $T_{\text{connection\_release\_redirect\_NR}}$ .

The time delay ( $T_{\text{connection\_release\_redirect\_NR}}$ ) is the time between the end of the last slot containing the RRC command, “*RRCRelease*” (TS 38.331 [2]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ( $T_{\text{connection\_release\_redirect\_NR}}$ ) shall be less than:

$$T_{\text{connection\_release\_redirect\_NR}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-NR}} + T_{\text{SI-NR}} + T_{\text{RACH}}$$

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- the conditions of SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.5 for a corresponding NR Band are fulfilled.

$T_{\text{RRC\_procedure\_delay}}$ : It is the RRC procedure delay for processing the received message “*RRCRelease*” as defined in clause 6.2.2 of TS 38.331 [2].

$T_{\text{identify-NR}}$ : It is the time to identify the target NR cell and depends on the FR of the target NR cell. It is defined in Table 6.2.3.2.1-1. Note that  $T_{\text{identify-NR}} = T_{\text{PSS/SSS-sync}} + T_{\text{meas}}$ , in which  $T_{\text{PSS/SSS-sync}}$  is the cell search time and  $T_{\text{meas}}$  is the measurement time due to cell selection criteria evaluation.

$T_{\text{SI-NR}}$ : It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.  $T_{\text{RACH}}$ : It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell.  $T_{\text{RACH}}$  can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$T_{\text{TS}}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise  $T_{\text{TS}}$  is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the *measObjectNR*s having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC,  $T_{\text{TS}}$  is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this clause is applied with  $T_{\text{TS}} = 20$  ms if the SSB transmission periodicity is not larger than 20 ms; otherwise,
- there is no requirement if the SSB transmission periodicity is larger than 20ms.



**Table 6.2.3.2.1-1: Time to identify target NR cell for RRC connection release with redirection to NR**

| FR of target NR cell | T <sub>identify-NR</sub>  |
|----------------------|---|
| FR1                  | MAX (680 ms, 11 x T <sub>rs</sub> )   |
| FR2                  | MAX (880 ms, 8x11 x T <sub>rs</sub> )   |
| Note:                | If the UE has been provided with higher layer signaling of <i>smtc2</i> specified in TS 38.331 [2] prior to the redirection command, T <sub>rs</sub> follows <i>smtc1</i> or <i>smtc2</i> according to the physical cell ID of the target cell. |

### 6.2.3.2.2 RRC connection release with redirection to E-UTRAN

The UE shall be capable of performing the RRC connection release with redirection to the target E-UTRAN cell within T<sub>connection\_release\_redirect\_E-UTRA</sub>.

The time delay (T<sub>connection\_release\_redirect\_E-UTRA</sub>) is the time between the end of the last slot containing the RRC command, “*RRCRelease*” (TS 38.331 [2]) on the PDSCH and the time the UE starts to send random access to the target E-UTRA cell. The time delay (T<sub>connection\_release\_redirect\_E-UTRA</sub>) shall be less than:

$$T_{\text{connection\_release\_redirect\_E-UTRA}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-E-UTRA}} + T_{\text{SI-E-UTRA}} + T_{\text{RACH}}$$

The target E-UTRA FDD or TDD cell shall be considered detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in annex B.1.2 of TS 36.133 [15] are fulfilled for a corresponding Band, and
- the same conditions as for inter-frequency RSRQ measurements specified in annex B.1.2 of TS 36.133 [15] are fulfilled for a corresponding Band, and
- SCH conditions specified in annex B.1.2 of TS 36.133 [15] are fulfilled for a corresponding Band.

T<sub>RRC\_procedure\_delay</sub>: It is the RRC procedure delay for processing the received message “*RRCRelease*” as defined in clause 6.2.2 of TS 38.331 [2].

T<sub>identify-E-UTRA</sub>: It is the time to identify the target E-UTRA cell. It shall be less than 320 ms.

T<sub>SI-E-UTRA</sub>: It is the time required for acquiring all the relevant system information of the target E-UTRA cell. This time depends upon whether the UE is provided with the relevant system information (SI) of the target E-UTRA cell or not by the old NR cell before the RRC connection is released.

T<sub>RACH</sub>: It is the delay caused due to the random access procedure when sending random access to the target E-UTRA cell.

### 6.2.3.2.3 RRC connection release with redirection to NR carrier subject to CCA

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell subject to CCA within T<sub>connection\_release\_redirect\_NR\_CCA</sub>.

The time delay (T<sub>connection\_release\_redirect\_NR\_CCA</sub>) is the time between the end of the last slot containing the RRC command, “*RRCRelease*” (TS 38.331 [2]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay (T<sub>connection\_release\_redirect\_NR\_CCA</sub>) shall be less than:

$$T_{\text{connection\_release\_redirect\_NR\_CCA}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-NR\_CCA}} + T_{\text{SI-NR\_CCA}} + T_{\text{RACH\_CCA}}$$

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- the conditions of SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.5 for a corresponding NR Band are fulfilled.

T<sub>RRC\_procedure\_delay</sub>: It is the RRC procedure delay for processing the received message “*RRCRelease*” as defined in clause 6.2.2 of TS 38.331 [2].

T<sub>identify-NR\_CCA</sub>: It is the time to identify the target NR cell and is defined as:

- T<sub>identify-NR\_CCA</sub> = T<sub>PSS/SSS-sync</sub> + T<sub>meas</sub>; T<sub>PSS/SSS-sync</sub> is the cell search time and T<sub>meas</sub> is the measurement time due to cell selection criteria evaluation.

- $T_{\text{identify-NR\_CCA}} = \text{MAX}(680 \text{ ms}, (L_1+11) \times T_{\text{rs}})$ ; where  $L_1$  is the number of SMTC occasions not available at the UE due to DL CCA failures. If  $L_1 > L_{1,\text{max}}$  then the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1]; where  $L_{1,\text{max}}$  is defined in Table 6.2.3.2.3-1.

$T_{\text{SI-NR\_CCA}}$ : It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

$T_{\text{RACH\_CCA}}$ : It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell:

- $T_{\text{RACH\_CCA}} = (1+L_2) \times T_{\text{SSB,RO}} + 10 \text{ ms } T_{\text{PRACH}}$ ; where:
  - $L_2$  is the consecutive number of SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failures.  $L_2 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [33].
  - $T_{\text{SSB,RO}}$  is the SSB to PRACH occasion association period as defined in the table 8.1-1 of TS 38.213 [3].
  - The value of  $L_2$  is limited by *PREAMBLE\_TRANSMISSION\_COUNTER*, which is increased when PRACH occasion is unavailable for PRACH transmission due to UL CCA failure as specified in TS 38.321 [7]. The UE behaviour when *PREAMBLE\_TRANSMISSION\_COUNTER* reaches the *preambleTransMax* is specified in TS 38.321 [7].

$T_{\text{rs}}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise  $T_{\text{rs}}$  is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this clause is applied with  $T_{\text{rs}} = 20 \text{ ms}$  if the SSB transmission periodicity is not larger than 20 ms;
- otherwise, there is no requirement if the SSB transmission periodicity is larger than 20ms.

**Table 6.2.3.2.3-1: Maximum allowed number of missed SMTC occasions during cell identification**

| SMTC periodicity ( $T_{\text{rs}}$ ) [ms] | Maximum allowed number of missed SMTC occasions ( $L_{1,\text{max}}$ ) |
|---|--|
| $T_{\text{rs}} \leq 40$                   | 8  |
| $T_{\text{rs}} > 40$                      | 4  |

## 7 Timing

### 7.1 UE transmit timing

#### 7.1.1 Introduction

The UE shall have capability to follow the frame timing change of the reference cell in connected state. The uplink frame transmission takes place  $(N_{\text{TA}} + N_{\text{TA\_offset}}) \times T_{\text{c}}$  before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. For serving cell(s) in pTAG, UE shall use the SpCell as the reference cell for deriving the UE transmit timing for cells in the pTAG. For serving cell(s) in sTAG, UE shall use any of the activated SCells as the reference cell for deriving the UE transmit timing for the cells in the sTAG. UE initial transmit timing accuracy and gradual timing adjustment requirements are defined in the following requirements.

In the requirements of clause 7.1.2, the term reference cell on a carrier frequency subject to CCA is not available at the UE refers to when at least one SSB is configured by gNB, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available during at least one discovery burst transmission window, at the UE due to DL CCA failures at gNB during the last 1280 ms; otherwise the reference cell on the carrier frequency subject to CCA is considered as available at the UE.

## 7.1.2 Requirements

The UE initial transmission timing error shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is specified in Table 7.1.2-1. This requirement applies:

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

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

$(N_{TA} + N_{TA\text{ offset}}) \times T_c$  (in  $T_c$  units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3 was applied.  $N_{TA}$  for other channels is not changed until next timing advance is received. The value of  $N_{TA\text{ offset}}$  depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR).  $N_{TA\text{ offset}}$  is defined in Table 7.1.2-2.

**Table 7.1.2-1:  $T_e$  Timing Error Limit**

| Frequency Range   | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$                    |
|---|--------------------------|-----------------------------|--------------------------|
| 1   | 15                       | 15                          | $12 \cdot 64 \cdot T_c$  |
|   |                          | 30                          | $10 \cdot 64 \cdot T_c$  |
|   |                          | 60                          | $10 \cdot 64 \cdot T_c$  |
|   | 30                       | 15                          | $8 \cdot 64 \cdot T_c$   |
|   |                          | 30                          | $8 \cdot 64 \cdot T_c$   |
|   |                          | 60                          | $7 \cdot 64 \cdot T_c$   |
| 2   | 120                      | 60                          | $3.5 \cdot 64 \cdot T_c$ |
|   |                          | 120                         | $3.5 \cdot 64 \cdot T_c$ |
|   | 240                      | 60                          | $3 \cdot 64 \cdot T_c$   |
|   |                          | 120                         | $3 \cdot 64 \cdot T_c$   |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [6] |                          |                             |                          |

**Table 7.1.2-2: The Value of  $N_{TA\text{ offset}}$**

| Frequency range and band of cell used for uplink transmission   | $N_{TA\text{ offset}}$ (Unit: $T_c$ ) |
|---|---------------------------------------|
| FR1 FDD or TDD band with neither E-UTRA-NR nor NB-IoT-NR coexistence case   | 25600 (Note 1)                        |
| FR1 FDD band with E-UTRA-NR and/or NB-IoT-NR coexistence case   | 0 (Note 1)                            |
| FR1 TDD band with E-UTRA-NR and/or NB-IoT-NR coexistence case   | 39936 (Note 1)                        |
| FR2   | 13792                                 |
| <p>Note 1: The UE identifies <math>N_{TA\text{ offset}}</math> based on the information n-TimingAdvanceOffset as specified in TS 38.331 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of <math>N_{TA\text{ offset}}</math> is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [3] and the value 39936 of <math>N_{TA\text{ offset}}</math> can also be provided for a FDD serving cell.</p> <p>Note 2: Void</p> |                                       |

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

**Table 7.1.2-3: void**

If the UE uses a reference cell on a carrier frequency subject to CCA for deriving the UE transmit timing, then the UE shall meet all the transmit timing requirements defined in clause 7.1.2 provided that the reference cell is available at the UE. If the reference cell is not available at the UE on a carrier frequency subject to CCA, then the UE is allowed to transmit in the uplink provided that the UE meets all the transmit timing requirements defined in clause 7.1.2; otherwise the UE shall not transmit any uplink signal.

If a reference cell on a carrier frequency belonging to the PTAG, which is subject to CCA, is not available at the UE then the UE is allowed to use any of available activated SCell(s) at the UE in PTAG as a new reference cell. If the SCell used as reference cell is deactivated, or becomes not available, the UE is allowed to use another active serving cell in PTAG as new reference cell.

If a reference cell on a carrier frequency belonging to the STAG, which is subject to CCA is not available at the UE then the UE is allowed to use any of available activated SCell(s) at the UE in STAG as a new reference cell.

### 7.1.2.1 Gradual timing adjustment

Requirements in this section shall apply regardless of whether the reference cell is on a carrier frequency subject to CCA or not.

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

- 1) The maximum amount of the magnitude of the timing change in one adjustment shall be  $T_q$ .
- 2) The minimum aggregate adjustment rate shall be  $T_p$  per second.
- 3) The maximum aggregate adjustment rate shall be  $T_q$  per 200 ms.

where the maximum autonomous time adjustment step  $T_q$  and the aggregate adjustment rate  $T_p$  are specified in Table 7.1.2.1-1.

**Table 7.1.2.1-1:  $T_q$  Maximum Autonomous Time Adjustment Step and  $T_p$  Minimum Aggregate Adjustment rate**

| Frequency Range   | SCS of uplink signals (kHz) | $T_q$                    | $T_p$                    |
|---|-----------------------------|--------------------------|--------------------------|
| 1   | 15                          | $5.5 \cdot 64 \cdot T_c$ | $5.5 \cdot 64 \cdot T_c$ |
|   | 30                          | $5.5 \cdot 64 \cdot T_c$ | $5.5 \cdot 64 \cdot T_c$ |
|   | 60                          | $5.5 \cdot 64 \cdot T_c$ | $5.5 \cdot 64 \cdot T_c$ |
| 2   | 60                          | $2.5 \cdot 64 \cdot T_c$ | $2.5 \cdot 64 \cdot T_c$ |
|   | 120                         | $2.5 \cdot 64 \cdot T_c$ | $2.5 \cdot 64 \cdot T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [6] |                             |                          |                          |

### 7.1.2.2 Void

**Table 7.1.2.2-1: Void**

## 7.2 UE timer accuracy

### 7.2.1 Introduction

UE timers are used in different protocol entities to control the UE behaviour.

## 7.2.2 Requirements

For UE timers specified in TS 38.331 [2], the UE shall comply with the timer accuracies according to Table 7.2.2-1.

The requirements are only related to the actual timing measurements internally in the UE. They do not include the following:

- Inaccuracy in the start and stop conditions of a timer (e.g. UE reaction time to detect that start and stop conditions of a timer is fulfilled), or
- Inaccuracies due to restrictions in observability of start and stop conditions of a UE timer (e.g. slot alignment when UE sends messages at timer expiry).

**Table 7.2.2-1**

| Timer value [s]      | Accuracy          |
|----------------------|-------------------|
| timer value < 4      | $\pm 0.1\text{s}$ |
| timer value $\geq 4$ | $\pm 2.5\%$       |

## 7.3 Timing advance

### 7.3.1 Introduction

The timing advance is initiated from gNB to UE in EN-DC, NR-DC, NE-DC and NR SA operation modes, with MAC message that implies the adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [7].

### 7.3.2 Requirements

#### 7.3.2.1 Timing Advance adjustment delay

UE shall adjust the timing of its uplink transmission timing at time slot  $n+k+1$  for a timing advance command received in time slot  $n$ , and the value of  $k$  is defined in clause 4.2 in TS 38.213 [3]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

#### 7.3.2.2 Timing Advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 7.3.2.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [3].

**Table 7.3.2.2-1: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing(kHz)           | 15            | 30            | 60            | 120          |
|---------------------------------------|---------------|---------------|---------------|--------------|
| UE Timing Advance adjustment accuracy | $\pm 256 T_c$ | $\pm 256 T_c$ | $\pm 128 T_c$ | $\pm 32 T_c$ |

## 7.4 Cell phase synchronization accuracy

### 7.4.1 Definition

Cell phase synchronization accuracy for TDD is defined as the maximum absolute deviation in frame start timing between any pair of cells on the same frequency that have overlapping coverage areas.

### 7.4.2 Minimum requirements

The cell phase synchronization accuracy measured at BS antenna connectors or radiated interface boundaries shall be better than 3  $\mu\text{s}$ .

## 7.5 Maximum Transmission Timing Difference

### 7.5.1 Introduction

A UE shall be capable of handling a relative transmission timing difference between subframe timing boundary of E-UTRA PCell and the closest slot timing boundary of PSCell to be aggregated for EN-DC operation.

A UE shall be capable of handling a relative transmission timing difference among the closest slot timing boundaries of different carriers to be aggregated in NR carrier aggregation.

A UE shall be capable of handling a relative transmission timing difference between slot timing boundary of PCell and subframe timing boundary of E-UTRA PSCell to be aggregated for NE-DC operation.

A UE shall be capable of handling a relative transmission timing difference between slot timing boundaries of PCell and the closest slot timing boundary of PSCell to be aggregated in NR DC operation.

### 7.5.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-1.

**Table 7.5.2-1 Maximum uplink transmission timing difference requirement for asynchronous EN-DC**

| Sub-carrier spacing in E-UTRA PCell (kHz)   | UL Sub-carrier spacing for data in PSCell (kHz) | Maximum uplink transmission timing difference ( $\mu$ s) |
|---|---|--|
| 15  | 15  | 500  |
| 15  | 30  | 250  |
| 15  | 60  | 125  |
| 15  | 120 <sup>Note1</sup>                            | 62.5   |
| NOTE 1: For E-UTRA FDD-NR FDD intra-band EN-DC, for which the requirement is defined in clause 7.5.3 and this Table 7.5.2-1 is also applicable, the scenario with 120kHz PSCell does not exist. |   |  |

**Table 7.5.2-2 Void**

#### 7.5.2.1 Minimum Requirements for inter-band synchronous EN-DC

The requirements in this clause apply as a reference for inter-band synchronous EN-DC.

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell for inter-band synchronous EN-DC as shown in Table 7.5.2.1-1. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD, E-UTRA TDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

**Table 7.5.2.1-1 Maximum uplink transmission timing difference requirement for inter-band synchronous EN-DC**

| Sub-carrier spacing in E-UTRA PCell (kHz) | UL Sub-carrier spacing for data in PSCell (kHz) | Maximum uplink transmission timing difference ( $\mu$ s) |
|---|---|--|
| 15  | 15  | 35.21  |
| 15  | 30  | 35.21  |
| 15  | 60  | 35.21  |
| 15  | 120   | 35.21  |

### 7.5.3 Minimum Requirements for intra-band EN-DC

For intra-band EN-DC, only co-located deployment is applied.

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-1 for E-UTRA FDD-NR FDD intra-band EN-DC provided the UE indicates that it is capable of asynchronous EN-DC operation [2].

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.3-1 for E-UTRA TDD-NR TDD and E-UTRA FDD-NR FDD intra-band EN-DC provided the UE does not indicate that it is capable of asynchronous FDD-FDD EN-DC operation [16].

**Table 7.5.3-1: Maximum uplink transmission timing difference requirement for intra-band synchronous EN-DC**

| Sub-carrier spacing in E-UTRA PCell (kHz)  | UL Sub-carrier spacing for data in PSCell (kHz) | Maximum uplink transmission timing difference ( $\mu$ s) |
|--|---|--|
| 15   | 15  | 5.21 <sup>Note 1, Note 2</sup>                           |
| 15   | 30  | 5.21 <sup>Note 2</sup>                                   |
| 15   | 60  | 5.21 <sup>Note 2</sup>                                   |
| NOTE 1: This is not applicable for a UE which indicates the capability of only supporting single UL timing ( <i>ul-TimingAlignmentEUTRA-NR</i> is signalled). Single UL timing for E-UTRA and NR cell is assumed for this UE.      |   |  |
| NOTE 2: If the transmission timing difference exceeds the cyclic prefix length of the UL Sub-carrier spacing for data in PSCell, NR UE Tx EVM degradation is expected for the symbol that is overlapping the LTE subframe boundary |   |  |

### 7.5.4 Minimum Requirements for NR Carrier Aggregation

The UE shall be capable of handling at least a relative transmission timing difference between slot timing of all pairs of TAGs as shown in Table 7.5.4-1, provided that the UE is:

- configured with the pTAG and the sTAG for inter-band NR carrier aggregation in SA or NR-DC mode, or
- configured with more than one sTAG for inter-band NR carrier aggregation in EN-DC or NE-DC mode.

**Table 7.5.4-1: Maximum uplink transmission timing difference requirement for inter-band NR carrier aggregation**

| Frequency Range of the pair of TAGs | Maximum uplink transmission timing difference ( $\mu$ s)   |
|-------------------------------------|--|
| FR1                                 | 34.6   |
| FR2                                 | 8.5 <sup>Note 1</sup>  |
| Between FR1 and FR2                 | 26.1   |
| Note 1:                             | This requirement applies to the UE capable of independent beam management for FR2 inter-band CA. |

### 7.5.5 Minimum Requirements for inter-band NE-DC

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and E-UTRA PSCell as shown in Table 7.5.5-1 for inter-band asynchronous NE-DC.

**Table 7.5.5-1: Maximum uplink transmission timing difference requirement for inter-band asynchronous NE-DC**

| Sub-carrier spacing in PCell (kHz) | UL Sub-carrier spacing for data in E-UTRA PSCell (kHz) | Maximum uplink transmission timing difference ( $\mu$ s) |
|------------------------------------|--|--|
| 15                                 | 15   | 500  |
| 30                                 | 15   | 250  |
| 60                                 | 15   | 125  |
| 120                                | 15   | 62.5   |
| NOTE 1: Void                       |  |  |

**Table 7.5.5-2 Void**

### 7.5.5.1 Minimum Requirements for inter-band synchronous NE-DC

The requirements in this clause apply as a reference for inter-band synchronous NE-DC.

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and E-UTRA PSCell for inter-band synchronous NE-DC as shown in Table 7.5.5.1-1. The requirements for synchronous NE-DC are applicable for NR TDD- E-UTRA TDD, NR FDD- E-UTRA FDD, NR TDD- E-UTRA FDD and NR FDD- E-UTRA TDD inter-band NE-DC.

**Table 7.5.5.1-1: Maximum uplink transmission timing difference requirement for inter-band synchronous NE-DC**

| Sub-carrier spacing in PCell (kHz) | UL Sub-carrier spacing for data in E-UTRA PSCell (kHz) | Maximum uplink transmission timing difference ( $\mu$ s) |
|------------------------------------|--|--|
| 15                                 | 15   | 35.21  |
| 30                                 | 15   | 35.21  |
| 60                                 | 15   | 35.21  |
| 120                                | 15   | 35.21  |

### 7.5.6 Minimum Requirements for inter-band NR DC

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and PSCell as shown in Table 7.5.6-1 provided that the UE indicates that it is capable of synchronous NR DC only [14].

**Table 7.5.6-1: Maximum uplink transmission timing difference requirement for inter-band synchronous NR DC**

| Frequency Range |             | Maximum uplink transmission timing difference ( $\mu$ s) |
|-----------------|-------------|--|
| Cell in MCG     | Cell in SCG |  |
| FR1             | FR1         | 34.6   |
| FR2             | FR2         | 8.5  |
| FR1             | FR2         | 34.1   |

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and PSCell as shown in Table 7.5.6-2 provided that the UE indicates that it is capable of asynchronous NR DC [14].



**Table 7.5.6-2 Maximum uplink transmission timing difference requirement for inter-band asynchronous NR DC**

| Max {Sub-carrier spacing in PCell (kHz), Sub-carrier spacing in PSCell (kHz)} | Maximum uplink transmission timing difference ( $\mu$ s) |
|---|--|
| 15  | 500  |
| 30  | 250  |
| 60  | 125  |
| 120   | 62.5   |

## 7.6 Maximum Receive Timing Difference

### 7.6.1 Introduction

A UE shall be capable of handling a relative receive timing difference between subframe timing boundary of an E-UTRA cell belonging to the MCG and the closest slot timing boundary of a cell belonging to SCG to be aggregated for EN-DC operation.

A UE shall be capable of handling a relative receive timing difference between subframe timing boundary of an E-UTRA cell belonging to the SCG to be aggregated for NE-DC operation and the closest slot timing boundary of a cell belonging to MCG.

A UE shall be capable of handling a relative receive timing difference between slot timing boundary of a cell belonging to MCG and the closest slot timing boundary of a cell belonging to the SCG to be aggregated for NR DC operation.

A UE shall be capable of handling a relative receive timing difference among the closest slot timing boundaries of different carriers to be aggregated in NR carrier aggregation.

The requirements defined in clause 7.6 are also applicable when UE is configured to receive multiple PDSCH transmission occasions from one or more QCL sources on any one of the aggregated NR carriers.

### 7.6.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver as shown in Table 7.6.2-1.

**Table 7.6.2-1: Maximum receive timing difference requirement for asynchronous EN-DC**

| Sub-carrier spacing of E-UTRA cell in MCG (kHz)  | DL Sub-carrier spacing of cell in SCG (kHz) (Note 1) | Maximum receive timing difference ( $\mu$ s) |
|--|--|--|
| 15   | 15   | 500  |
| 15   | 30   | 250  |
| 15   | 60   | 125  |
| 15   | 120 <sup>Note2</sup>                                 | 62.5   |
| NOTE 1: DL Sub-carrier spacing is $\min\{SCS_{SS}, SCS_{DATA}\}$ .   |  |  |
| NOTE 2: For E-UTRA FDD-NR FDD intra-band EN-DC, for which the requirement is defined in clause 7.6.3 and this Table 7.6.2-1 is also applicable, the scenario with 120 kHz does not exit. |  |  |

**Table 7.6.2-2 Void**

**Table 7.6.2-3 Void**

#### 7.6.2.1 Minimum Requirements for inter-band synchronous EN-DC

The requirements in this clause apply as a reference for inter-band synchronous EN-DC.

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from an E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver for inter-band synchronous EN-DC as shown in Table 7.6.2.1-1. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD, E-UTRA TDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

**Table 7.6.2.1-1: Maximum receive timing difference requirement for inter-band synchronous EN-DC**

| Sub-carrier spacing of E-UTRA cell in MCG (kHz)                    | DL Sub-carrier spacing of cell in SCG (kHz) (Note1) | Maximum receive timing difference ( $\mu$ s) |
|--|---|--|
| 15   | 15  | 33   |
| 15   | 30  |  |
| 15   | 60  |  |
| 15   | 120   |  |
| Note 1: DL Sub-carrier spacing is $\min\{SCS_{SS}, SCS_{DATA}\}$ . |   |  |

### 7.6.3 Minimum Requirements for intra-band EN-DC

For intra-band EN-DC, only co-located deployment is applied.

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG as shown in Table 7.6.2-1 for E-UTRA FDD-NR FDD intra-band EN-DC provided the UE indicates that it is capable of asynchronous EN-DC operation [2].

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG as shown in Table 7.6.3-1 for E-UTRA FDD-NR FDD and E-UTRA TDD-NR TDD intra-band EN-DC provided the UE does not indicate that it is capable of asynchronous FDD-FDD EN-DC operation [16].

**Table 7.6.3-1 Maximum receive timing difference requirement for intra-band synchronous EN-DC**

| Sub-carrier spacing of E-UTRA cell in MCG (kHz)                    | DL Sub-carrier spacing of cell in SCG (kHz) <sup>Note1</sup> | Maximum receive timing difference ( $\mu$ s) |
|--|--|--|
| 15   | 15   | 3  |
| 15   | 30   | 3  |
| 15   | 60   | 3  |
| NOTE 1: DL Sub-carrier spacing is $\min\{SCS_{SS}, SCS_{DATA}\}$ . |  |  |

**Table 7.6.3-2 Void**

### 7.6.4 Minimum Requirements for NR Carrier Aggregation

For intra-band CA, only co-located deployment is applied. For intra-band non-contiguous NR carrier aggregation, the UE shall be capable of handling at least a relative receive timing difference between slot timing of different carriers to be aggregated at the UE receiver as shown in Table 7.6.4-1 below.

**Table 7.6.4-1: Maximum receive timing difference requirement for intra-band non-contiguous NR carrier aggregation**

| Frequency Range  | Maximum receive timing difference ( $\mu\text{s}$ ) |
|--|---|
| FR1  | 3 <sup>1</sup>                                      |
| FR2  | 0.26  |
| Note 1: In the case of different SCS on different CCs, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot. |   |

For inter-band NR carrier aggregation, the UE shall be capable of handling at least a relative receive timing difference between slot timing of all pairs of carriers to be aggregated at the UE receiver as shown in Table 7.6.4-2 below.

**Table 7.6.4-2: Maximum receive timing difference requirement for inter-band NR carrier aggregation**

| Frequency Range of the pair of carriers   | Maximum receive timing difference ( $\mu\text{s}$ ) |
|---|---|
| FR1   | 33  |
| FR2   | 8 <sup>note1</sup>                                  |
| Between FR1 and FR2   | 25  |
| Note1: This requirement applies to the UE capable of independent beam management for FR2 inter-band CA. |   |

## 7.6.5 Minimum Requirements for inter-band NE-DC

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and subframe timing of signal from an E-UTRA cell belonging to the SCG at the UE receiver for asynchronous NE-DC as shown in Table 7.6.5-1.

**Table 7.6.5-1: Maximum receive timing difference requirement for asynchronous NE-DC**

| Sub-carrier spacing of cell in MCG (kHz)   | DL Sub-carrier spacing of EUTRA cell in SCG (kHz)<br>(Note 1) | Maximum receive timing difference ( $\mu\text{s}$ ) |
|--|---|---|
| 15   | 15  | 500   |
| 30   | 15  | 250   |
| 60   | 15  | 125   |
| 120  | 15  | 62.5  |
| NOTE 1: DL Sub-carrier spacing is $\min\{\text{SCS}_{\text{SS}}, \text{SCS}_{\text{DATA}}\}$ . |   |   |
| NOTE 2: Void   |   |   |

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and subframe timing of signal from a E-UTRA cell belonging to the SCG at the UE receiver for inter-band synchronous NE-DC as shown in Table 7.6.5-2. The requirements for synchronous NE-DC are applicable for NR TDD- E-UTRA TDD, NR FDD- E-UTRA FDD, NR TDD- E-UTRA FDD and NR FDD- E-UTRA TDD inter-band NE-DC.

**Table 7.6.5-2: Void**

### 7.6.5.1 Minimum Requirements for inter-band synchronous NE-DC

The requirements in this clause apply as a reference for inter-band synchronous NE-DC.

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and subframe timing of signal from a E-UTRA cell belonging to the SCG at the UE receiver for inter-band synchronous NE-DC as shown in Table 7.6.5.1-1. The requirements for synchronous NE-DC are

applicable for NR TDD- E-UTRA TDD, NR FDD- E-UTRA FDD, NR TDD- E-UTRA FDD and NR FDD- E-UTRA TDD inter-band NE-DC.

**Table 7.6.5.1-1: Maximum receive timing difference requirement for inter-band synchronous NE-DC**

| Sub-carrier spacing of cell in MCG (kHz) | DL Sub-carrier spacing of EUTRA cell in SCG (kHz) (Note1) | Maximum receive timing difference ( $\mu$ s) |
|--|---|--|
| 15                                       | 15  | 33   |
| 30                                       | 15  |  |
| 60                                       | 15  |  |
| 120                                      | 15  |  |

## 7.6.6 Minimum Requirements for inter-band NR DC

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG at the UE receiver as shown in Table 7.6.6-1 provided that the UE indicates that it is capable of synchronous NR DC only [16].

**Table 7.6.6-1: Maximum receive timing difference requirement for inter-band synchronous NR DC**

| Frequency Range |             | Maximum receive timing difference ( $\mu$ s) |
|-----------------|-------------|--|
| Cell in MCG     | Cell in SCG |  |
| FR1             | FR1         | 33   |
| FR2             | FR2         | 8  |
| FR1             | FR2         | 33   |

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG at the UE receiver as shown in Table 7.6.6-2 provided that the UE indicates that it is capable of asynchronous NR DC [16].

**Table 7.6.6-2 Maximum receive timing difference requirement for inter-band asynchronous NR DC**

| Max {Sub-carrier spacing in PCell (kHz), Sub-carrier spacing in PSCell (kHz)} | Maximum receive timing difference ( $\mu$ s) |
|---|--|
| 15  | 500  |
| 30  | 250  |
| 60  | 125  |
| 120   | 62.5   |

## 7.7 *deriveSSB-IndexFromCell* tolerance

### 7.7.1 Minimum requirements

When *deriveSSB-IndexFromCell* is enabled, the UE assumes frame boundary alignment (including half frame, subframe and slot boundary alignment) across cells on the same frequency carrier is within a tolerance not worse than min(2 SSB symbols, 1 PDSCH symbol) and the SFNs of all cells on the same frequency carrier are the same.

## 7.8 Void

# 8 Signalling characteristics

## 8.1 Radio Link Monitoring

### 8.1.1 Introduction

The requirements in clause 8.1 apply for radio link monitoring on:

- PCell in SA NR, NR-DC and NE-DC operation mode,
- PSCell in NR-DC and EN-DC operation mode.

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

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

The threshold  $Q_{out}$  is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ( $BLER_{out}$ ) as defined in Table 8.1.1-1. For SSB based radio link monitoring,  $Q_{out\_SSB}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.2.1-1. For CSI-RS based radio link monitoring,  $Q_{out\_CSI-RS}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.3.1-1.

The threshold  $Q_{in}$  is defined as the level at which the downlink radio link quality can be received with significantly higher reliability than at  $Q_{out}$  and shall correspond to the in-sync block error rate ( $BLER_{in}$ ) as defined in Table 8.1.1-1. For SSB based radio link monitoring,  $Q_{in\_SSB}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.2.1-2. For CSI-RS based radio link monitoring,  $Q_{in\_CSI-RS}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.3.1-2.

The out-of-sync block error rate ( $BLER_{out}$ ) and in-sync block error rate ( $BLER_{in}$ ) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 8.1.1-1 by default. All requirements in clause 8.1 are applicable for BLER Configuration #0 in Table 8.1.1-1.

**Table 8.1.1-1: Out-of-sync and in-sync block error rates**

| Configuration | $BLER_{out}$ | $BLER_{in}$ |
|---------------|--------------|-------------|
| 0             | 10%          | 2%          |

UE shall be able to monitor up to  $N_{RLM}$  RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number  $L_{max}$  of SSBs per half frame according to TS 38.213 [3], where  $N_{RLM}$  is specified in Table 8.1.1-2 according TS 38.213 [3], and meet the requirements as specified in clause 8.1. UE is not required to meet the requirements in clause 8.1 if RLM-RS is not configured and no TCI state for PDCCH is activated.

**Table 8.1.1-2: Maximum number of RLM-RS resources  $N_{RLM}$** 

| Carrier frequency range of PCell/PSCell   | $L_{max}$ | Maximum number of RLM-RS resources, $N_{RLM}$ |
|---|-----------|---|
| FR1, $\leq 3$ GHz <sup>Note</sup>   | 4         | 2   |
| FR1, $> 3$ GHz <sup>Note</sup>  | 8         | 4   |
| FR2   | 64        | 8   |
| NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3GHz is replaced by 1.88GHz, as specified in clause 4.1 in TS 38.213 [3]. |           |   |

## 8.1.2 Requirements for SSB based radio link monitoring

### 8.1.2.1 Introduction

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.1.2.2.

**Table 8.1.2.1-1: PDCCH transmission parameters for out-of-sync evaluation**

| Attribute  | Value for BLER Configuration #0 |
|--|---------------------------------|
| DCI format   | 1-0                             |
| Number of control OFDM symbols                                   | 2                               |
| Aggregation level (CCE)  | 8                               |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 4dB                             |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 4dB                             |
| Bandwidth (PRBs)   | 24                              |
| Sub-carrier spacing (kHz)  | SCS of the active DL BWP        |
| DMRS precoder granularity  | REG bundle size                 |
| REG bundle size  | 6                               |
| CP length  | Normal                          |
| Mapping from REG to CCE  | Distributed                     |

**Table 8.1.2.1-2: PDCCH transmission parameters for in-sync evaluation**

| Attribute  | Value for BLER Configuration #0 |
|--|---------------------------------|
| DCI payload size   | 1-0                             |
| Number of control OFDM symbols                                   | 2                               |
| Aggregation level (CCE)  | 4                               |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 0dB                             |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB                             |
| Bandwidth (PRBs)   | 24                              |
| Sub-carrier spacing (kHz)  | SCS of the active DL BWP        |
| DMRS precoder granularity  | REG bundle size                 |
| REG bundle size  | 6                               |
| CP length  | Normal                          |
| Mapping from REG to CCE  | Distributed                     |

### 8.1.2.2 Minimum requirement

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

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

$T_{\text{Evaluate\_out\_SSB}}$  and  $T_{\text{Evaluate\_in\_SSB}}$  are defined in Table 8.1.2.2-1 for FR1.

$T_{\text{Evaluate\_out\_SSB}}$  and  $T_{\text{Evaluate\_in\_SSB}}$  are defined in Table 8.1.2.2-2 for FR2 with scaling factor  $N=8$ .

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the SSB; and
- $P = 1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{T_{\text{SMTCperiod}}}}$ , when RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ).
- $P$  is  $P_{\text{sharing factor}}$ , when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC period ( $T_{\text{SSB}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}} - \frac{T_{\text{SSB}}}{T_{\text{SMTCperiod}}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{\text{SMTCperiod}} \neq \text{MGRP}$  or
  - $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{SSB}} < 0.5 * T_{\text{SMTCperiod}}$
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}}}$ , when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{SSB}} = 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{T_{\text{SMTCperiod}}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ( $T_{\text{SSB}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < \text{MGRP}$ )
- $P_{\text{sharing factor}} = 1$ , if the RLM-RS resource outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.
- $P_{\text{sharing factor}} = 3$ , otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is present,  $T_{\text{SMTCperiod}}$  follows *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  follows *smtc1*.  $T_{\text{SMTCperiod}}$  is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present,  $T_{\text{SMTCperiod}}$  follows *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  follows *smtc1*.

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

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

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

**Table 8.1.2.2-1: Evaluation period  $T_{\text{Evaluate\_out\_SSB}}$  and  $T_{\text{Evaluate\_in\_SSB}}$  for FR1**

| Configuration                 | $T_{\text{Evaluate\_out\_SSB}}$ (ms)  | $T_{\text{Evaluate\_in\_SSB}}$ (ms)  |
|-------------------------------|---|--|
| no DRX                        | $\text{Max}(200, \text{Ceil}(10 \times P) \times T_{\text{SSB}})$                             | $\text{Max}(100, \text{Ceil}(5 \times P) \times T_{\text{SSB}})$                               |
| DRX cycle $\leq 320\text{ms}$ | $\text{Max}(200, \text{Ceil}(15 \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ | $\text{Max}(100, \text{Ceil}(7.5 \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ |
| DRX cycle $> 320\text{ms}$    | $\text{Ceil}(10 \times P) \times T_{\text{DRX}}$  | $\text{Ceil}(5 \times P) \times T_{\text{DRX}}$  |

NOTE:  $T_{\text{SSB}}$  is the periodicity of the SSB configured for RLM.  $T_{\text{DRX}}$  is the DRX cycle length.

**Table 8.1.2.2-2: Evaluation period  $T_{\text{Evaluate\_out\_SSB}}$  and  $T_{\text{Evaluate\_in\_SSB}}$  for FR2**

| Configuration                 | $T_{\text{Evaluate\_out\_SSB}}$ (ms)   | $T_{\text{Evaluate\_in\_SSB}}$ (ms)   |
|-------------------------------|--|---|
| no DRX                        | $\text{Max}(200, \text{Ceil}(10 \times P \times N) \times T_{\text{SSB}})$                             | $\text{Max}(100, \text{Ceil}(5 \times P \times N) \times T_{\text{SSB}})$                               |
| DRX cycle $\leq 320\text{ms}$ | $\text{Max}(200, \text{Ceil}(15 \times P \times N) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ | $\text{Max}(100, \text{Ceil}(7.5 \times P \times N) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ |
| DRX cycle $> 320\text{ms}$    | $\text{Ceil}(10 \times P \times N) \times T_{\text{DRX}}$  | $\text{Ceil}(5 \times P \times N) \times T_{\text{DRX}}$  |

NOTE:  $T_{\text{SSB}}$  is the periodicity of the SSB configured for RLM.  $T_{\text{DRX}}$  is the DRX cycle length.

### 8.1.2.3 Measurement restrictions for SSB based RLM

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

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.



For FR2, when the SSB for RLM measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

For FR2, there is no measurement restriction allowed when the network configures mixed numerology between SSB for RLM measurement on one FR2 band and CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the other FR2 band, provided that UE is capable of independent beam management on this FR2 band pair.

## 8.1.3 Requirements for CSI-RS based radio link monitoring

### 8.1.3.1 Introduction

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

**Table 8.1.3.1-1: PDCCH transmission parameters for out-of-sync evaluation**

| Attribute   | Value for BLER Configuration #0 |
|---|---------------------------------|
| DCI format  | 1-0                             |
| Number of control OFDM symbols                                      | 2                               |
| Aggregation level (CCE)   | 8                               |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | 4dB                             |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 4dB                             |
| Bandwidth (PRBs)  | 48                              |
| Sub-carrier spacing (kHz)   | SCS of the active DL BWP        |
| DMRS precoder granularity   | REG bundle size                 |
| REG bundle size   | 6                               |
| CP length   | Normal                          |
| Mapping from REG to CCE   | Distributed                     |

**Table 8.1.3.1-2: PDCCH transmission parameters for in-sync evaluation**

| Attribute   | Value for BLER Configuration #0 |
|---|---------------------------------|
| DCI payload size  | 1-0                             |
| Number of control OFDM symbols                                      | 2                               |
| Aggregation level (CCE)   | 4                               |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | 0dB                             |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0dB                             |
| Bandwidth (PRBs)  | 48                              |
| Sub-carrier spacing (kHz)   | SCS of the active DL BWP        |
| DMRS precoder granularity   | REG bundle size                 |
| REG bundle size   | 6                               |
| CP length   | Normal                          |
| Mapping from REG to CCE   | Distributed                     |

### 8.1.3.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{\text{Evaluate\_out\_CSI-RS}}$  ms period becomes worse than the threshold  $Q_{\text{out\_CSI-RS}}$  within  $T_{\text{Evaluate\_out\_CSI-RS}}$  ms evaluation period.

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

- $T_{\text{Evaluate\_out\_CSI-RS}}$  and  $T_{\text{Evaluate\_in\_CSI-RS}}$  are defined in Table 8.1.3.2-1 for FR1.
- $T_{\text{Evaluate\_out\_CSI-RS}}$  and  $T_{\text{Evaluate\_in\_CSI-RS}}$  are defined in Table 8.1.3.2-2 for FR2 with scaling factor  $N=1$ .

The requirements of  $T_{\text{Evaluate\_out\_CSI-RS}}$  and  $T_{\text{Evaluate\_in\_CSI-RS}}$  apply provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements do not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the CSI-RS; and
- $P=1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR2,

- $P=1$ , when the RLM-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is not overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < \text{MGRP}$ )
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when the RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).
- $P = P_{\text{sharing factor}}$ , when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}} - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{\text{SMTCperiod}} \neq \text{MGRP}$  or
  - $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} < 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} = 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{CSI-RS}}}{MGRP}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < MGRP$ )
- $P_{\text{sharing factor}} = 1$ , if the RLM-RS resource outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,
  - not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.
- $P_{\text{sharing factor}} = 3$ , otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is present,  $T_{\text{SMTCperiod}}$  follows *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  follows *smtc1*.  $T_{\text{SMTCperiod}}$  is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present,  $T_{\text{SMTCperiod}}$  follows *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  follows *smtc1*.

Note: The overlap between CSI-RS for RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.

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

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

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

The values of  $M_{\text{out}}$  and  $M_{\text{in}}$  used in Table 8.1.3.2-1 and Table 8.1.3.2-2 are defined as:

- $M_{\text{out}} = 20$  and  $M_{\text{in}} = 10$ , if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* [6, clause 7.4.1] set to 3 and over the bandwidth  $\geq 24$  PRBs.

**Table 8.1.3.2-1: Evaluation period  $T_{\text{Evaluate\_out\_CSI-RS}}$  and  $T_{\text{Evaluate\_in\_CSI-RS}}$  for FR1**

| Configuration                  | $T_{\text{Evaluate\_out\_CSI-RS}}$ (ms)   | $T_{\text{Evaluate\_in\_CSI-RS}}$ (ms)   |
|--------------------------------|---|--|
| no DRX                         | $\text{Max}(200, \text{Ceil}(M_{\text{out}} \times P) \times T_{\text{CSI-RS}})$  | $\text{Max}(100, \text{Ceil}(M_{\text{in}} \times P) \times T_{\text{CSI-RS}})$  |
| $\text{DRX} \leq 320\text{ms}$ | $\text{Max}(200, \text{Ceil}(1.5 \times M_{\text{out}} \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{CSI-RS}}))$   | $\text{Max}(100, \text{Ceil}(1.5 \times M_{\text{in}} \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{CSI-RS}}))$ |
| $\text{DRX} > 320\text{ms}$    | $\text{Ceil}(M_{\text{out}} \times P) \times T_{\text{DRX}}$  | $\text{Ceil}(M_{\text{in}} \times P) \times T_{\text{DRX}}$  |
| NOTE:                          | $T_{\text{CSI-RS}}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{\text{CSI-RS}}$ equal to 5 ms, 10ms, 20 ms or 40 ms. $T_{\text{DRX}}$ is the DRX cycle length. |  |

**Table 8.1.3.2-2: Evaluation period  $T_{\text{Evaluate\_out\_CSI-RS}}$  and  $T_{\text{Evaluate\_in\_CSI-RS}}$  for FR2**

| Configuration                  | $T_{\text{Evaluate\_out\_CSI-RS}}$ (ms)  | $T_{\text{Evaluate\_in\_CSI-RS}}$ (ms)  |
|--------------------------------|--|---|
| no DRX                         | $\text{Max}(200, \text{Ceil}(M_{\text{out}} \times P \times N) \times T_{\text{CSI-RS}})$  | $\text{Max}(100, \text{Ceil}(M_{\text{in}} \times P \times N) \times T_{\text{CSI-RS}})$  |
| $\text{DRX} \leq 320\text{ms}$ | $\text{Max}(200, \text{Ceil}(1.5 \times M_{\text{out}} \times P \times N) \times \text{Max}(T_{\text{DRX}}, T_{\text{CSI-RS}}))$   | $\text{Max}(100, \text{Ceil}(1.5 \times M_{\text{in}} \times P \times N) \times \text{Max}(T_{\text{DRX}}, T_{\text{CSI-RS}}))$ |
| $\text{DRX} > 320\text{ms}$    | $\text{Ceil}(M_{\text{out}} \times P \times N) \times T_{\text{DRX}}$  | $\text{Ceil}(M_{\text{in}} \times P \times N) \times T_{\text{DRX}}$  |
| NOTE:                          | $T_{\text{CSI-RS}}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{\text{CSI-RS}}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{\text{DRX}}$ is the DRX cycle length. |   |

### 8.1.3.3 Measurement restrictions for CSI-RS based RLM

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

For both FR1 and FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

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

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

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS for RLM measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

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

For FR2, when the CSI-RS for RLM measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, or L1-RSRP measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.
  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

### 8.1.4 Minimum requirement at transitions

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

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

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an

evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

### 8.1.5 Minimum requirement for UE turning off the transmitter

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

### 8.1.6 Minimum requirement for L1 indication

When the downlink radio link quality on all the configured RLM-RS resources is worse than  $Q_{out}$ , layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [2].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than  $Q_{in}$ , layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

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

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

In case DRX is used,  $T_{Indication\_interval}$  is  $\text{Max}(10\text{ms}, 1.5 \times \text{DRX\_cycle\_length}, 1.5 \times T_{RLM-RS,M})$  if DRX cycle\_length is less than or equal to 320ms, and  $T_{Indication\_interval}$  is DRX cycle\_length if DRX cycle\_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

### 8.1.7 Scheduling availability of UE during radio link monitoring

When the reference signal to be measured for RLM has different subcarrier spacing than PDSCH/PDCCH or is on frequency range 2, there are restrictions on the scheduling availability as described in the following clauses.

#### 8.1.7.1 Scheduling availability of UE performing radio link monitoring with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

#### 8.1.7.2 Scheduling availability of UE performing radio link monitoring with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR1 is performed, the scheduling restrictions on FR1 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols. When inter-band carrier aggregation within FR1 is performed, there are no scheduling restrictions on FR1 serving cell(s) in the bands due to radio link monitoring performed on FR1 serving PCell or PSCell in different bands.

### 8.1.7.3 Scheduling availability of UE performing radio link monitoring on FR2

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cell(s) in the bands for the following cases, provided that UE is capable of independent beam management on this FR2 band pair:

when performing radio link monitoring performed on FR2 serving PCell or PSCell in different bands,

- the UE is configured with same or different numerology between SSB on one FR2 band and data on the other FR2 band.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

### 8.1.7.4 Scheduling availability of UE performing radio link monitoring on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR-DC

There are no scheduling restrictions on FR1 serving cell(s) due to radio link monitoring performed on FR2 serving PCell and/or PSCell.

There are no scheduling restrictions on FR2 serving cell(s) due to radio link monitoring performed on FR1 serving PCell and/or PSCell.

## 8.1A Radio Link Monitoring with CCA on Target Frequency

### 8.1A.1 Introduction

The requirements in clause 8.1A apply for radio link monitoring on a carrier frequency with CCA for cells:

- PCell in SA NR operation mode,
- PSCell in EN-DC operation mode.

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [3]. The configured

RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

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

The threshold  $Q_{out,CCA}$  is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ( $BLER_{out,CCA}$ ) as defined in Table 8.1A.1-1. For SSB based radio link monitoring,  $Q_{out,SSB,CCA}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1A.2.1-1.

The threshold  $Q_{in,CCA}$  is defined as the level at which the downlink radio link quality can be received with significantly higher reliability than at  $Q_{out,CCA}$  and shall correspond to the in-sync block error rate ( $BLER_{in}$ ) as defined in Table 8.1A.1-1. For SSB based radio link monitoring,  $Q_{in,SSB,CCA}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1A.2.1-2.

The out-of-sync block error rate ( $BLER_{out,CCA}$ ) and in-sync block error rate ( $BLER_{in,CCA}$ ) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 8.1A.1-1 as default. All requirements in clause 8.1A are applicable for BLER Configuration #0 in Table 8.1A.1-1.

**Table 8.1A.1-1: Out-of-sync and in-sync block error rates**

| Configuration | $BLER_{out,CCA}$ | $BLER_{in,CCA}$ |
|---------------|------------------|-----------------|
| 0             | 10%              | 2%              |

UE shall be able to monitor up to  $N_{RLM}$  RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number  $L_{max}$  of SSBs per half frame according to TS 38.213 [3], where  $N_{RLM}$  is specified in Table 8.1A.1-2, and meet the requirements as specified in clause 8.1A. UE is not required to meet the requirements in clause 8.1A if RLM-RS is not configured and no TCI state for PDCCH is activated.

**Table 8.1A.1-2: Maximum number of RLM-RS resources  $N_{RLM}$**

| $L_{max}$ | Maximum number of RLM-RS resources, $N_{RLM}$ |
|-----------|---|
| 8         | 4   |

The requirements in clause 8.1A apply for any *channelAccessMode* configuration [TS 38.331, 2].

In the requirements of clause 8.1A, the term RLM-RS SSB occasion not available at the UE refers to when the RLM-RS SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the set of configured RLM-RS resources are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation period; otherwise the RLM-RS SSB is considered as available at the UE.

## 8.1A.2 Requirements for SSB Based Radio Link Monitoring

### 8.1A.2.1 Introduction

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually configured to be transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.1A.2.2 but occasionally may not be transmitted due to CCA operation.

**Table 8.1A.2.1-1: PDCCH transmission parameters for out-of-sync evaluation**

| Attribute  | Value for BLER Configuration #0 |
|--|---------------------------------|
| DCI format   | 1-0                             |
| Number of control OFDM symbols                                   | 2                               |
| Aggregation level (CCE)  | 8                               |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 4 dB                            |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 4 dB                            |
| Bandwidth (PRBs)   | 24                              |
| Sub-carrier spacing (kHz)  | SCS of the active DL BWP        |
| DMRS precoder granularity  | REG bundle size                 |
| REG bundle size  | 6                               |
| CP length  | Normal                          |
| Mapping from REG to CCE  | Distributed                     |

**Table 8.1A.2.1-2: PDCCH transmission parameters for in-sync evaluation**

| Attribute  | Value for BLER Configuration #0 |
|--|---------------------------------|
| DCI payload size   | 1-0                             |
| Number of control OFDM symbols                                   | 2                               |
| Aggregation level (CCE)  | 4                               |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 0dB                             |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB                             |
| Bandwidth (PRBs)   | 24                              |
| Sub-carrier spacing (kHz)  | SCS of the active DL BWP        |
| DMRS precoder granularity  | REG bundle size                 |
| REG bundle size  | 6                               |
| CP length  | Normal                          |
| Mapping from REG to CCE  | Distributed                     |

### 8.1A.2.2 Minimum Requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{\text{Evaluate\_out\_SSB,CCA}}$  [ms] period becomes worse than the threshold  $Q_{\text{out\_SSB,CCA}}$  within  $T_{\text{Evaluate\_out\_SSB,CCA}}$  [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{\text{Evaluate\_in\_SSB,CCA}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_SSB,CCA}}$  within  $T_{\text{Evaluate\_in\_SSB,CCA}}$  [ms] evaluation period. During the in-sync evaluation procedure, layer 1 of the UE shall not send any in-sync indication for the cell to the higher layers when  $L_{\text{in}}$  exceeds  $L_{\text{in,max}}$ , where  $L_{\text{in}}$  and  $L_{\text{in,max}}$  are defined in Table 8.1A.2.2-1.

$T_{\text{Evaluate\_out\_SSB,CCA}}$  and  $T_{\text{Evaluate\_in\_SSB,CCA}}$  are defined in Table 8.1A.2.2-1, where

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the SSB RLM-RS resources; and
- $P=1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB RLM-RS resources.

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



**Table 8.1A.2.2-1: Evaluation period  $T_{\text{Evaluate\_out\_SSB,CCA}}$  and  $T_{\text{Evaluate\_in\_SSB,CCA}}$** 

| Configuration        | $T_{\text{Evaluate\_out\_SSB,CCA}}$ (ms)  |   | $T_{\text{Evaluate\_in\_SSB,CCA}}$ (ms)  |
|----------------------|---|---|--|
|                      | RLM-RS SSB Es/lot <sup>Note4</sup> $\geq -7$ dB   | RLM-RS SSB Es/lot <sup>Note4</sup> $< -7$ dB  |  |
| no DRX               | $\text{Max}(200, \text{Ceil}(17 \cdot P) \cdot T_{\text{SSB}})$                                       | $\text{Max}(200, \text{Ceil}(24 \cdot P) \cdot T_{\text{SSB}})$                                       | $\text{Max}(100, \text{Ceil}((5+L_{\text{in}}) \cdot P) \cdot T_{\text{SSB}})$                                       |
| DRX cycle $\leq 320$ | $\text{Max}(200, \text{Ceil}(1.5 \cdot 15 \cdot P) \cdot \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ | $\text{Max}(200, \text{Ceil}(1.5 \cdot 20 \cdot P) \cdot \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ | $\text{Max}(100, \text{Ceil}(1.5 \cdot (5+L_{\text{in}}) \cdot P) \cdot \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ |
| DRX cycle $> 320$    | $\text{Ceil}(13 \cdot P) \cdot T_{\text{DRX}}$  | $\text{Ceil}(16 \cdot P) \cdot T_{\text{DRX}}$  | $\text{Ceil}((5+L_{\text{in}}) \cdot P) \cdot T_{\text{DRX}}$  |

NOTE 1:  $T_{\text{SSB}}$  is the periodicity of the SSB configured for RLM.  $T_{\text{DRX}}$  is the DRX cycle length.

NOTE 2: When DRX is not configured,  $L_{\text{in}}$  is the number of RLM-RS SSB occasions which are not available at the UE during  $T_{\text{Evaluate\_in\_SSB,CCA}}$ , where  $L_{\text{in}} \leq L_{\text{in,max}}$ . When DRX is configured,  $L_{\text{in}}$  is the number of DRX cycles in which at least one RLM-RS SSB occasion is not available at the UE during  $T_{\text{Evaluate\_in\_SSB,CCA}}$ , where  $L_{\text{in}} \leq L_{\text{in,max}}$ . The UE is not required to determine the availability of SSB occasions more frequent than  
Once per  $\text{Max}(10\text{ms}, P \cdot T_{\text{SSB}})$  if no DRX is used,  
Once per  $\text{Max}(10\text{ms}, \text{Ceil}(1.5 \cdot P) \cdot \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$  if DRX cycle  $\leq 320\text{ms}$ ,  
Once per  $P \cdot T_{\text{DRX}}$  if DRX cycle  $> 320\text{ms}$ .

NOTE 3:  $L_{\text{in,max}}=7$  for  $\text{Max}(T_{\text{DRX}}, T_{\text{SSB}}) \leq 40$  assuming  $T_{\text{DRX}}=0$  for non-DRX case,  
 $L_{\text{in,max}}=5$  for  $40 < \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}) \leq 320$ ,  
 $L_{\text{in,max}}=3$  for  $T_{\text{DRX}} > 320$ .

NOTE 4: RLM-RS SSB Es/lot is the averaged Es/lot over the most recent previous out-of-sync evaluation period.

### 8.1A.2.3 Measurement Restrictions for SSB based RLM

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

When the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for RLM.

### 8.1A.3 Minimum requirement at transitions

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

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

### 8.1A.4 Minimum requirement for UE turning off the transmitter

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2]. The UE shall not perform CCA procedure on any of the serving carrier frequencies with CCA after the expiry of T310.

### 8.1A.5 Minimum requirement for L1 indication

When the downlink radio link quality on all the configured RLM-RS resources is worse than  $Q_{out,CCA}$ , layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [2].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than  $Q_{in,CCA}$ , layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from layer 1 shall be separated by at least  $T_{Indication\_interval,CCA}$ .

When DRX is not used  $T_{Indication\_interval,CCA}$  is  $\max(10\text{ms}, T_{RLM-RS,M})$ , where  $T_{RLM-RS,M}$  is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to  $T_{SSB}$  specified in clause 8.1A.2 if the RLM-RS resource is SSB.

In case DRX is used,  $T_{Indication\_interval,CCA}$  is  $\text{Max}(10\text{ms}, 1.5 \times \text{DRX\_cycle\_length}, 1.5 \times T_{RLM-RS,M})$  if  $\text{DRX\_cycle\_length}$  is less than or equal to 320ms, and  $T_{Indication\_interval,CCA}$  is  $\text{DRX\_cycle\_length}$  if  $\text{DRX\_cycle\_length}$  is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

### 8.1A.6 Scheduling availability of UE during radio link monitoring

When the reference signal to be measured for RLM on a carrier frequency with CCA has different subcarrier spacing than PDSCH/PDCCH, there are restrictions on the scheduling availability as described in the following clauses.

#### 8.1A.6.1 Scheduling availability of UE performing radio link monitoring with the same subcarrier spacing as PDSCH/PDCCH

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH.

#### 8.1A.6.2 Scheduling availability of UE performing radio link monitoring with a different subcarrier spacing than PDSCH/PDCCH

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for radio link monitoring.

When intra-band carrier aggregation is performed, the scheduling restrictions on PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols.

## 8.2 Interruption

### 8.2.1 EN-DC Interruption

#### 8.2.1.1 Introduction

This clause contains the requirements related to the interruptions on PSCell, and SCell, when

- E-UTRA PCell transitions between active and non-active during DRX, or
- E-UTRA PCell transitions from non-DRX to DRX, or
- E-UTRA SCell in MCG or SCell in SCG is added or released, or
- E-UTRA SCell in MCG or SCell(s) in SCG is activated or deactivated, or
- measurements on SCC with deactivated SCell in either E-UTRA MCG or NR SCG, or
- a supplementary UL carrier or an UL carrier is configured or de-configured, or
- UL/DL active BWP is switched on PSCell or SCell in SCG, or
- E-UTRA SCell in MCG or SCell(s) in SCG is directly activated and hibernated, or
- E-UTRA SCell in MCG is hibernated, or
- Multiple SCells in SCG are activated or deactivated, or
- SCell dormancy switches, or
- CQI/RRM measurement happens during SCell dormancy, or
- UE-specific CBW is changed on PSCell or SCell in SCG, or
- CGI reading of an NR neighbour cell with autonomous gaps, or
- CGI reading of an E-UTRA neighbour cell with autonomous gaps.
- NR SRS carrier based switching, or
- E-UTRA SRS carrier based switching, or
- UE dynamic Tx switches between two uplink carriers.

The requirements shall apply for E-UTRA-NR DC with an E-UTRA PCell.

This clause contains interruptions where victim cell is PSCell or SCell belonging to SCG. Requirements for interruptions requirements when the victim cell is E-UTRA PCell or E-UTRA SCell belonging to MCG are specified in TS 36.133 [15].

For a UE which does not support per-FR measurement gaps, interruptions to the PSCell or activated SCG SCells may be caused by EUTRA PCell, EUTRA SCells or SCells on any frequency range. For UE which support per-FR gaps, interruptions to the PSCell or activated SCG SCells may be caused by EUTRA PCell, EUTRA SCells or SCells on the same frequency range as the victim cell.

#### 8.2.1.2 Requirements

##### 8.2.1.2.1 Interruptions at transitions between active and non-active during DRX

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active during DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.1.2.1-1.

**Table 8.2.1.2.1-1: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |       |
|-------|---------------------|-------------------------------|-------|
|       |                     | Sync                          | Async |
| 0     | 1                   | 1                             | 2     |
| 1     | 0.5                 | 1                             | 2     |
| 2     | 0.25                | 3                             |       |
| 3     | 0.125               | 5                             |       |

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

#### 8.2.1.2.2 Interruptions at transitions from non-DRX to DRX

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions from non-DRX to DRX when PSCell or SCell is in non-DRX shall not exceed X slot as defined in table 8.2.1.2.1-1.

When PSCell and the activated SCell are in DRX, no interruption due to E-UTRA PCell transitions from non-DRX to DRX is allowed.

#### 8.2.1.2.3 Interruptions at SCell addition/release

The requirements in this clause shall apply for the UE configured with PSCell.

When one E-UTRA SCell in MCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X1 slot, if the active serving cell is not in the same band as the E-UTRA SCell being added or released, or
  - of up to  $\max\{Y1 \text{ slot} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as the E-UTRA SCell being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA SCell being added or released are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in SCG;

Where X1 and Y1 are specified in Table 8.2.1.2.3-1.

When one SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR1 band pair or in a FR1+FR2 band pair.
  - of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair

or

- of up to  $Y1 \text{ slot} + T_{\text{SMTC\_duration}}$  if the active serving cells are in the same band as the SCell being added or released, provided the cell specific reference signals from the active serving cells and the SCell being added or released are available in the same slot, where,  $T_{\text{SMTC\_duration}}$  is
  - the longest SMTC duration among all above active serving cells in SCG and the SCell being added when one SCell is added. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and  $T_{\text{SMTC\_duration}}$  for the SCell being added is [x]ms. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being added,  $T_{\text{SMTC\_duration}}$  for the SCell being added is 0ms;
  - the longest SMTC duration among all above active serving cells in SCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.1.2.3-2.

**Table 8.2.1.2.3-1: Interruption length X1 and Y1 at E-UTRA SCell addition/Release**

| $\mu$ | NR Slot length (ms) | Interruption length X1 (slots) |       | Interruption length Y1 (slots) |       |
|-------|---------------------|--------------------------------|-------|--------------------------------|-------|
|       |                     | Sync                           | Async | Sync                           | Async |
| 0     | 1                   | 1                              | 2     | 1                              | 2     |
| 1     | 0.5                 | 2                              | 3     | 2                              | 3     |
| 2     | 0.25                | 5                              |       | 4                              | 5     |
| 3     | 0.125               | 9                              |       | N/A                            | - N/A |

**Table 8.2.1.2.3-2: Interruption length X1 and Y1 at SCell addition/Release**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots)                 |   | Interruption length Y1 (slots) |
|-------|------------------------------------|--|---|--------------------------------|
|       |                                    |  |   |                                |
| 0     | 1                                  | 1  |   | 1                              |
| 1     | 0.5                                | 2  |   | 2                              |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 4 | 4                              |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 5 |                                |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 8 | 8                              |
|       |                                    | Aggressor cell is on FR1                       | 9 |                                |

#### 8.2.1.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with PSCell and one SCell.

When one E-UTRA SCell in MCG is activated from deactivated or dormant state, or deactivated from activated or dormant state:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X2 slot, if the active serving cell is not in the same band as the E-UTRA SCell being activated or deactivated, or
  - of up to  $\max\{Y2 \text{ slot} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as the E-UTRA SCell being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCell being activated or deactivated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in SCG.

Where X2 and Y2 are specified in Table 8.2.1.2.4-1.

When one SCell in SCG is activated or deactivated:

- an interruption on any serving cell in SCG:
  - of up to X2 slot, if the active serving cell and the SCell being activated or deactivated are in a FR1 band pair or in a FR1+FR2 band pair.
  - of up to X2 slot, if the active serving cells and the SCell being activated or deactivated are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair.

or

- of up to  $Y2 \text{ slot} + T_{\text{SMTC\_duration}}$  if the active serving cells are in the same band as the SCell being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCell being activated or deactivated are available in the same slot, where,  $T_{\text{SMTC\_duration}}$  is
  - the longest SMTC duration among all above active serving cells in SCG and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and  $T_{\text{SMTC}}$

$\mu$  duration for the SCell being activated is [x]ms. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated,  $T_{SMTC\ duration}$  for the SCell being activated is 0ms;

- the longest SMTC duration among all above active serving cells in SCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.1.2.4-2.

**Table 8.2.1.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation**

| $\mu$ | NR Slot length (ms) | Interruption length X2 (slots) |       | Interruption length Y2 (slots) |       |
|-------|---------------------|--------------------------------|-------|--------------------------------|-------|
|       |                     | Sync                           | Async | Sync                           | Async |
| 0     | 1                   | 1                              | 2     | 1                              | 2     |
| 1     | 0.5                 | 1                              | 2     | 1                              | 2     |
| 2     | 0.25                | 3                              |       | 2                              | 3     |
| 3     | 0.125               | 5                              |       | N/A                            | N/A   |

**Table 8.2.1.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X2 (slots)                 |   | Interruption length Y2 (slots) |
|-------|------------------------------------|--|---|--------------------------------|
| 0     | 1                                  | 1  |   | 1                              |
| 1     | 0.5                                | 1  |   | 1                              |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 2 | 2                              |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 3 |                                |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 4 | 4                              |
|       |                                    | Aggressor cell is on FR1                       | 5 |                                |

### 8.2.1.2.5 Interruptions during measurements on SCC

#### 8.2.1.2.5.1 Interruptions during measurements on deactivated NR SCC

Interruption on PSCell and other activated NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

#### 8.2.1.2.5.2 Interruptions during measurements on deactivated E-UTRAN SCC

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells is 640 ms or longer.
- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells if indicated by the network using *IE allowInterruptions* [15].

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or
- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

**Table 8.2.1.2.5.2-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) |       | Interruption length Y3 (slots) |       |
|-------|---------------------|--------------------------------|-------|--------------------------------|-------|
|       |                     | Sync                           | Async | Sync                           | Async |
| 0     | 1                   | 1                              | 2     | 1                              | 2     |
| 1     | 0.5                 | 1                              | 2     | 1                              | 2     |
| 2     | 0.25                | 3                              |       | 2                              | 3     |
| 3     | 0.125               | 5                              |       | N/A                            | N/A   |

#### 8.2.1.2.5.3 Interruptions during CQI measurements on dormant E-UTRAN SCell

When one E-UTRA SCell in MCG is dormant, the UE is allowed due to CQI measurements on the dormant E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK.

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA dormant SCell being measured, or
- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA dormant SCell being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA dormant SCell being measured are available in the same slot.

Where X3 and Y3 are defined in Table 8.2.1.2.5.2-1.

#### 8.2.1.2.5.4 Interruptions during RRM measurements on dormant E-UTRAN SCC

When one E-UTRA SCell in MCG is dormant, the UE is allowed due to RRM measurements on the E-UTRA SCC with the dormant E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK.

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA dormant SCC being measured, or
- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA dormant SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA dormant SCC being measured are available in the same slot.

Where X3 and Y3 are defined in Table 8.2.1.2.5.2-1.

#### 8.2.1.2.6 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or de-configured in NR non-standalone operation as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or de-configured, an interruption of up to X4 slot, is allowed during the RRC reconfiguration procedure [2] on E-UTRA PCell, all activated E-UTRA SCells, PSCell and all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of E-UTRA PCell, all activated E-UTRA SCells, PSCell and all activated SCells within the same FR as the configured or de-configured UL.

**Table 8.2.1.2.6-1: Interruption length X4 at UL carrier RRC reconfiguration**

| $\mu$ | NR Slot length (ms) | Interruption length X4 (slots) |       |
|-------|---------------------|--------------------------------|-------|
|       |                     | Sync                           | Async |
| 0     | 1                   | 1                              | 2     |
| 1     | 0.5                 | 2                              | 3     |
| 2     | 0.25                | 5                              |       |
| 3     | 0.125               | 9                              |       |

### 8.2.1.2.7 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based BWP switch, timer-based BWP switch or UL BWP switch triggered by consistent uplink CCA failures in this clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{\text{BWPswitchDelay}}$  as defined in clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay  $T_{\text{MultipleBWPswitchDelay}} + Y$  as defined in clause 8.6.2A.1 when BWP switch occurs on multiple CCs. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{\text{BWPswitchDelay}}$  as defined in clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay  $T_{\text{MultipleBWPswitchDelay}}$  as defined in clause 8.6.2B.1 when BWP switch occurs on multiple CCs simultaneously or  $T_{\text{MultipleBWPswitchDelayTotal}}$  as defined in clause 8.6.2B.2 when BWP switch occurs on multiple CCs over partially overlapping time period. Interruptions are not allowed during BWP switch involving any other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The interruption is only allowed within the delay  $T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}$  defined in clause 8.6.3 when BWP switch occurs on a single CC. The interruption is only allowed within the delay  $T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}} + D_{\text{RRC}} \cdot (N-1)$  as defined in clause 8.6.3A when BWP switch occurs on multiple CCs.

When UL BWP switch is triggered by consistent uplink CCA failures [7], the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active UL BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the UL BWP switching involves SCS changing. When the UL BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing UL BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the UL BWP switching delay  $T_{\text{BWPswitchDelay}}$  as defined in clause 8.6.2. Interruptions are not allowed during UL BWP switch involving other parameter change.



**Table 8.2.1.2.7-1: interruption length X**

| $\mu$       | NR Slot length (ms) | Interruption length X (slots) |
|-------------|---------------------|-------------------------------|
| 0           | 1                   | 1                             |
| 1           | 0.5                 | 1                             |
| 2           | 0.25                | 3                             |
| 3           | 0.125               | 5                             |
| Note1: void |                     |                               |

**Table 8.2.1.2.7-2: Parameters which cause interruption other than SCS**

| Parameters                  | Comment            |
|-----------------------------|--------------------|
| <i>locationAndBandwidth</i> | From TS 38.331 [2] |
| <i>nrofSRS-Ports</i>        |                    |
| <i>maxMIMO-Layers-r16</i>   |                    |

### 8.2.1.2.8 Interruptions at direct SCell activation and hibernation

#### 8.2.1.2.8.1 Interruptions during direct SCell activation and hibernation of E-UTRA SCell

When one E-UTRA SCell in MCG is directly activated and hibernated:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X1 slots, if the active serving cell is not in the same band as any of the E-UTRA SCells being directly activated or hibernated, or
  - of up to  $\max\{Y1 \text{ slots} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as any of the E-UTRA SCells being directly activated or hibernated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being directly activated or hibernated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in MCG Where X1 and Y1 are specified in Table 8.2.1.2.3-1.

#### 8.2.1.2.8.2 Interruptions during direct SCell activation

When one or multiple SCell(s) in SCG are directly activated at SCell addition:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X1 slot, if the active serving cell is not in the same band as the SCell being directly activated, or
  - of up to  $\max\{Y1 \text{ slot} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as the SCell being directly activated, provided the cell specific reference signals from the active serving cells and the SCell being directly activated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in SCG.

Where X1 and Y1 are specified in Table 8.2.1.2.3-2.

#### 8.2.1.2.9 Interruptions at SCell hibernation

When one E-UTRA SCell in MCG is hibernated:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X2 slots, if the active serving cell is not in the same band as any of the E-UTRA SCells being hibernated, or
  - of up to  $\max\{Y2 \text{ slots} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as any of the E-UTRA SCells being hibernated, provided the cell specific reference signals from the active serving cells and

the E-UTRA SCells being hibernated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.1.2.4-1.

#### 8.2.1.2.10 Interruptions at SCell activation/deactivation with multiple downlink SCells

The requirements in this clause shall apply for the UE configured with PSCell and up to 6 downlink SCell(s).

When multiple SCells in SCG are activated or deactivated by one single MAC CE command:

- an interruption on any serving cell in SCG is specified as in clause 8.2.1.2.4.

#### 8.2.1.2.11 Interruptions due to UE-specific CBW change

When UE receives an RRC reconfiguration that changes *offsetToCarrier* or *carrierBandwidth*, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its CBW. X is defined in Table 8.2.1.2.11-1. The interruption is only allowed within the delay  $T_{\text{RRCprocessingDelay}} + T_{\text{CBWchangeDelayRRC}}$  defined in clause 8.7.

**Table 8.2.1.2.11-1: interruption length X**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|-------|---------------------|-------------------------------|
| 0     | 1                   | 1                             |
| 1     | 0.5                 | 1                             |
| 2     | 0.25                | 3                             |
| 3     | 0.125               | 5                             |

#### 8.2.1.2.12 Interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to an active UL BWP of another activated carrier;
- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by *srs-SwitchFromServCellIndex* and *srs-SwitchFromCarrier* in TS38.331 [2];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in SCG.
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.1.2.12-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.1.2.12-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.1.2.12-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.1.2.12-2.

**Table 8.2.1.2.12-1: Interruption length X1 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X1 (slots)               |    |
|-------|------------------------------------|---|--|----|
|       |                                    |   | Sub carrier spacing for aggressor cell (kHz) |    |
|       |                                    |   | 15   | 30 |
| 0     | 1                                  | $\leq 200$  | 2  | 2  |
|       |                                    | 300, 500  | 2  | 2  |
|       |                                    | 900   | 3  | 3  |
| 1     | 0.5                                | $\leq 200$  | 3  | 2  |
|       |                                    | 300, 500  | 3  | 3  |
|       |                                    | 900   | 4  | 4  |
| 2     | 0.25                               | $\leq 200$  | 4  | 3  |
|       |                                    | 300, 500  | 5  | 4  |
|       |                                    | 900   | 7  | 6  |
| 3     | 0.125                              | $\leq 200$  | 7  | 5  |
|       |                                    | 300, 500  | 9  | 7  |
|       |                                    | 900   | 12   | 10 |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

**Table 8.2.1.2.12-2: Interruption length X2 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note1</sup> | Interruption length X2 (slots)               |     |
|-------|------------------------------------|--|--|-----|
|       |                                    |  | Sub carrier spacing for aggressor cell (kHz) |     |
|       |                                    |  | 60   | 120 |
| 0     | 1                                  | $\leq 200$                                       | 2  | 2   |
| 1     | 0.5                                | $\leq 200$                                       | 2  | 2   |
| 2     | 0.25                               | $\leq 200$                                       | 3  | 3   |
| 3     | 0.125                              | $\leq 200$                                       | 4  | 4   |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 8.2.1.2.12-1 and in Table 8.2.1.2.12-2 based on SRS carrier switching time  $\leq 200\mu\text{s}$  shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 8.2.1.2.12-1 and in Table 8.2.1.2.12-2 shall apply.

### 8.2.1.2.13 Interruptions at E-UTRA SRS carrier based switching

A PUSCH-less carrier of E-UTRA SCell is a TDD carrier without PUCCH/PUSCH configured. When a UE needs to transmit periodic or aperiodic SRS [23] and/or non-contention based PRACH on a PUSCH-less carrier of E-UTRA SCell, the UE can perform carrier based switching to one or more PUSCH-less carrier of E-UTRA SCells from a E-

UTRA carrier with PUSCH or from another PUSCH-less E-UTRA carrier of SCell prior to transmitting SRS and/or PRACH, provided that:

- switching is from a configured E-UTRA carrier to another activated TDD E-UTRA carrier;
- the PUSCH-less carrier of E-UTRA SCells to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission or configured via RRC [15] for periodic SRS transmission;
- the E-UTRA serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by *srs-SwitchFromServCellIndex* [15];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS36.213 [26];
- the SRS switching is not colliding with PDCCH in subframe 0 and 5 as specified in TS36.213 [26];
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 36.331 [2], and is compliant to the requirements for inter-band CA with uplink in one E-UTRA band and without simultaneous Rx/Tx specified in TS 36.101 [25], the SRS or RACH transmission are not simultaneously scheduled with DL subframe #0 or DL subframe #5 on other E-UTRA carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 8.2.1.2.13-1.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 8.2.1.2.13-1

**Table 8.2.1.2.13-1: Interruption length X3 (slot)**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) |
|-------|---------------------|--------------------------------|
| 0     | 1                   | 2                              |
| 1     | 0.5                 | 3                              |
| 2     | 0.25                | 5                              |
| 3     | 0.125               | 9                              |

#### 8.2.1.2.14 DL Interruptions at switching between two uplink carriers

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [26], where E-UTRA UL carrier is capable of one transmit antenna connector and NR UL carrier is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [2]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in NR carrier. The DL interruption lengths of X for NR carrier(s) are defined in Table 8.2.1.2.14-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band EN-DC configurations as specified in clause 5.5B.4 of TS 38.101-3 [20].

**Table 8.2.1.2.14-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$  | NR Slot length (ms) | Uplink Tx switching period<br>Note1 |       |
|--|---------------------|-------------------------------------|-------|
|  |                     | 35us                                | 140us |
| 0  | 1                   | 2                                   | 3     |
| 1  | 0.5                 | 3                                   | 6     |
| 2  | 0.25                | 4                                   | 10    |
| Note 1: Uplink Tx switching period depends on UE capability <i>uplinkTxSwitchingPeriod</i> . |                     |                                     |       |

### 8.2.1.2.15 Interruptions due to SCell dormancy

#### 8.2.1.2.15.1 Interruptions due to SCell dormancy switch

When one SCell in SCG is switched from dormancy to non-dormancy or from non-dormancy to dormancy [7] when UE is in DRX active time,

- the UE is allowed an interruption on active serving cell in SCG as defined in clause 8.2.1.2.7, except that the interruption is allowed regardless of which parameters change between the dormant BWP and the non-dormant BWP
- The starting time of interruption shall be within the dormancy switching delay as defined in clause 8.6.2.

When multiple SCells in SCG are switched from dormancy to non-dormancy or vice versa when the UE is in DRX active time, the interruption requirement described above applies for each BWP switch.

#### 8.2.1.2.15.2 Interruptions due to CQI measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of CQI measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements on dormant SCells shall not exceed 0.5%.

#### 8.2.1.2.15.3 Interruptions due to RRM measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of RRM measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from RRM measurements on dormant SCells shall not exceed 1.0%.

### 8.2.1.2.16 Interruptions when identifying CGI of an NR cell with autonomous gaps

When a UE is identifying CGI of an NR cell with autonomous gaps, the UE is allowed interruptions on PSCell or any activated SCell:

- with up to K1 interruptions with interrupted slots up to interruption length X1 specified in Table 8.2.1.2.16-1 for each interruption during MIB decoding time period  $T_{MIB}$  (ms) specified in clause 9.11.
- with up to L1 interruptions with interrupted slots up to interruption length Y1 specified in Table 8.2.1.2.16-1 for each interruption during SIB1 decoding time period  $T_{SIB1}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 1.
- with up to L2 interruptions with interrupted slots up to interruption length Y2 specified in Table 8.2.1.2.16-1 for each interruption during SIB1 decoding time period  $T_{SIB1}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 2 and 3.

Where:

- K1 = 6 for the target cell carrier frequency on FR1 and K1 = 25 for the target cell carrier frequency on FR2, and

- $L1 = T_{SIB1}/20$ , and
- $L2 = T_{SIB1}/T_{SMTC}$ , where  $T_{SMTC}$  is the periodicity of the SMTC occasion configured for the target cell carrier.

**Table 8.2.1.2.16-1: Interruption length X1, Y1 and Y2 during measurements with autonomous gaps**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | Interruption length Y1 (slots) | Interruption length Y2 (slots) |
|-------|------------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 0     | 1                                  | 6                              | 7                              | 6                              |
| 1     | 0.5                                | 12                             | 13                             | 10                             |
| 2     | 0.25                               | 24                             | 25                             | 19                             |
| 3     | 0.125                              | 48                             | 49                             | 37                             |

### 8.2.1.2.17 Interruptions when identifying CGI of an E-UTRA cell with autonomous gaps

When a UE is identifying CGI of an E-UTRA FDD cell or E-UTRA TDD cell with autonomous gaps, within time period

- $T_{\text{identify\_CGI, intra}}$  specified in clause 8.1.2.2.3, or clause 8.1.2.2.4 in TS 36.133 [15], or
- $T_{\text{identify\_CGI, inter}}$  specified in clause 8.1.2.3.5, or clause 8.1.2.3.6, or clause 8.1.2.3.7, or clause 8.1.2.3.6 in TS 36.133 [15], or
- $T_{\text{identify\_CGI, E-UTRA}}$  specified in clause 9.4.7.1

the UE shall be able to transmit at least the number of ACK/NACKs specified in Table 8.2.1.2.17-1 on PSCell or any activated SCell in the frequency range where autonomous gaps are used, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured.

**Table 8.2.1.2.17-1: Minimum number of ACK/NACKs transmitted by the UE**

| Minimum number of transmitted ACK/NACKs | Configuration of the serving cell in which the transmitted ACK/NACKs are counted |         |
|---|--|---------|
|   | Duplex mode configuration  | SCS     |
| 84                                      | FDD  | 15 kHz  |
| 193                                     | FDD  | 30 kHz  |
| 402                                     | FDD  | 60 kHz  |
| 28                                      | TDD <sup>Note 1</sup>  | 15 kHz  |
| 81                                      | TDD <sup>Note 1</sup>  | 30 kHz  |
| 159                                     | TDD <sup>Note 1</sup>  | 60 kHz  |
| 233                                     | TDD <sup>Note 2</sup>  | 60 kHz  |
| 491                                     | TDD <sup>Note 2</sup>  | 120 kHz |

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  
NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

## 8.2.2 SA: Interruptions with Standalone NR Carrier Aggregation

### 8.2.2.1 Introduction

This clause contains the requirements related to the interruptions on PCell and activated SCell if configured, when

up to 7 SCells are configured, de-configured, activated or deactivated, or  
 a supplementary UL carrier or an UL carrier is configured or de-configured, or  
 measurements on SCC with deactivated SCell in NR SCG, or  
 UL/DL BWP is switched on PCell or SCell, or  
 CGI reading of an NR neighbour cell with autonomous gaps, or  
 CGI reading of an E-UTRA neighbour cell with autonomous gaps.  
 UE-specific CBW is changed on PCell or SCell, or  
 NR SRS carrier based switching, or  
 UE dynamic Tx switches between two uplink carriers.

Note: interruptions at SCell addition/release, activation/deactivation and during measurements on SCC may not be required by all UEs.

The interruptions shall not interrupt RRC signalling or ACK/NACKs related to RRC reconfiguration procedure according to TS38.331 [2] for SCell addition/release or MAC control signalling according to TS37.340 [17] for SCell activation/deactivation command.

This clause additionally contains requirements related to interruptions at inter-frequency SFTD between PCell in FR1 and neighbour cell in FR2.

For a UE which does not support per-FR measurement gap, interruptions to the PCell and activated SCell may be caused by SCells on any frequency range. For a UE which supports per-FR gaps, interruptions to PCell and activated SCell may be caused by SCells on the same frequency range as the victim cell.

In addition to standalone NR carrier aggregation when no CCA is configured, the requirements in clause 8.2.2. and all subclauses of 8.2.2 apply when the UE is configured with

- A PCell not using CCA in downlink and one or more SCells using CCA in downlink or
- A PCell and one or more SCells using CCA in downlink

## 8.2.2.2 Requirements

### 8.2.2.2.1 Interruptions at SCell addition/release

When any number of SCells between one and 7 is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any active serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:
  - of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR1 band pair or in a FR1+FR2 band pair.
  - of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair.

Where X1 is specified in Table 8.2.2.2.1-1.

or

- of up to the duration shown in table 8.2.2.2.1-2, if the active serving cells are in the same band as the SCell being added or released, provided the cell specific reference signals from the active serving cells and the SCell being added or released are available in the same slot.

Table 8.2.2.2.1-1: Interruption length X1 for SCell addition/release for inter-band CA

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots)                 |   |
|-------|------------------------------------|--|---|
| 0     | 1                                  | 1  |   |
| 1     | 0.5                                | 2  |   |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 4 |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 5 |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 8 |
|       |                                    | Aggressor cell is on FR1                       | 9 |

Table 8.2.2.2.1-2: Interruption duration for SCell addition/release for intra-band CA

| $\mu$   | NR Slot length (ms) | Interruption length (slots)   |
|---|---------------------|---|
| 0   | 1                   | $1 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 1   | 0.5                 | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 2   | 0.25                | $4 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 3   | 0.125               | $8 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| <p>NOTE 1: <math>T_{\text{SMTC\_duration}}</math> measured in subframes is</p> <ul style="list-style-type: none"> <li>- the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added. If SSB configuration (<i>absoluteFrequencySSB</i>) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and <math>T_{\text{SMTC\_duration}}</math> for the SCell being added is [x]ms. If no SSB configuration (<i>absoluteFrequencySSB</i>) nor SMTC configuration is provided for the SCell being added, <math>T_{\text{SMTC\_duration}}</math> for the SCell being added is 0ms;</li> <li>- the longest SMTC duration among all active serving cells in the same band when one SCell is released.</li> </ul> <p>NOTE 2: <math>N_{\text{slot}}^{\text{subframe},\mu}</math> is as defined in TS 38.211 [6].</p> |                     |   |

### 8.2.2.2.2 Interruptions at SCell activation/deactivation

When an intra-band SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:
  - of up to X2 slot, if the active serving cell and the SCell being activated or deactivated are in a FR1 band pair or in a FR1+FR2 band pair.
  - of up to X2 slot, if the active serving cell and the SCell being activated or deactivated are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair.

Where X2 is specified in Table 8.2.2.2.2-1.

or

- of up to the duration shown in table 8.2.2.2.2-2, if the active serving cells are in the same band as the SCell being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCell being activated or deactivated are available in the same slot.



**Table 8.2.2.2-1: Interruption length X2 for SCell activation/deactivation for inter-band CA**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X2 (slots)                 |   |
|-------|------------------------------------|--|---|
| 0     | 1                                  |  | 1 |
| 1     | 0.5                                |  | 1 |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 2 |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 3 |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 4 |
|       |                                    | Aggressor cell is on FR1                       | 5 |

**Table 8.2.2.2-2: Interruption duration for SCell activation/deactivation for intra-band CA**

| $\mu$  | NR Slot length (ms) | Interruption length (slots)   |
|--|---------------------|---|
| 0  | 1                   | $1 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 1  | 0.5                 | $1 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 2  | 0.25                | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 3  | 0.125               | $4 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| <p>NOTE 1: <math>T_{\text{SMTC\_duration}}</math> measured in subframes is</p> <ul style="list-style-type: none"> <li>- the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (<i>absoluteFrequencySSB</i>) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and <math>T_{\text{SMTC\_duration}}</math> for the SCell being activated is [x]ms. If no SSB configuration (<i>absoluteFrequencySSB</i>) nor SMTC configuration is provided for the SCell being activated, <math>T_{\text{SMTC\_duration}}</math> for the SCell being activated is 0ms;</li> <li>- the longest SMTC duration among all active serving cells in the same band when one SCell is deactivated.</li> </ul> <p>NOTE 2: <math>N_{\text{slot}}^{\text{subframe},\mu}</math> is as defined in TS 38.211 [6].</p> |                     |   |

### 8.2.2.2.3 Interruptions during measurements on deactivated SCC

Interruptions on PCell or activated SCell(s) due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer.

- If the PCell or activated SCell(s) is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on PCell or activated SCell(s) immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2-1.
- If the PCell or activated SCell(s) is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell or activated SCell(s) no earlier than X slots before  $T_{\text{SMTC\_duration}}$  and no later than X slots after  $T_{\text{SMTC\_duration}}$ , provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and  $T_{\text{SMTC\_duration}}$  are given by Table 8.2.2.2.3-1. The interruption shall not exceed requirements in Table 8.2.2.2.3-1.

**Table 8.2.2.2.3-1: Interruption duration for measurement on deactivated SCell for intra-band CA**

| $\mu$   | NR Slot length (ms) | X (slots) | Interruption length (slots)   |
|---|---------------------|-----------|---|
| 0   | 1                   | 1         | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 1   | 0.5                 | 1         | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 2   | 0.25                | 2         | $4 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 3   | 0.125               | 4         | $8 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| NOTE 1: $T_{\text{SMTC\_duration}}$ measured in subframes is the longest SMTC duration among all above active serving cells and the deactivated SCell to be measured; |                     |           |   |
| NOTE 2: $N_{\text{slot}}^{\text{subframe},\mu}$ is as defined in TS 38.211 [6].   |                     |           |   |

#### 8.2.2.2.4 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or de-configured in NR standalone carrier aggregation as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or de-configured, an interruption of up to the duration shown in table 8.2.2.2.4-1, is allowed during the RRC reconfiguration procedure [2] on PCell and all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of PCell and all the activated SCells within the same FR as the configured or de-configured UL.

**Table 8.2.2.2.4-1: Interruption duration for UL carrier RRC reconfiguration**

| $\mu$ | NR Slot length (ms) | Interruption length (slots) |
|-------|---------------------|-----------------------------|
| 0     | 1                   | 1                           |
| 1     | 0.5                 | 2                           |
| 2     | 0.25                | 4                           |
| 3     | 0.125               | 8                           |

#### 8.2.2.2.5 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based BWP switch, timer-based BWP switch or UL BWP switch triggered by consistent uplink CCA failures in this clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{\text{BWPswitchDelay}}$  as defined in clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay  $T_{\text{MultipleBWPswitchDelay}} + Y$  as defined in clause 8.6.2A.1 when BWP switch occurs on multiple CCs. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{\text{BWPswitchDelay}}$  as defined in clause 8.6.2 when BWP switch occurs on a single

CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay  $T_{\text{MultipleBWPswitchDelay}}$  as defined in clause 8.6.2B.1 when BWP switch occurs on multiple CCs simultaneously or  $T_{\text{MultipleBWPswitchDelayTotal}}$  as defined in clause 8.6.2B.2 when BWP switch occurs on multiple CCs over partially overlapping time period. Interruptions are not allowed during BWP switch involving any other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The interruption is only allowed within the delay  $T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}$  defined in clause 8.6.3 when BWP switch occurs on a single CC. The interruption is only allowed within the delay  $T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}} + D_{\text{RRC}} \cdot (N-1)$  as defined in clause 8.6.3A when BWP switch occurs on multiple CCs.

When UL BWP switch is triggered by consistent uplink CCA failures [7], UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active UL BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the UL BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing UL BWP switching. X is defined in Table 8.2.2.2.5-1. The starting time of interruption is only allowed within the UL BWP switching delay  $T_{\text{BWPswitchDelay}}$  as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

**Table 8.2.2.2.5-1: Interruption length X**

| $\mu$  | NR Slot length (ms) | Interruption length X (slots) |
|--------|---------------------|-------------------------------|
| 0      | 1                   | 1                             |
| 1      | 0.5                 | 1                             |
| 2      | 0.25                | 3                             |
| 3      | 0.125               | 5                             |
| Note1: | void                |                               |

**Table 8.2.2.2.5-2: Parameters which cause interruption other than SCS**

| Parameters                  | Comment            |
|-----------------------------|--------------------|
| <i>locationAndBandwidth</i> | From TS 38.331 [2] |
| <i>nrofSRS-Ports</i>        |                    |
| <i>maxMIMO-Layers-r16</i>   |                    |

### 8.2.2.2.6 Interruptions at inter-frequency SFTD measurement

The requirements in this clause concern interruptions on PCell, as well as on activated SCells in MCG, when the UE is performing SFTD measurements on inter-frequency neighbour cell(s). The following requirements apply when no PSCell is configured.

For a UE with per-FR gap capability:

- for neighbour cell in FR1:
  - the percentage of interrupted slots on uplink and downlink on FR1 serving cells during the SFTD measurement period  $T_{\text{measure\_SFTD1}}$  specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1. No interruption is allowed on FR2 serving cells.
  - the length of each interruption on FR1 serving cells shall not exceed the number of slots specified in Table 8.2.2.2.6-2.
- for neighbour cell in FR2:

- the percentage of interrupted slots on uplink and downlink on FR2 serving cells during the SFTD measurement period  $T_{\text{measure\_SFTD1}}$  specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1. No interruption is allowed on FR1 serving cells.
- the length of each interruption on FR2 serving cells shall not exceed the number of slots specified in Table 8.2.2.2.6-2.

For a UE with per-UE gap capability:

- for neighbour cell in FR1 or FR2:
  - the percentage of interrupted slots on uplink and downlink on FR1 and FR2 serving cells during the SFTD measurement period  $T_{\text{measure\_SFTD1}}$  specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1.
  - the length of each interruption on FR1 and FR2 serving cells shall not exceed the number of slots specified in Table 8.2.2.2.6-2.

**Table 8.2.2.2.6-1: Requirements on maximum percentage of interrupted slots in serving cell in inter-frequency SFTD**

| SFTD configuration  | Serving cell $\mu$ | Neighbour cell SMTC periodicity |      |      |      |      |       |
|---------------------|--------------------|---------------------------------|------|------|------|------|-------|
|                     |                    | 5ms                             | 10ms | 20ms | 40ms | 80ms | 160ms |
| With RSRP report    | 0                  | 8.4%                            | 6.3% | 8.4% | 6.3% | 5.3% | 4.7%  |
|                     | 1                  |                                 |      |      |      |      |       |
|                     | 2                  |                                 |      |      |      |      |       |
|                     | 3                  |                                 |      |      |      |      |       |
| Without RSRP report | 0                  | 11.4%                           | 8.6% | 7.9% | 6.8% | 6.3% | 6.0%  |
|                     | 1                  |                                 |      |      |      |      |       |
|                     | 2                  |                                 |      |      |      |      |       |
|                     | 3                  |                                 |      |      |      |      |       |

**Table 8.2.2.2.6-2: Interruption duration for FR1 serving cell in inter-frequency SFTD with neighbour cell in FR1**

| $\mu$ | NR Slot length (ms) | Interruption length (slots) |
|-------|---------------------|-----------------------------|
| 0     | 1                   | 1                           |
| 1     | 0.5                 | 2                           |
| 2     | 0.25                | 4                           |
| 3     | 0.125               | 8                           |

**Table 8.2.2.2.6-3: Void**

**Table 8.2.2.2.6-4: Void**

#### 8.2.2.2.7 Interruptions at SCell activation/deactivation with multiple downlink SCells

The requirements in this clause shall apply for the UE configured with PCell and up to 7 downlink SCell(s).

When multiple SCell is activated or deactivated by one single MAC CE command:

- an interruption on any active serving cell is specified as in clause 8.2.2.2.2:

#### 8.2.2.2.8 Interruptions due to UE-specific CBW change

The requirements in clause 8.2.1.2.11 apply for this clause.

### 8.2.2.2.9 Interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to another activated carrier;
- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD.
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.2.2.9-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.2.2.9-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.2.2.9-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.2.2.9-2.

Table 8.2.2.2.9-1: Interruption length X1 (slot)

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X1 (slots)               |    |
|-------|------------------------------------|---|--|----|
|       |                                    |   | Sub carrier spacing for aggressor cell (kHz) |    |
|       |                                    |   | 15   | 30 |
| 0     | 1                                  | $\leq 200$  | 2  | 2  |
|       |                                    | 300, 500  | 2  | 2  |
|       |                                    | 900   | 2  | 2  |
| 1     | 0.5                                | $\leq 200$  | 3  | 2  |
|       |                                    | 300, 500  | 3  | 3  |
|       |                                    | 900   | 4  | 4  |
| 2     | 0.25                               | $\leq 200$  | 4  | 3  |
|       |                                    | 300, 500  | 5  | 4  |
|       |                                    | 900   | 7  | 6  |
| 3     | 0.125                              | $\leq 200$  | 7  | 5  |
|       |                                    | 300, 500  | 9  | 7  |
|       |                                    | 900   | 12   | 10 |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

Table 8.2.2.2.9-2: Interruption length X2 (slot)

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X2 (slots)               |     |
|-------|------------------------------------|---|--|-----|
|       |                                    |   | Sub carrier spacing for aggressor cell (kHz) |     |
|       |                                    |   | 60   | 120 |
| 0     | 1                                  | $\leq 200$  | 2  | 2   |
| 1     | 0.5                                | $\leq 200$  | 2  | 2   |
| 2     | 0.25                               | $\leq 200$  | 3  | 3   |
| 3     | 0.125                              | $\leq 200$  | 4  | 4   |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 8.2.2.2.9-1 and in Table 8.2.2.2.9-2 based on SRS carrier switching time  $\leq 200\mu\text{s}$  shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 8.2.2.2.9-1 and in Table 8.2.2.2.9-2 shall apply.

#### 8.2.2.2.10 DL Interruptions at UE switching between two uplink carriers

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [26], where NR uplink carrier 1 is capable of one transmit antenna connector and NR uplink carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [2]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in either NR carrier 1 or carrier 2 as indicated in RRC signalling [2]. The DL interruption lengths of X are defined in Table 8.2.2.2.10-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band UL CA configurations as specified in clause 5.2A.2 of TS 38.101-1 [18].

**Table 8.2.2.2.10-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$  | NR Slot length (ms) | Uplink Tx switching period <sup>Note1</sup> |       |       |
|--|---------------------|---|-------|-------|
|  |                     | 35us  | 140us | 210us |
| 0  | 1                   | 2   | 3     | 4     |
| 1  | 0.5                 | 3   | 6     | 7     |
| 2  | 0.25                | 4   | 10    | 14    |
| Note 1: Uplink Tx switching period depends on UE capability <i>uplinkTxSwitchingPeriod</i> |                     |   |       |       |

#### 8.2.2.2.11 Interruptions at direct SCell activation

When one or multiple SCell(s) are directly activated at SCell addition,

- the UE is allowed an interruption on any active serving cell:
  - of up to the duration shown in Table 8.2.2.2.1-1, if the active serving cell is not in the same band as the SCell being directly activated, or
  - of up to the duration shown in Table 8.2.2.2.1-2, if the active serving cells are in the same band as the SCell being activated provided the cell specific reference signals from the active serving cells and the SCell being activated are available in the same slot.

#### 8.2.2.2.12 Interruptions due to SCell dormancy

##### 8.2.2.2.12.1 Interruptions due to SCell dormancy switch

When one SCell in MCG is switched from dormancy to non-dormancy or from non-dormancy to dormancy [7] when UE is in DRX active time,

- the UE is allowed an interruption on active serving cell in MCG as defined in clause 8.2.2.2.5, except that the interruption is allowed regardless of which parameters change between the dormant BWP and the non-dormant BWP
- The starting time of interruption shall be within the dormancy switching delay as defined in clause 8.6.2.

When multiple SCells in MCG are switched from dormancy to non-dormancy or vice versa when the UE is in DRX active time, the interruption requirement described above applies for each BWP switch.

##### 8.2.2.2.12.2 Interruptions due to CQI measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of CQI measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements on dormant SCells shall not exceed 0.5%.

##### 8.2.2.2.12.3 Interruptions due to RRM measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of RRM measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from RRM measurements on dormant SCells shall not exceed 1.0%.

#### 8.2.2.2.13 Interruptions at transitions between active and non-active during DRX

For the UEs that are capable of *secondaryDRX-Group*[14] in FR1+FR2 CA, when two DRX groups are configured each group of serving cells, no interruption is allowed for UEs supporting either per UE or per FR gaps.

### 8.2.2.2.14 Interruptions when identifying CGI of an NR cell with autonomous gaps

When a UE is identifying CGI of an NR cell with autonomous gaps, the UE is allowed interruptions on PCell or any activated SCell:

- with up to  $K1$  interruptions with interrupted slots up to interruption length  $X1$  specified in Table 8.2.2.2.14-1 for each interruption during MIB decoding time period  $T_{MIB}$  (ms) specified in clause 9.11.
- with up to  $L1$  interruptions with interrupted slots up to interruption length  $Y1$  specified in Table 8.2.2.2.14-1 for each interruption during SIB1 decoding time period  $T_{SIB1}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 1.
- with up to  $L2$  interruptions with interrupted slots up to interruption length  $Y2$  specified in Table 8.2.2.2.14-1 for each interruption during SIB1 decoding time period  $T_{SIB1}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 2 and 3.

Where:

- $K1 = 6$  for the target cell carrier frequency on FR1 and  $K1 = 25$  for the target cell carrier frequency on FR2, and
- $L1 = T_{SIB1}/20$ , and
- $L2 = T_{SIB1}/T_{SMTC}$ , where  $T_{SMTC}$  is the periodicity of the SMTC occasion configured for the target cell carrier .

**Table 8.2.2.2.14-1: Interruption length  $X1$ ,  $Y1$  and  $Y2$  during measurements with autonomous gaps**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length $X1$ (slots) | Interruption length $Y1$ (slots) | Interruption length $Y2$ (slots) |
|-------|------------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 0     | 1                                  | 6                                | 7                                | 6                                |
| 1     | 0.5                                | 12                               | 13                               | 10                               |
| 2     | 0.25                               | 24                               | 25                               | 19                               |
| 3     | 0.125                              | 48                               | 49                               | 37                               |

### 8.2.2.2.15 Interruptions when identifying CGI of an E-UTRA cell with autonomous gaps

When a UE is identifying CGI of an E-UTRA FDD cell or E-UTRA TDD cell with autonomous gaps, within time period  $T_{identify\_CGI, E-UTRA}$  specified in clause 9.4.7.1, the UE shall be able to transmit at least the number of ACK/NACKs specified in Table 8.2.2.2.15-1 on PCell or any activated SCell in the frequency range where autonomous gaps are used, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured.

**Table 8.2.2.2.15-1: Minimum number of ACK/NACKs transmitted by the UE during  $T_{identify\_CGI, E-UTRA}$**

| Minimum number of transmitted ACK/NACKs | SCS                       |     |
|---|---------------------------|-----|
|   | Duplex mode configuration | SCS |
|   | Duplex mode configuration | SCS |



|   |                       |         |
|---|-----------------------|---------|
| 84  | FDD                   | 15 kHz  |
| 193   | FDD                   | 30 kHz  |
| 402   | FDD                   | 60 kHz  |
| 28  | TDD <sup>Note 1</sup> | 15 kHz  |
| 81  | TDD <sup>Note 1</sup> | 30 kHz  |
| 159   | TDD <sup>Note 1</sup> | 60 kHz  |
| 233   | TDD <sup>Note 2</sup> | 60 kHz  |
| 491   | TDD <sup>Note 2</sup> | 120 kHz |
| NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18]. |                       |         |
| NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19]. |                       |         |

## 8.2.3 NE-DC Interruptions

### 8.2.3.1 Introduction

This clause contains the requirements related to the interruptions on PCell and SCell, when

- E-UTRA PSCell transitions between active and non-active during DRX, or
- E-UTRA PSCell transitions from non-DRX to DRX, or
- E-UTRA PSCell/SCell in SCG or SCell in MCG is added or released, or
- E-UTRA PSCell/SCell in SCG or SCell(s) in MCG is activated or deactivated, or
- measurements on SCC with deactivated SCell in either E-UTRA SCG or NR MCG or
- PUSCH/PUCCH carrier configuration and deconfiguration in NR MCG, or
- UL/DL BWP is switched on PCell or SCell in MCG, or
- UE-specific CBW is changed on PCell or SCell in MCG, or
- CGI reading of an NR neighbour cell with autonomous gaps, or
- CGI reading of an E-UTRA neighbour cell with autonomous gaps.
- NR SRS carrier based switching, or
- E-UTRA SRS carrier based switching.

The requirements shall apply for NE-DC with an NR PCell.

This clause contains interruptions where victim cell is PCell or SCell belonging to MCG. Requirements for interruptions requirements when the victim cell is E-UTRA PSCell or E-UTRA SCell belonging to SCG are specified in TS 36.133 [15].

For a UE which does not support per-FR measurement gap, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on any frequency range. For UE which support per-FR gap, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on the same frequency range as the victim cell.

### 8.2.3.2 Requirements

#### 8.2.3.2.1 Interruptions at transitions between active and non-active during DRX

Interruption on PCell and the activated SCell if configured due to E-UTRA PSCell transitions between active and non-active during DRX when PCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PSCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.3.2.1-1.

**Table 8.2.3.2.1-1: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR slot length (ms) | Interruption length X (slots) |       |
|-------|---------------------|-------------------------------|-------|
|       |                     | Sync                          | Async |
| 0     | 1                   | 1                             | 2     |
| 1     | 0.5                 | 1                             | 2     |
| 2     | 0.25                | 3                             |       |
| 3     | 0.125               | 5                             |       |

When both PCell and E-UTRA PSCell are in DRX, no interruption is allowed.

#### 8.2.3.2.2 Interruptions at transitions from non-DRX to DRX

Interruption on PCell and the activated SCell if configured due to E-UTRA PSCell transitions from non-DRX to DRX when PCell or SCell is in non-DRX shall not exceed X slots as defined in table 8.2.3.2.1-1.

#### 8.2.3.2.3 Interruptions at PSCell/SCell addition/release

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell.

When one E-UTRA PSCell/SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X1 slots, if the active serving cell is not in the same band as the E-UTRA PSCell/SCell being added or released, or
  - of up to  $\max\{Y1 \text{ slots} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as the E-UTRA PSCell/SCell being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA PSCell/SCell being added or released are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above activated serving cells in MCG;

Where X1 and Y1 are specified in Table 8.2.3.2.3-1.

When one SCell in MCG is added or released:

- the UE is allowed an interruption on any activated serving cell in MCG:
  - of up to X1 slots, if the active serving cell and the SCell being added or released are in a FR1 band pair or in a FR1+FR2 band pair.
  - of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair.

or

- of up to  $Y1 \text{ slots} + T_{\text{SMTC\_duration}}$  if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where,  $T_{\text{SMTC\_duration}}$  is
  - the longest SMTC duration among all above active serving cells in MCG and the SCell being added when one SCell is added. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and  $T_{\text{SMTC\_duration}}$  for the SCell being added is [x]ms. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being added,  $T_{\text{SMTC\_duration}}$  for the SCell being added is 0ms;
  - the longest SMTC duration among all above active serving cells in MCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.3.2.3-2.

**Table 8.2.3.2.3-1: Interruption length X1 and Y1 at E-UTRA PSCell/SCell addition/release**

| $\mu$ | NR Slot length (ms) | Interruption length X1 (slots) |       | Interruption length Y1 (slots) |       |
|-------|---------------------|--------------------------------|-------|--------------------------------|-------|
|       |                     | Sync                           | Async | Sync                           | Async |
| 0     | 1                   | 1                              | 2     | 1                              | 2     |
| 1     | 0.5                 | 2                              | 3     | 2                              | 3     |
| 2     | 0.25                | 5                              |       | 4                              | 5     |
| 3     | 0.125               | 9                              |       | N/A                            | N/A   |

**Table 8.2.3.2.3-2: Interruption length X1 and Y1 at SCell addition/Release**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots)                 |   | Interruption length Y1 (slots) |
|-------|------------------------------------|--|---|--------------------------------|
|       |                                    |  |   |                                |
| 0     | 1                                  | 1  |   | 1                              |
| 1     | 0.5                                | 2  |   | 2                              |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 4 | 4                              |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 5 |                                |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 8 | 8                              |
|       |                                    | Aggressor cell is on FR1                       | 9 |                                |

#### 8.2.3.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell and one SCell.

When one E-UTRA SCell in SCG is activated from deactivated or dormant state, or deactivated from activated or dormant state:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X2 slots, if the active serving cell is not in the same band as the E-UTRA SCell being activated or deactivated, or
  - of up to  $\max\{Y2 \text{ slots} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as the E-UTRA SCell being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCell being activated or deactivated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.3.2.4-1.

Where X2 and Y2 are specified in Table 8.2.3.2.4-1.

When one SCell in MCG is activated or deactivated:

- the UE is allowed an interruption on any serving cell in MCG:
  - of up to X2 slots, if the active serving cell is not in the same band as the SCell being activated or deactivated, or
  - of up to  $Y2 \text{ slots} + T_{\text{SMTC\_duration}}$  if the active serving cells are in the same band as the SCell being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCell being activated or deactivated are available in the same slot, where,  $T_{\text{SMTC\_duration}}$  is
    - the longest SMTC duration among all above active serving cells in MCG and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and  $T_{\text{SMTC\_duration}}$  for the SCell being activated is [x]ms. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated,  $T_{\text{SMTC\_duration}}$  for the SCell being activated is 0ms;

- the longest SMTC duration among all above active serving cells in MCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.3.2.4-2.

**Table 8.2.3.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation**

| $\mu$ | NR Slot length (ms) | Interruption length X2 (slots) |       | Interruption length Y2 (slots) |       |
|-------|---------------------|--------------------------------|-------|--------------------------------|-------|
|       |                     | Sync                           | Async | Sync                           | Async |
| 0     | 1                   | 1                              | 2     | 1                              | 2     |
| 1     | 0.5                 | 1                              | 2     | 1                              | 2     |
| 2     | 0.25                | 3                              |       | 2                              | 3     |
| 3     | 0.125               | 5                              |       | N/A                            | N/A   |

**Table 8.2.3.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X2 (slots)                 |   | Interruption length Y2 (slots) |
|-------|------------------------------------|--|---|--------------------------------|
|       |                                    |  |   |                                |
| 0     | 1                                  | 1  |   | 1                              |
| 1     | 0.5                                | 1  |   | 1                              |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 2 | 2                              |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 3 |                                |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 4 | 4                              |
|       |                                    | Aggressor cell is on FR1                       | 5 |                                |

### 8.2.3.2.5 Interruptions during measurements on SCC

#### 8.2.3.2.5.1 Interruptions during measurements on deactivated NR SCC

Interruption on PCell and other activated SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3.

#### 8.2.3.2.5.2 Interruptions during measurements on deactivated E-UTRAN SCC

When one E-UTRA SCell in SCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells is 640 ms or longer.
- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [15].

Each interruption shall not exceed

- X3 slots, if the PCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or
- Y3 slots + SMTC duration, if the PCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Where X3 and Y3 are specified in Table 8.2.3.2.5-1

**Table 8.2.3.2.5-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) |       | Interruption length Y3 (slot) |       |
|-------|---------------------|--------------------------------|-------|-------------------------------|-------|
|       |                     | Sync                           | Async | Sync                          | Async |
| 0     | 1                   | 1                              | 2     | 1                             | 2     |
| 1     | 0.5                 | 1                              | 2     | 1                             | 2     |
| 2     | 0.25                | 3                              |       | 2                             | 3     |
| 3     | 0.125               | 5                              |       | N/A                           | N/A   |

#### 8.2.3.2.5.3 Interruptions during CQI measurements on dormant E-UTRAN SCC

When one E-UTRA SCell in SCG is dormant, the UE is allowed due to CQI measurements on the dormant E-UTRA SCell:

- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK.

Each interruption shall not exceed

- X3 slots, if the PCell or activated SCell is not in the same band as the E-UTRA dormant SCell being measured, or
- Y3 slots + SMTC duration, if the PCell or activated SCell is in the same band as the E-UTRA dormant SCell being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA dormant SCell being measured are available in the same slot.

Where X3 and Y3 are defined in Table 8.2.3.2.5.2-1.

#### 8.2.3.2.5.4 Interruptions during RRM measurements on dormant E-UTRAN SCC

When one E-UTRA SCell in SCG is dormant, the UE is allowed due to RRM measurements on the E-UTRA SCC with the dormant E-UTRA SCell:

- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK.

Each interruption shall not exceed

- X3 slots, if the PCell or activated SCell is not in the same band as the E-UTRA dormant SCC being measured, or
- Y3 slots + SMTC duration, if the PCell or activated SCell is in the same band as the E-UTRA dormant SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA dormant SCC being measured are available in the same slot.

Where X3 and Y3 are defined in Table 8.2.3.2.5.2-1.

#### 8.2.3.2.6 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or de-configured in NE-DC.

When an UL carrier or supplementary UL carrier is configured or deconfigured, an interruption of up to X4 slot as specified in Table 8.2.3.2.6-1, is allowed during the RRC reconfiguration procedure in TS 38.331 [2] on PCell, all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of PCell, all activated E-UTRA SCells, E-UTRA PSCell and all activated SCells within the same FR as the configured or de-configured UL.

**Table 8.2.3.2.6-1: Interruption length X4 at UL carrier RRC reconfiguration**

| $\mu$ | NR Slot length (ms) | Interruption length X4 (slots) |       |
|-------|---------------------|--------------------------------|-------|
|       |                     | Sync                           | Async |
| 0     | 1                   | 1                              | 2     |
| 1     | 0.5                 | 2                              | 3     |
| 2     | 0.25                | 5                              |       |
| 3     | 0.125               | 9                              |       |

### 8.2.3.2.7 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based BWP switch, timer-based BWP switch or UL BWP switch triggered by consistent uplink CCA failures in this clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

When UE receives a DCI indicating the UE to switch its active BWP, or when a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, or when the UE receives an RRC command indicating the UE to switch its active BWP or when UL BWP switch is triggered by consistent uplink CCA failures, the UE is allowed an interruption on PCell and any activated SCells as defined in clause 8.2.2.2.5.

### 8.2.3.2.8 Interruptions at direct SCell activation and hibernation

#### 8.2.3.2.8.1 Interruptions during direct SCell activation and hibernation of E-UTRA SCell

When one E-UTRA SCell in SCG is directly activated and hibernated:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being directly activated or hibernated, or
  - of up to  $\max\{Y1 \text{ slot} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as any of the E-UTRA SCells being directly activated or hibernated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being directly activated or hibernated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in MCG.

Where X1 and Y1 are specified in Table 8.2.3.2.3-1.

#### 8.2.3.2.8.2 Interruptions during direct SCell activation

When one or multiple SCell(s) in MCG are directly activated at SCell addition:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X1 slot, if the active serving cell is not in the same band as the SCell being directly activated, or
  - of up to  $\max\{Y1 \text{ slot} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as the SCell being directly activated, provided the cell specific reference signals from the active serving cells and the SCell being directly activated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in MCG.

Where X1 and Y1 are specified in Table 8.2.3.2.3-2.

#### 8.2.3.2.9 Interruptions at SCell hibernation

When one E-UTRA SCell in SCG is hibernated:

- the UE is allowed an interruption on any active serving cell in MCG:

- of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being hibernated, or
- of up to  $\max\{Y2 \text{ slot} + T_{\text{SMTC\_duration}}, 5\text{ms}\}$  if the active serving cells are in the same band as any of the E-UTRA SCells being hibernated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being hibernated are available in the same slot, where  $T_{\text{SMTC\_duration}}$  is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.3.2.4-1.

### 8.2.3.2.10 Interruptions at SCell activation/deactivation with multiple downlink SCells

The requirements in this clause shall apply for the UE configured with E-UTRA PCell and up to 6 downlink SCell(s).

When multiple SCells in MCG are activated or deactivated by one single MAC CE command:

- an interruption on any serving cell in MCG is specified as in clause 8.2.3.2.4.

### 8.2.3.2.11 Interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to another activated carrier;
- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in MCG.- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in MCG if UE is not capable of Per-FR gap, or on active serving cell(s) in MCG in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.3.2.11-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in MCG if UE is not capable of Per-FR gap, or on active serving cell(s) in MCG in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.3.2.11-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in MCG if UE is not capable of Per-FR gap, or on active serving cell(s) in MCG in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.3.2.11-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in MCG if UE is not capable of Per-FR gap, or on active serving cell(s) in MCG in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.3.2.11-2.

**Table 8.2.3.2.11-1: Interruption length X1 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X1 (slots)               |    |
|-------|------------------------------------|---|--|----|
|       |                                    |   | Sub carrier spacing for aggressor cell (kHz) |    |
|       |                                    |   | 15   | 30 |
| 0     | 1                                  | $\leq 200$  | 2  | 2  |
|       |                                    | 300, 500  | 2  | 2  |
|       |                                    | 900   | 3  | 3  |
| 1     | 0.5                                | $\leq 200$  | 3  | 2  |
|       |                                    | 300, 500  | 3  | 3  |
|       |                                    | 900   | 4  | 4  |
| 2     | 0.25                               | $\leq 200$  | 4  | 3  |
|       |                                    | 300, 500  | 5  | 4  |
|       |                                    | 900   | 7  | 6  |
| 3     | 0.125                              | $\leq 200$  | 7  | 5  |
|       |                                    | 300, 500  | 9  | 7  |
|       |                                    | 900   | 12   | 10 |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

**Table 8.2.3.2.11-2: Interruption length X2 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X2 (slots)               |     |
|-------|------------------------------------|---|--|-----|
|       |                                    |   | Sub carrier spacing for aggressor cell (kHz) |     |
|       |                                    |   | 60   | 120 |
| 0     | 1                                  | $\leq 200$  | 2  | 2   |
| 1     | 0.5                                | $\leq 200$  | 2  | 2   |
| 2     | 0.25                               | $\leq 200$  | 3  | 3   |
| 3     | 0.125                              | $\leq 200$  | 4  | 4   |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 8.2.3.2.11-1 and in Table 8.2.3.2.11-2 based on SRS carrier switching time  $\leq 200\mu\text{s}$  shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 8.2.3.2.11-1 and in Table 8.2.3.2.11-2 shall apply.

### 8.2.3.2.12 Interruptions at E-UTRA SRS carrier based switching

A PUSCH-less carrier of E-UTRA SCell is a TDD carrier without PUCCH/PUSCH configured. When a UE needs to transmit periodic or aperiodic SRS [23] and/or non-contention based PRACH on a PUSCH-less E-UTRA carrier of SCell, the UE can perform carrier based switching to one or more PUSCH-less carrier of E-UTRA SCells from a E-UTRA carrier with PUSCH or from another PUSCH-less E-UTRA carrier of SCell prior to transmitting SRS and/or PRACH, provided that:

- switching is from a configured E-UTRA carrier to another activated TDD carrier;
- the PUSCH-less carrier of E-UTRA SCells to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission or configured via RRC [15] for periodic SRS transmission;
- the E-UTRA serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by *srs-SwitchFromServCellIndex* [15];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS36.213 [TBD];



- the SRS switching is not colliding with PDCCH in subframe 0 and 5 as specified in TS36.213 [TBD];
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 36.331 [2], and is compliant to the requirements for inter-band CA with uplink in one E-UTRA band and without simultaneous Rx/Tx specified in TS 36.101 [25], the SRS or RACH transmission are not simultaneously scheduled with DL subframe #0 or DL subframe #5 on other E-UTRA carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in MCG if UE is not capable of Per-FR gap, or on active serving cell(s) in MCG in FR1 if UE is capable of Per-FR gap, during the switching to the PUSCH-less carrier of a serving cell,

- with up to X2 slot as specified in Table 8.2.3.2.12-1.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in MCG if UE is not capable of Per-FR gap, or on active serving cell(s) in MCG in FR1 if UE is capable of Per-FR gap, during the switching from the PUSCH-less carrier of a serving cell,

- with up to X2 slot as specified in Table 8.2.3.2.12-1

**Table 8.2.3.2.12-1: Interruption length X2 (slot)**

| $\mu$ | NR Slot length (ms) | Interruption length X2 (slots) |
|-------|---------------------|--------------------------------|
| 0     | 1                   | 2                              |
| 1     | 0.5                 | 3                              |
| 2     | 0.25                | 5                              |
| 3     | 0.125               | 9                              |

### 8.2.3.2.13 Interruptions due to SCell dormancy

#### 8.2.3.2.13.1 Interruptions due to SCell dormancy switch

When one SCell in MCG is switched from dormancy to non-dormancy or from non-dormancy to dormancy [7] when UE is in DRX active time,

- the UE is allowed an interruption on active serving cell in MCG as defined in clause 8.2.3.2.7, except that the interruption is allowed regardless of which parameters change between the dormant BWP and the non-dormant BWP
- The starting time of interruption shall be within the dormancy switching delay as defined in clause 8.6.2.

When multiple SCells in MCG are switched from dormancy to non-dormancy or vice versa when the UE is in DRX active time, the interruption requirement described above applies for each BWP switch.

#### 8.2.3.2.13.2 Interruptions due to CQI measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of CQI measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements on dormant SCells shall not exceed 0.5%.

#### 8.2.3.2.13.3 Interruptions due to RRM measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of RRM measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from RRM measurements on dormant SCells shall not exceed 1.0%.

### 8.2.3.2.14 Interruptions when identifying CGI of an NR cell with autonomous gaps

When a UE is identifying CGI of an NR cell with autonomous gaps, the UE is allowed interruptions on PCell or any activated SCell:

- with up to  $K1$  interruptions with interrupted slots up to interruption length  $X1$  specified in Table 8.2.3.2.14-1 for each interruption during MIB decoding time period  $T_{MIB}$  (ms) specified in clause 9.11.
- with up to  $L1$  interruptions with interrupted slots up to interruption length  $Y1$  specified in Table 8.2.3.2.14-1 for each interruption during SIB1 decoding time period  $T_{SIB1}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 1.
- with up to  $L2$  interruptions with interrupted slots up to interruption length  $Y2$  specified in Table 8.2.3.2.14-1 for each interruption during SIB1 decoding time period  $T_{SIB1}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 2 and 3.

Where:

- $K1 = 6$  for the target cell carrier frequency on FR1 and  $K1 = 25$  for the target cell carrier frequency on FR2, and
- $L1 = T_{SIB1}/20$ , and
- $L2 = T_{SIB1}/T_{SMTC}$ , where  $T_{SMTC}$  is the periodicity of the SMTC occasion configured for the target cell carrier .

**Table 8.2.3.2.14-1: Interruption length  $X1$ ,  $Y1$  and  $Y2$  during measurements with autonomous gaps**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length $X1$ (slots) | Interruption length $Y1$ (slots) | Interruption length $Y2$ (slots) |
|-------|------------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 0     | 1                                  | 6                                | 7                                | 6                                |
| 1     | 0.5                                | 12                               | 13                               | 10                               |
| 2     | 0.25                               | 24                               | 25                               | 19                               |
| 3     | 0.125                              | 48                               | 49                               | 37                               |

### 8.2.3.2.15 Interruptions when identifying CGI of an E-UTRA cell with autonomous gaps

When a UE is identifying CGI of an E-UTRA FDD cell or E-UTRA TDD cell with autonomous gaps, within time period

- $T_{\text{identify\_CGI, intra}}$  specified in clause 8.1.2.2.3, or clause 8.1.2.2.4 in TS 36.133 [15], or
- $T_{\text{identify\_CGI, inter}}$  specified in clause 8.1.2.3.5, or clause 8.1.2.3.6, or clause 8.1.2.3.7, or clause 8.1.2.3.6 in TS 36.133 [15], or
- $T_{\text{identify\_CGI, E-UTRA}}$  specified in clause 9.4.7.1

the UE shall be able to transmit at least the number of ACK/NACKs specified in Table 8.2.3.2.15-1 on PCell or any activated SCell in the frequency range where autonomous gaps are used, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured.

**Table 8.2.3.2.15-1: Minimum number of ACK/NACKs transmitted by the UE**

| Minimum number of transmitted ACK/NACKs | Configuration of the serving cell in which the transmitted ACK/NACKs are counted |         |
|---|--|---------|
|   | Duplex mode configuration  | SCS     |
| 84                                      | FDD  | 15 kHz  |
| 193                                     | FDD  | 30 kHz  |
| 402                                     | FDD  | 60 kHz  |
| 28                                      | TDD <sup>Note 1</sup>  | 15 kHz  |
| 81                                      | TDD <sup>Note 1</sup>  | 30 kHz  |
| 159                                     | TDD <sup>Note 1</sup>  | 60 kHz  |
| 233                                     | TDD <sup>Note 2</sup>  | 60 kHz  |
| 491                                     | TDD <sup>Note 2</sup>  | 120 kHz |

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  
NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

### 8.2.3.2.16 Interruptions due to UE-specific CBW change

The requirements in clause 8.2.1.2.11 apply for this clause.

## 8.2.4 NR-DC: Interruptions

### 8.2.4.1 Introduction

This clause contains the requirements related to the interruptions on PCell, PSCell and activated SCell if configured, when

- up to 1 SCell in FR1 and up to 7 SCell(s) in FR2 are configured, deconfigured, activated or deactivated or,
- a supplementary UL carrier or an UL carrier is configured or de-configured, or
- measurements on SCC with deactivated SCell in NR SCG, or
- UL/DL BWP is switched on PCell, PSCell or SCell,
- UE-specific CBW is changed on PCell, PSCell or SCell, or
- transitions between active and non-active during DRX, or
- transitions from non-DRX to DRX, or
- CGI reading of an NR neighbour cell with autonomous gaps, or
- CGI reading of an E-UTRA neighbour cell with autonomous gaps.
- NR SRS carrier based switching.

Note: interruptions at SCell addition/release, activation/deactivation and during measurements on SCC may not be required by all UEs.

The interruptions shall not interrupt RRC signalling or ACK/NACKs related to RRC reconfiguration procedure [2] for SCell addition/release or MAC control signalling [17] for SCell activation/deactivation command.

The requirements shall apply for NR-DC with an NR PCell, PSCell or SCell.

For a UE which does not support per-FR measurement gap, interruptions to the PCell and activated SCell may be caused by SCells on any frequency range. For a UE which supports per-FR gaps, interruptions to PCell, PSCell and activated SCell may be caused by SCells on the same frequency range as the victim cell.

## 8.2.4.2 Requirements

### 8.2.4.2.1 Interruptions at PSCell/SCell addition/release

When PSCell or one or more SCells is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any activated serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.4.2.1-1, if the active serving cell is not in the same band as the PSCell or SCell being added or released, where the requirements for Sync apply for synchronous NR-DC, and for asynchronous NR-DC if the active serving cell is in the same CG as the PSCell or SCell being added or released, and the requirements for Async apply for asynchronous NR-DC if the active serving cell is not in the same CG as the PSCell or SCell being added or released, or
  - of up to the duration shown in table 8.2.4.2.1-2, if the active serving cells are in the same band as the SCell being added or released, provided the cell specific reference signals from the active serving cells and the SCell being added or released are available in the same slot.

**Table 8.2.4.2.1-1: Interruption duration for PSCell/SCell addition/release for inter-band DC/CA**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length (slots)                    |   |       |
|-------|------------------------------------|--|---|-------|
|       |                                    | Sync   |   | Async |
| 0     | 1                                  | 1  |   | 2     |
| 1     | 0.5                                | 2  |   | 3     |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 4 | 5     |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 5 |       |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 8 | 9     |
|       |                                    | Aggressor cell is on FR1                       | 9 |       |

**Table 8.2.4.2.1-2: Interruption duration for SCell addition/release for intra-band DC/CA**

| $\mu$  | NR Slot length (ms) | Interruption length (slots)                        |
|--|---------------------|--|
| 0  | 1                   | $1 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$ |
| 1  | 0.5                 | $2 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$ |
| 2  | 0.25                | $4 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$ |
| 3  | 0.125               | $8 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$ |
| <p>NOTE 1: <math>T_{SMTC\_duration}</math> measured in subframes is</p> <ul style="list-style-type: none"> <li>- the longest SMTC duration among all above activeserving cells and the SCell being added when one SCell is added. If SSB configuration (<i>absoluteFrequencySSB</i>) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and <math>T_{SMTC\_duration}</math> for the SCell being added is [x]ms. If no SSB configuration (<i>absoluteFrequencySSB</i>) nor SMTC configuration is provided for the SCell being added, <math>T_{SMTC\_duration}</math> for the SCell being added is 0ms;</li> <li>- the longest SMTC duration among all active serving cells in the same band when one SCell is released.</li> </ul> <p>NOTE 2: <math>N_{slot}^{subframe,\mu}</math> is as defined in TS 38.211 [6]</p> |                     |  |

**8.2.4.2.2 Interruptions at SCell activation/deactivation**

When a SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:
- of up to the duration shown in table 8.2.4.2.2-1, if the active serving cell is not in the same band as the SCell being activated or deactivated, where the requirements for Sync apply for synchronous NR-DC, and for asynchronous NR-DC if the active serving cell is in the same CG as the SCell being activated, and the requirements for Async apply for asynchronous NR-DC if the active serving cell is not in the same CG as the SCell being activated, or
- of up to the duration shown in table 8.2.4.2.2-2, if the active serving cells are in the same band as the SCell being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCell being activated or deactivated are available in the same slot.

**Table 8.2.4.2.2-1: Interruption duration for SCell activation/deactivation for inter-band DC/CA**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length (slots)                    |       |   |
|-------|------------------------------------|--|-------|---|
|       |                                    | Sync   | Async |   |
| 0     | 1                                  | 1  | 2     |   |
| 1     | 0.5                                | 1  | 2     |   |
| 2     | 0.25                               | Both aggressor cell and victim cell are on FR2 | 2     | 3 |
|       |                                    | Either aggressor cell or victim cell is on FR1 | 3     |   |
| 3     | 0.125                              | Aggressor cell is on FR2                       | 4     | 5 |
|       |                                    | Aggressor cell is on FR1                       | 5     |   |

**Table 8.2.4.2.2-2: Interruption duration for SCell activation/deactivation for intra-band DC/CA**

| $\mu$   | NR Slot length (ms) | Interruption length (slots)   |
|---|---------------------|---|
| 0   | 1                   | $1 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 1   | 0.5                 | $1 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 2   | 0.25                | $2 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| 3   | 0.125               | $4 + T_{\text{SMTC\_duration}} * N_{\text{slot}}^{\text{subframe},\mu}$ |
| <p>NOTE 1: <math>T_{\text{SMTC\_duration}}</math> measured in subframes is</p> <ul style="list-style-type: none"> <li>- the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (<i>absoluteFrequencySSB</i>) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and <math>T_{\text{SMTC\_duration}}</math> for the SCell being activated is <math>\lceil x \rceil</math>ms. If no SSB configuration (<i>absoluteFrequencySSB</i>) nor SMTC configuration is provided for the SCell being activated, <math>T_{\text{SMTC\_duration}}</math> for the SCell being activated is 0ms;</li> <li>- the longest SMTC duration among all active serving cells in the same band when one SCell is deactivated.</li> </ul> <p>NOTE 2: <math>N_{\text{slot}}^{\text{subframe},\mu}</math> is as defined in TS 38.211 [6].</p> |                     |   |

#### 8.2.4.2.3 Interruptions during measurements on SCC

Interruption on PCell, PSCell and other activated SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with SpCell.

#### 8.2.4.2.4 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or de-configured in NR-DC as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or de-configured, an interruption of up to the duration shown in table 8.2.4.2.4-1, is allowed during the RRC reconfiguration procedure in TS38.331 [2] on all the other activated serving cells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of all the other serving cells within the same FR as the configured or de-configured UL.

**Table 8.2.4.2.4-1: Interruption duration for UL carrier RRC reconfiguration**

| $\mu$ | NR Slot length (ms) | Interruption length (slots) |
|-------|---------------------|-----------------------------|
| 0     | 1                   | 1                           |
| 1     | 0.5                 | 2                           |
| 2     | 0.25                | 4                           |
| 3     | 0.125               | 8                           |

#### 8.2.4.2.5 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based BWP switch, timer-based BWP switch or UL BWP switch triggered by consistent uplink CCA failures in this clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

When UE receives a DCI indicating the UE to switch its active BWP, or when a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, or when the UE receives an RRC command indicating the UE to switch its active BWP or when UL BWP switch is triggered by consistent uplink CCA failures, the UE is allowed to cause an interruption on any other serving cells as defined in clause 8.2.2.2.5. In addition to what is defined in 8.2.2.5, when

RRC-based BWP switch occurs on multiple CCs over partially overlapping period, the interruption is only allowed within the delay  $T_{\text{RRCprocessingDelay}} + T_{\text{Waiting}} + T_{\text{BWPswitchDelayRRC}} + D_{\text{RRC}} \cdot (M-1)$  as defined in clause 8.6.3A.3.

Besides, in asynchronous scenario the UE is allowed an additional interrupt of 1 slot length.

#### 8.2.4.2.6 Interruptions at transitions between active and non-active during DRX

When PCell is in non-DRX and PSCell is in DRX, interruptions on PCell and the activated SCell in MCG if configured due to transitions from active to non-active and from non-active to active during PSCell DRX are allowed with up to 1% probability of missed ACK/NACK when the configured PSCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured PSCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.4.2.6-1.

When PSCell is in non-DRX and PCell is in DRX, interruptions on PSCell on the activated SCell in SCG if configured due to transitions from active to non-active and from non-active to active during PCell DRX are allowed with up to 1% probability of missed ACK/NACK when the configured PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.4.2.6-1.

**Table 8.2.4.2.6-1: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |       |
|-------|---------------------|-------------------------------|-------|
|       |                     | Sync                          | Async |
| 0     | 1                   | 1                             | 2     |
| 1     | 0.5                 | 1                             | 2     |
| 2     | 0.25                | 3                             |       |
| 3     | 0.125               | 5                             |       |

When both PCell and PSCell are in DRX, no interruption is allowed.

#### 8.2.4.2.7 Interruptions at transitions from non-DRX to DRX

Interruption on PCell and the activated SCell in MCG if configured due to PSCell transitions from non-DRX to DRX when PCell is in non-DRX shall not exceed X slots as defined in table 8.2.4.2.6-1.

Interruption on PSCell and the activated SCell in SCG if configured due to PCell transitions from non-DRX to DRX when PSCell is in non-DRX shall not exceed X slots as defined in table 8.2.4.2.6-1.

#### 8.2.4.2.8 Interruptions at SCell activation/deactivation with multiple downlink SCells

The requirements in this clause shall apply for the UE configured with NR-DC and up to 1 downlink SCell in FR1 and up to 7 downlink SCell(s) in FR2.

When multiple SCell are activated or deactivated by one single MAC CE command in MCG or SCG:

- an interruption on any serving cell in MCG or SCG is specified as in clause 8.2.4.2.2.

When multiple SCell are activated or deactivated in both MCG and SCG by two MAC CE commands respectively:

- an interruption on any serving cell in MCG is specified as in clause 8.2.4.2.2, and
- an interruption on any serving cell in SCG is specified as in clause 8.2.4.2.2.

#### 8.2.4.2.9 Interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to another activated carrier;

- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in the same CG.- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.4.2.9-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.4.2.9-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 8.2.4.2.9-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 8.2.4.2.9-2.

**Table 8.2.4.2.9-1: Interruption length X1 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X1 (slots)               |    |
|-------|------------------------------------|---|--|----|
|       |                                    |   | Sub carrier spacing for aggressor cell (kHz) |    |
|       |                                    |   | 15   | 30 |
| 0     | 1                                  | $\leq 200$  | 2  | 2  |
|       |                                    | 300, 500  | 2  | 2  |
|       |                                    | 900   | 3  | 3  |
| 1     | 0.5                                | $\leq 200$  | 3  | 2  |
|       |                                    | 300, 500  | 3  | 3  |
|       |                                    | 900   | 4  | 4  |
| 2     | 0.25                               | $\leq 200$  | 4  | 3  |
|       |                                    | 300, 500  | 5  | 4  |
|       |                                    | 900   | 7  | 6  |
| 3     | 0.125                              | $\leq 200$  | 7  | 5  |
|       |                                    | 300, 500  | 9  | 7  |
|       |                                    | 900   | 12   | 10 |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.



**Table 8.2.4.2.9-2: Interruption length X2 (slot)**

| $\mu$  | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X2 (slots)               |     |
|--|------------------------------------|---|--|-----|
|  |                                    |   | Sub carrier spacing for aggressor cell (kHz) |     |
|  |                                    |   | 60   | 120 |
| 0  | 1                                  | $\leq 200$  | 2  | 2   |
| 1  | 0.5                                | $\leq 200$  | 2  | 2   |
| 2  | 0.25                               | $\leq 200$  | 3  | 3   |
| 3  | 0.125                              | $\leq 200$  | 4  | 4   |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter <i>SRS-SwitchingTimeNR</i> . |                                    |   |  |     |

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 8.2.2.2.9-1 and in Table 8.2.2.2.9-2 based on SRS carrier switching time  $\leq 200\mu\text{s}$  shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 8.2.2.2.9-1 and in Table 8.2.2.2.9-2 shall apply.

#### 8.2.4.2.10 Interruptions at direct SCell activation

When one or multiple SCell(s) are directly activated at SCell addition:

- the UE is allowed an interruption on any active serving cell:
  - of up to the duration shown in Table 8.2.4.2.1-1, if the active serving cell is not in the same band as the SCell being directly activated, where the requirements for Sync apply for synchronous NR-DC, and for asynchronous NR-DC if the active serving cell is in the same CG as the SCell being directly activated, and the requirements for Async apply for asynchronous NR-DC if the active serving cell is not in the same CG as the SCell being directly activated, or
  - of up to the duration shown in Table 8.2.4.2.1-2, if the active serving cells are in the same band as the SCell being directly activated provided the cell specific reference signals from the active serving cells and the SCell being directly activated are available in the same slot.

#### 8.2.4.2.11 Interruptions when identifying CGI of an NR cell with autonomous gaps

When a UE is identifying CGI of an NR cell with autonomous gaps, the UE is allowed interruptions on PCell, PSCell or any activated SCell:

- with up to K1 interruptions with interrupted slots up to interruption length X1 specified in Table 8.2.4.2.11-1 for each interruption during MIB decoding time period  $T_{\text{MIB}}$  (ms) specified in clause 9.11.
- with up to L1 interruptions with interrupted slots up to interruption length Y1 specified in Table 8.2.4.2.11-1 for each interruption during SIB1 decoding time period  $T_{\text{SIB1}}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 1.
- with up to L2 interruptions with interrupted slots up to interruption length Y2 specified in Table 8.2.4.2.11-1 for each interruption during SIB1 decoding time period  $T_{\text{SIB1}}$  (ms) specified in clause 9.11 for SSB and CORESET for RMSI scheduling multiplexing patterns 2 and 3.

Where:

- $K1 = 6$  for the target cell carrier frequency on FR1 and  $K1 = 25$  for the target cell carrier frequency on FR2, and
- $L1 = T_{\text{SIB1}}/20$ , and
- $L2 = T_{\text{SIB1}}/T_{\text{SMTC}}$ , where  $T_{\text{SMTC}}$  is the periodicity of the SMTC occasion configured for the target cell carrier .

**Table 8.2.4.2.11-1: Interruption length X1, Y1 and Y2 during measurements with autonomous gaps**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | Interruption length Y1 (slots) | Interruption length Y2 (slots) |
|-------|------------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 0     | 1                                  | 6                              | 7                              | 6                              |
| 1     | 0.5                                | 12                             | 13                             | 10                             |
| 2     | 0.25                               | 24                             | 25                             | 19                             |
| 3     | 0.125                              | 48                             | 49                             | 37                             |

#### 8.2.4.2.12 Interruptions when identifying CGI of an E-UTRA cell with autonomous gaps

When a UE is identifying CGI of an E-UTRA FDD cell or E-UTRA TDD cell with autonomous gaps, within time period  $T_{\text{identify\_CGI, E-UTRA}}$  specified in clause 9.4.7.1, the UE shall be able to transmit at least the number of ACK/NACKs specified in Table 8.2.4.2.12-1 on PCell, PSCell or any activated SCell in the frequency range where autonomous gaps are used, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured.

**Table 8.2.4.2.12-1: Minimum number of ACK/NACKs transmitted by the UE during  $T_{\text{identify\_CGI, E-UTRA}}$** 

| Minimum number of transmitted ACK/NACKs | Configuration of the serving cell in which the transmitted ACK/NACKs are counted |         |
|---|--|---------|
|   | Duplex mode configuration  | SCS     |
| 84                                      | FDD  | 15 kHz  |
| 193                                     | FDD  | 30 kHz  |
| 402                                     | FDD  | 60 kHz  |
| 28                                      | TDD <sup>Note 1</sup>  | 15 kHz  |
| 81                                      | TDD <sup>Note 1</sup>  | 30 kHz  |
| 159                                     | TDD <sup>Note 1</sup>  | 60 kHz  |
| 233                                     | TDD <sup>Note 2</sup>  | 60 kHz  |
| 491                                     | TDD <sup>Note 2</sup>  | 120 kHz |

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  
NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

#### 8.2.4.2.13 Interruptions due to SCell dormancy

##### 8.2.4.2.13.1 Interruptions due to SCell dormancy switch

When one SCell in MCG or SCG is switched from dormancy to non-dormancy or from non-dormancy to dormancy [7] when UE is in DRX active time,

- the UE is allowed an interruption on active serving cell in MCG and SCG as defined in clause 8.2.4.2.5, except that the interruption is allowed regardless of which parameters change between the dormant BWP and the non-dormant BWP
- The starting time of interruption shall be within the dormancy switching delay as defined in clause 8.6.2.

When multiple SCells in MCG or SCG are switched from dormancy to non-dormancy or vice versa when the UE is in DRX active time, the interruption requirement described above applies for each BWP switch.

#### 8.2.4.2.13.2 Interruptions due to CQI measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of CQI measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements on dormant SCells shall not exceed 0.5%.

#### 8.2.4.2.13.3 Interruptions due to RRM measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of RRM measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from RRM measurements on dormant SCells shall not exceed 1.0%.

#### 8.2.4.2.14 Interruptions due to UE-specific CBW change

The requirements in clause 8.2.1.2.11 apply for this clause.

#### 8.2.4.2A Void

##### 8.2.4.2A.1 Void

##### 8.2.4.2A.2 Void

##### 8.2.4.2A.3 Void

## 8.3 SCell Activation and Deactivation Delay

### 8.3.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to activate a deactivated SCell and deactivate an activated SCell in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC.

The requirements shall apply for EN-DC, standalone NR carrier aggregation, NE-DC, and NR-DC.

### 8.3.2 SCell Activation Delay Requirement for Deactivated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot  $n$ , the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot  $n +$

$\frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$ , where:

$T_{\text{HARQ}}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]

$T_{\text{activation\_time}}$  is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1,  $T_{\text{activation\_time}}$  is:

- $T_{\text{FirstSSB}} + 5\text{ms}$ , if the measurement period of the SCell being activated is equal to or smaller than 2400ms.

- $T_{\text{FirstSSB\_MAX}} + T_{\text{rs}} + 5\text{ms}$ , if the measurement period of the SCell being activated is larger than 2400ms.

If the SCell is unknown and belongs to FR1, and if one of the following conditions is met

- 'ssb-PositionInBurst' indicates only one SSB is being actually transmitted, or
- 'ssb-PositionInBurst' indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation,

provided that the side condition  $\hat{E}_s/I_{ot} \geq -2\text{dB}$  is fulfilled,  $T_{\text{activation\_time}}$  is:

- $T_{\text{FirstSSB\_MAX}} + T_{\text{SMTC\_MAX}} + T_{\text{rs}} + 5\text{ms}$ , if the following conditions are met,
  - the SCell is contiguous to an active serving cell in the same band, and
  - its *ssb-PositionInBurst* is same as the one of contiguous FR1 active serving cell, and
  - its SMTC offset is same as the one of contiguous FR1 active serving cell, and
  - its RTD with contiguous FR1 active serving cell is smaller than or equal to 260ns with respect to the to-be-activated SCell's SSB numerology, and its reception power difference with contiguous FR1 active serving cell is smaller than or equal to 6dB;
- $T_{\text{FirstSSB\_MAX}} + T_{\text{SMTC\_MAX}} + 2 * T_{\text{rs}} + 5\text{ms}$ , otherwise.

otherwise, provided that the side condition  $\hat{E}_s/I_{ot} \geq -2\text{dB}$  is fulfilled,  $T_{\text{activation\_time}}$  is:

- $6\text{ms} + T_{\text{FirstSSB\_MAX}} + T_{\text{SMTC\_MAX}} + T_{\text{rs}} + T_{\text{L1-RSRP,measure}} + T_{\text{L1-RSRP,report}} + T_{\text{HARQ}} + \max(T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}} + 2\text{ms}, T_{\text{uncertainty\_SP}})$ , if semi-persistent CSI-RS is used for CSI reporting,
- $3\text{ms} + T_{\text{FirstSSB\_MAX}} + T_{\text{SMTC\_MAX}} + T_{\text{rs}} + T_{\text{L1-RSRP,measure}} + T_{\text{L1-RSRP,report}} + \max(T_{\text{HARQ}} + T_{\text{uncertainty\_MAC}} + 5\text{ms} + T_{\text{FineTiming}}, T_{\text{uncertainty\_RRC}} + T_{\text{RRC\_delay}})$ , if periodic CSI-RS is used for CSI reporting.
- However, when the following conditions are fulfilled, no activation requirement will be applied for this unknown SCell:
  - the SCell is contiguous to an active serving cell in the same band, and
  - A single SSB is used in the unknown SCell; or multiple SSBs are used in the SCell and TCI state indication for PDCCH is provided by the same MAC PDU used for SCell activation; and
  - its *ssb-PositionInBurst* is same as the one of contiguous FR1 active serving cell, and
  - its SMTC offset is same as the one of contiguous FR1 active serving cell
  - its RTD with contiguous FR1 active serving cell is larger than 260ns with respect to the to-be-activated SCell's SSB numerology, or its reception power difference with contiguous FR1 active serving cell is larger than 6dB;
- If the SCell being activated belongs to FR1 and if there is at least one active serving cell contiguous to the SCell on that FR1 band, if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration for the target SCell,  $T_{\text{activation\_time}}$  is 3 ms for UE supporting *scellWithoutSSB*, provided
  - The RTD between the target SCell and the contiguous active serving cell is within within  $\pm 260\text{ns}$ , and
  - The difference of the reception power with the contiguous active serving cell is  $\leq 6\text{dB}$ , and
  - The RS(s) of SCell being activated is (are) QCL-TypeA with TRS(s) of the SCell being activated, and the TRS(s) of the SCell being activated is (are) further QCL-TypeC with SSB(s) of any active serving cell that is contiguous to the SCell being activated on that FR1 band.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then  $T_{\text{activation\_time}}$  is  $T_{\text{FirstSSB}} + 5\text{ms}$  provided:

- The UE is provided with SMTC for the target SCell, and
- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in clause 3.6.3,

- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.
- SSB is in the same half-frame on the SCell and the contiguous FR2 active serving cell

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE supporting *scellWithoutSSB* is not provided with any SMTC for the target SCell,  $T_{\text{activation\_time}}$  is 3 ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is in FR1 or in FR2:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then  $T_{\text{activation\_time}}$  is:

- $3\text{ms} + \max(T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}} + 2\text{ms}, T_{\text{uncertainty\_SP}})$ , where  $T_{\text{uncertainty\_MAC}}=0$  and  $T_{\text{uncertainty\_SP}}=0$  if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then  $T_{\text{activation\_time}}$  is:

- $\max(T_{\text{uncertainty\_MAC}} + 5\text{ms} + T_{\text{FineTiming}}, T_{\text{uncertainty\_RRC}} + T_{\text{RRC\_delay}} - T_{\text{HARQ}})$ , where  $T_{\text{uncertainty\_MAC}}=0$  if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition  $\hat{E}_s/I_{ot} \geq -2\text{dB}$  is fulfilled, then  $T_{\text{activation\_time}}$  is:

- $6\text{ms} + T_{\text{FirstSSB\_MAX}} + 15 * T_{\text{SMTC\_MAX}} + 8 * T_{\text{rs}} + T_{\text{L1-RSRP, measure}} + T_{\text{L1-RSRP, report}} + T_{\text{HARQ}} + \max(T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}} + 2\text{ms}, T_{\text{uncertainty\_SP}})$ .

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition  $\hat{E}_s/I_{ot} \geq -2\text{dB}$  is fulfilled, then  $T_{\text{activation\_time}}$  is:

- $3\text{ms} + T_{\text{FirstSSB\_MAX}} + 15 * T_{\text{SMTC\_MAX}} + 8 * T_{\text{rs}} + T_{\text{L1-RSRP, measure}} + T_{\text{L1-RSRP, report}} + \max \{ (T_{\text{HARQ}} + T_{\text{uncertainty\_MAC}} + 5\text{ms} + T_{\text{FineTiming}}), (T_{\text{uncertainty\_RRC}} + T_{\text{RRC\_delay}}) \}$ .

where,

$T_{\text{SMTC\_MAX}}$ :

- In FR1, in case of intra-band SCell activation,  $T_{\text{SMTC\_MAX}}$  is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation,  $T_{\text{SMTC\_MAX}}$  is the SMTC periodicity of SCell being activated.
- In FR2, in case of intra-band SCell activation,  $T_{\text{SMTC\_MAX}}$  is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA; in case of FR2 inter-band SCell activation,  $T_{\text{SMTC\_MAX}}$  is the SMTC periodicity of SCell being activated.
- $T_{\text{SMTC\_MAX}}$  is bounded to a minimum value of 10ms.

$T_{\text{rs}}$  is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise  $T_{\text{rs}}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC,  $T_{\text{rs}}$  is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves  $T_{\text{rs}}$  is applied with  $T_{\text{rs}} = 5\text{ms}$  assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms.

$T_{\text{FirstSSB}}$ : is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ .

$T_{\text{FirstSSB\_MAX}}$ : Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.
- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{\text{FineTiming}}$  is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

$T_{\text{L1-RSRP, measure}}$  is L1-RSRP measurement delay  $T_{\text{L1-RSRP\_Measurement\_Period\_SSB}}$  ms or  $T_{\text{L1-RSRP\_Measurement\_Period\_CSI-RS}}$  based on applicability as defined in clause 9.5 assuming  $M=1$ .

$T_{\text{L1-RSRP, report}}$  is delay of acquiring CSI reporting resources.

$T_{\text{uncertainty\_MAC}}$  is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{\text{uncertainty\_RRC}}$  is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{\text{uncertainty\_SP}}$  is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{\text{RRC\_delay}}$  is the RRC procedure delay as specified in TS38.331 [2].

Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

When *absoluteFrequencySSB* is not configured in *DownlinkConfigCommon* for target SCell but SMTC for target SCell is configured, no requirement would be applied.

$T_{\text{CSI\_reporting}}$  is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to  $\max(5 * \text{measCycleSCell}, 5 * \text{DRX cycles})$  for FR1 before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable according to the cell identification conditions specified in clause 9.2 and 9.3.

- the SSB measured during the period equal to  $\max(5 \cdot \text{measCycleSCell}, 5 \cdot \text{DRX cycles})$  also remains detectable during the SCell activation delay according to the cell identification conditions specified in clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):
  - the UE has sent a valid L3-RSRP measurement report with SSB index
  - SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in clauses 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the activation command,  $T_{\text{SMTc\_Scell}}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated.  $T_{\text{SMTc\_MAX}}$  follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [2] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The starting point of an interruption window on spCell or any activated SCell, as specified in clause 8.2, shall not occur before slot  $n+1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  and not occur after slot  $n+1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{X}}}{\text{NR slot length}}$ , where NR slot length is with respect to the numerology used in the SCell being activated, and  $T_{\text{X}}$  is:

- $T_{\text{FirstSSB}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FirstSSB}}$ ;
- $T_{\text{FirstSSB\_MAX}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FirstSSB\_MAX}}$ ;
- $T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FineTiming}}$ .

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The requirements in this clause and requirements on interruption due to SCell activation in clause 8.2 apply provided that the SSB of the to-be-activated SCell is within the first active DL BWP of the SCell.

Starting from slot  $n + T_{\text{HARQ}} + 3 \text{ ms}$  where slot  $n$  is the slot where SCell activation command is received (as specified in clause 4.3 of TS 38.213 [3]) and until the SCell activation completion at UE, after at least one CSI-RS transmission occasion for the channel measurement and reporting (specified in clause 5.2.2.5 of TS 38.214 [26]), the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

### 8.3.3 SCell Deactivation Delay Requirement for Activated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC.

Upon receiving SCell deactivation command in slot  $n$ , the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ . The starting point of an interruption window on spCell or any

activated SCell, as specified in clause 8.2, shall not occur before slot  $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$  and not occur after slot  $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$ , where NR slot length is with respect to the numerology used in the SCell being deactivated.

Upon expiry of the *sCellDeactivationTimer* in slot  $n$ , the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot  $n + \frac{3ms}{NR\ slot\ length}$ . The starting point of an interruption window on spCell or any activated SCell, as specified in clause 8.2, shall not occur before slot  $n+1$  and not occur after slot  $n+1+\frac{3ms}{NR\ slot\ length}$ , where NR slot length is with respect to the numerology used in the SCell being deactivated.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

### 8.3.4 Direct SCell Activation at SCell addition

The requirements in this clause apply for UE being configured in the RRC reconfiguration message, TS 38.331 [2], with one SCell for which the parameter *sCellState* is set to *activated*. If the RRC reconfiguration message for direct SCell activation also configures PSCell addition or PSCell change, the direct SCell activation delay may be longer than the requirements defined in this clause.

The UE shall configure the SCell in activated state upon successful completion of the RRC reconfiguration procedure within the specified delay. The UE shall be capable to transmit valid CSI report and apply actions for the directly activated SCell no later than in slot  $n + \frac{N_{direct}}{NR\ slot\ length}$ ,

where:

- Slot  $n$  is the last slot overlapping with the PDSCH containing the RRC reconfiguration message,
- $N_{direct} = T_{RRC\_Process} + T_1 + T_{activation\_time} + T_{CSI\_Reporting} - 3ms$  for the cases specified in clause 8.3.2 that TCI state is not indicated within  $T_{activation\_time}$ ; otherwise,  $N_{direct} = T_{RRC\_Process} + T_1 + T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}$
- $T_{RRC\_Process}$ : RRC procedure delay as specified in clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC procedure delay defined in clause 12 of TS 38.331 [2],
- $T_1$ : Delay from slot  $n + \frac{T_{RRC\_Process}}{NR\ slot\ length}$  until the transmission of *RRCReconfigurationComplete* message,

Note:  $T_1$  is UE implementation dependent.

- $T_{HARQ}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3],
- If the SCell is known and belongs to FR1,  $T_{CSI\_Reporting}$  is specified in clause 8.3.2 and  $T_{activation\_time}$  is defined as:
  - $T_{FirstSSB} + 5ms$ , if the measurement period of the SCell being activated is equal to or smaller than 2400ms.
  - $T_{FirstSSB\_MAX} + T_{rs} + 5ms$ , if measurement period of the SCell being activated is larger than 2400ms.

where,

the measurement period in Table 9.2.5.2-1 applies if the target SCell was in an intra-frequency layer corresponding to an activated SCell;

the measurement period in Table 9.2.5.2-3 applies if the target SCell was in an intra-frequency layer corresponding to a deactivated SCell;

the measurement period in Table 9.3.5-1 applies if the target SCell was in an inter-frequency layer.

- Otherwise,  $T_{activation\_time}$  and  $T_{CSI\_Reporting}$  are specified in clause 8.3.2, where the following definitions of  $T_{FirstSSB}$  and  $T_{FirstSSB\_MAX}$  shall override the existing ones:
  - $T_{FirstSSB}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{T_{RRC\_Process} + T_1}{NR\ slot\ length}$



- $T_{\text{FirstSSB\_MAX}}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{T_{\text{RRC\_Process}} + T_1}{\text{NR slot length}}$ 
  - In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.
  - In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS38.321 [7] for an SCell at the first opportunities for the corresponding actions once the SCell is activated.

The SCell is known provided the following conditions are met for the SCell:

- During the last 5 seconds before the reception of the direct SCell configuration command:
  - the UE has sent a valid measurement report for the SCell being directly activated, and
  - the SSB measured remains detectable according to the cell identification conditions specified in sections 9.2 and 9.3,
  - the SSB measured during the period equal to [5] seconds also remains detectable during the SCell activation delay according to the cell identification conditions specified in clause 9.2 and 9.3.

Otherwise, the SCell is unknown.

The UE may be allowed to cause interruptions to serving cells on other component carriers during an interruption window, as specified in clause 8.2. The starting point of an interruption window on spCell or any activated SCell shall not occur before slot  $n+1$ , and shall not occur after slot  $n+1 + \frac{T_{\text{RRC\_Process}} + T_1 + T_X}{\text{NR slot length}}$ , where NR slot length is with respect to the numerology of the SCell being activated, and  $T_X$  is:

- $T_{\text{FirstSSB}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FirstSSB}}$ ;
- $T_{\text{FirstSSB\_MAX}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FirstSSB\_MAX}}$ ;
- $T_{\text{uncertainty\_MAC}} + T_{\text{FineTiming}}$ , for any scenario where  $T_{\text{activation\_time}}$  includes  $T_{\text{FineTiming}}$ .

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

Starting from the slot  $n + \frac{T_{\text{RRC\_Process}} + T_1}{\text{NR slot length}}$  until the UE has completed the direct SCell activation, the UE shall report CQI index = 0 (out of range) if the UE has available uplink resources to report CQI for the SCell.

### 8.3.5 Direct SCell Activation at Handover

The requirements in this clause apply for UE being configured in the RRC reconfiguration message, TS 38.331 [2], for handover with one SCell for which the parameter *sCellState* is set to *activated*.

The UE shall configure the SCell in activated state upon successful completion of the RRC reconfiguration procedure within the specified delay. The UE shall be capable to transmit valid CSI report and apply actions for the directly activated SCell no later than in slot  $n + \frac{N_{\text{direct}}}{\text{NR slot length}}$ ,

Where:

- Slot  $n$  is the last slot overlapping with the PDSCH containing RRC reconfiguration message.
- $N_{\text{direct}} = T_{\text{RRC\_process}} + T_{\text{interrupt}} + T_2 + T_3 + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}} - 3\text{ms}$  for the cases specified in clause 8.3.2 that TCI state is not indicated within  $T_{\text{activation\_time}}$ ; otherwise,  $N_{\text{direct}} = T_{\text{RRC\_process}} + T_{\text{interrupt}} + T_2 + T_3 + T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}$

- $T_{RRC\_Process}$ : RRC procedure delay as specified in clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC procedure delay defined in clause 12 of TS 38.331 [2],
- $T_{interrupt}$ : Interruption time during handover as specified in clause 6.1.1,
- $T_2$ : Delay from slot  $n + \frac{T_{RRC\_Process} + T_{interrupt}}{NR\ slot\ length}$  until UE has obtained a valid TA command for the target PCell,
- $T_3$ : Delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to  $k+1$  slot, where  $k$  is defined in clause 4.2 in TS 38.213,
- $T_{HARQ}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3],
  - If the SCell is configured as deactivated SCell before handover,  $T_{CSI\_Reporting}$  is specified in clause 8.3.2 and  $T_{activation\_time}$  is defined as:
    - $T_{FirstSSB} + 5\text{ms}$ , if the measurement period of the SCell being activated is equal to or smaller than [2400ms].
    - $T_{FirstSSB\_MAX} + T_{rs} + 5\text{ms}$ , if the measurement period of the SCell being activated is larger than [2400ms].
  - If the SCell is not configured as deactivated SCell but known and belongs to FR1,  $T_{CSI\_Reporting}$  is specified in clause 8.3.2 and  $T_{activation\_time}$  is defined as:
    - $T_{FirstSSB} + 5\text{ms}$ , if the measurement period of the SCell being activated is equal to or smaller than [2400ms].
    - $T_{FirstSSB\_MAX} + T_{rs} + 5\text{ms}$ , if measurement period of the SCell being activated is larger than [2400ms].

where,

the measurement period in Table 9.2.5.2-1 applies if the target SCell was in an intra-frequency layer corresponding to an activated SCell;

the measurement period in Table 9.2.5.2-3 applies if the target SCell was in an intra-frequency layer corresponding to a deactivated SCell;

the measurement period in Table 9.3.5-1 applies if the target SCell was in an inter-frequency layer.

- Otherwise,  $T_{activation\_time}$  and  $T_{CSI\_Reporting}$  are specified in clause 8.3.2, where the following definitions of  $T_{FirstSSB}$  and

$T_{FirstSSB\_MAX}$  shall override the existing ones:

- $T_{FirstSSB}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{T_{RRC\_Process} + T_{interrupt} + T_2 + T_3}{NR\ slot\ length}$
- $T_{FirstSSB\_MAX}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{T_{RRC\_Process} + T_{interrupt} + T_2 + T_3}{NR\ slot\ length}$ 
  - In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.
  - In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.321 [7] for an SCell at the first opportunities for the corresponding actions once the SCell is activated.

The SCell is known provided the following conditions are met for the SCell:

- During the last 5 seconds before the reception of the direct SCell configuration command:
  - the UE has sent a valid measurement report for the SCell being directly activated, and

- the SSB measured remains detectable according to the cell identification conditions specified in sections 9.2 and 9.3,
- the SSB measured during the period equal to [5] seconds also remains detectable during the SCell activation delay according to the cell identification conditions specified in clause 9.2 and 9.3.

Otherwise, the SCell is unknown.

The UE may be allowed to cause interruptions to PCell during an interruption window, as specified in clause 8.2. The starting point of an interruption window on PCell shall not occur before slot  $n+1 + \frac{T_{RRC\ Processing} + T_{interrupt} + T_2 + T_3}{NR\ slot\ length}$ , and not occur after slot  $n+1 + \frac{T_{RRC\ Processing} + T_{interrupt} + T_2 + T_3 + T_X}{NR\ slot\ length}$ , where NR slot length is with respect to the numerology of the SCell being activated, and  $T_X$  is:

- $T_{FirstSSB}$ , for any scenario where  $T_{activation\_time}$  includes  $T_{FirstSSB}$ ;
- $T_{FirstSSB\_MAX}$ , for any scenario where  $T_{activation\_time}$  includes  $T_{FirstSSB\_MAX}$ ;
- $T_{uncertainty\_MAC} + T_{FineTiming}$ , for any scenario where  $T_{activation\_time}$  includes  $T_{FineTiming}$ .

The length of the interruption window depends on the frequency band relation between the aggressor SCell and the victim PCell.

Starting from the slot  $n + \frac{T_{RRC\_Process} + T_{interrupt} + T_2 + T_3}{NR\ slot\ length}$  and until the UE has completed the direct SCell activation, the UE shall report CQI index = 0 (out of range) if the UE has available uplink resources to report CQI for the SCell.

### 8.3.6 Direct SCell Activation at RRCResume

The requirements in this clause apply for UE being configured in the RRC reconfiguration message in TS38.331 [2] for RRC Resume with one SCell for which the parameter  $sCellState$  is set to *activated*.

The requirements in clause 8.3.4 shall apply, except that the definition of  $T_I$  shall be deemed to be replaced with

$T_I$ : Delay from slot  $n + \frac{T_{RRC\_Process}}{NR\ slot\ length}$  until the transmission of RRCResumeComplete message,

### 8.3.7 SCell Activation Delay Requirement for Deactivated SCell with Multiple Downlink SCells

The requirements in this clause shall apply for the UE configured with more than one SCells.

In EN-DC, NE-DC, standalone NR, or in one CG of NR-DC, the requirements in this clause shall apply when the following conditions are met:

- UE only receives one single MAC command for multiple SCell activation within the activation period defined in this clause
- in each single CG, there are no other SCell activation, deactivation, addition or release before activation is completed for all the SCells activated by the single MAC CE in this clause, and
- in EN-DC and NE-DC, there are no E-UTRAN SCell activation, deactivation, addition or release before multiple SCell activation is completed in this clause, and
- any to-be-activated unknown SCell has active serving cell(s) or known to-be-activated SCell(s) on the same band

In two CGs of NR-DC, the requirements in this clause shall apply when the following conditions are met:

- UE receives one MAC command per CG for multiple SCell activation within the activation period defined in this clause, and
- UE supports per-FR measurement gap capability, and
- any to-be-activated unknown SCell has active serving cell(s) or known to-be-activated SCell(s) on the same band

The delay within which the UE shall be able to activate the deactivated SCell with other downlink to-be-activated SCell(s) depends upon the specified conditions.

Upon receiving SCell activation command in slot  $n$  for more than one SCell, for each of the to-be-activated SCell, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot  $n + \frac{T_{HARQ} + T_{activation\_time\_multiple\_scells} + T_{CSI\_Reporting}}{NR\ slot\ length}$ , where:

$T_{HARQ}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]

$T_{activation\_time\_multiple\_scells}$  is the target SCell activation delay in millisecond in multiple SCell activation scenario.

If the SCell is known and belongs to FR1 and the measurement period of the SCell being activated is equal to or smaller than [2400ms],  $T_{activation\_time\_multiple\_scells}$  is:

- $T_{FirstSSB\_MAX\_multiple\_scells} + T_{rs} + 5ms$ , if on the same band UE also has at least one parallel to-be-activated SCell which is FR1 known Scell with the measurement period larger than [2400ms] but does not have any parallel to-be-activated SCell which is FR1 unknown SCell.
- $T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + T_{rs} + 5ms$ , if on the same band UE also has at least one parallel to-be-activated SCell which is FR1 unknown Scell
- otherwise,  $T_{FirstSSB\_MAX\_multiple\_scells} + 5ms$ .

If the SCell is known and belongs to FR1 and the measurement period of the SCell being activated is larger than [2400ms],  $T_{activation\_time\_multiple\_scells}$  is:

- $T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + T_{rs} + 5ms$ , if on the same band UE also has at least one parallel to-be-activated SCell which is FR1 unknown Scell
- otherwise,  $T_{FirstSSB\_MAX\_multiple\_scells} + T_{rs} + 5ms$

If the SCell is unknown and belongs to FR1, provided that the side condition  $\hat{E}_s/I_{ot} \geq -2dB$  is fulfilled,  $T_{activation\_time\_multiple\_scells}$  is:

- $T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + T_{rs} + 5ms$ , if the SCell is not counted in  $N_1$
- The activation delay may be longer if SSB is not in the same half-frame on the SCell and the contiguous FR1 known cell or contiguous FR1 active serving cell

otherwise

- if the following conditions are met
  - 'ssb-PositionInBurst' indicates only one SSB is being actually transmitted, or
  - 'ssb-PositionInBurst' indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation,

$T_{activation\_time\_multiple\_scells}$  is:

- $T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + T_{rs} * N_1 + T_{rs} + 5ms$ ,

Otherwise:

$T_{activation\_time\_multiple\_scells}$  is:

- $6ms + T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + T_{rs} * N_1 + T_{L1-RSRP,measure} + T_{L1-RSRP,report} + T_{HARQ} + \max(T_{uncertainty\_MAC\_multiple\_scells} + T_{FineTiming} + 2ms, T_{uncertainty\_SP\_multiple\_scells})$ , if semi-persistent CSI-RS is used for CSI reporting,
- $3ms + T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + T_{rs} * N_1 + T_{L1-RSRP,measure} + T_{L1-RSRP,report} + \max(T_{HARQ} + T_{uncertainty\_MAC\_multiple\_scells} + 5ms + T_{FineTiming}, T_{uncertainty\_RRC\_multiple\_scells} + T_{RRC\_delay})$ , if periodic CSI-RS is used for CSI reporting.

If the SCell being activated belongs to FR1 and if there is at least one active serving cell contiguous to the SCell on that FR1 band, if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) nor

SMTC configuration for the target SCell,  $T_{\text{activation\_time\_multiple\_scells}}$  is same as single SCell activation delay requirement as defined in clause 8.3.2.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then  $T_{\text{activation\_time\_multiple\_scells}}$  is same as single SCell activation delay requirement as defined in clause 8.3.2.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell,  $T_{\text{activation\_time\_multiple\_scells}}$  is same as single SCell activation delay requirement as defined in clause 8.3.2

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then  $T_{\text{activation\_time\_multiple\_scells}}$  is same as single SCell activation delay requirement as defined in clause 8.3.2.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then  $T_{\text{activation\_time\_multiple\_scells}}$  is same as single SCell activation delay requirement as defined in clause 8.3.2.

If the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition  $\hat{E}_s/\text{lot} \geq -2\text{dB}$  is fulfilled, then  $T_{\text{activation\_time\_multiple\_scells}}$  is:

- $3 \text{ ms} + \max(T_{\text{uncertainty\_MAC\_multiple\_scells}} + T_{\text{FineTiming}} + 2\text{ms}, T_{\text{uncertainty\_SP\_multiple\_scells}})$ , if on the same band UE also has at least one parallel to-be-activated SCell which is FR2 known SCell.  $T_{\text{uncertainty\_MAC\_multiple\_scells}} = 0$  and  $T_{\text{uncertainty\_SP\_multiple\_scells}} = 0$  if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation commands at the same time.

If the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition  $\hat{E}_s/\text{lot} \geq -2\text{dB}$  is fulfilled, then  $T_{\text{activation\_time\_multiple\_scells}}$  is:

- $\max(T_{\text{uncertainty\_MAC\_multiple\_scells}} + 5\text{ms} + T_{\text{FineTiming}}, T_{\text{uncertainty\_RRC\_multiple\_scells}} + T_{\text{RRC\_delay}} - T_{\text{HARQ}})$ , if on the same band UE also has at least one parallel to-be-activated SCell which is FR2 known SCell .  
 $T_{\text{uncertainty\_MAC\_multiple\_scells}} = 0$  if UE receives the SCell activation command and TCI state activation commands at the same time.

The requirements for FR2 unknown SCells apply provided that the parameter *ssb-PositionsInBurst* is same for the SCell and the known serving cell on the same FR2 band. The activation delay FR2 unknown SCell may be longer if SSB is not in the same half-frame on the SCell and the contiguous FR2 known cell.

Where,

$N_1$  is the number counting for parallel FR1 unknown to-be-activated SCell(s) only except the ones which fulfilled the following conditions:

- contiguous to an active serving cell in the same band, or to a known SCell in the same band being activated by the same MAC PDU, and
- A single SSB is used in the unknown SCell; or multiple SSBs are used in the unknown SCell and TCI state indication for PDCCH is provided by the same MAC PDU used for SCell activation; and
- its *ssb-PositionInBurst* is same as the one of contiguous FR1 known cell or contiguous FR1 active serving cell, and
- its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to 260ns with respect to the to-be-activated SCell's SSB numerology and its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to 6dB, and
- its SMTC offset is same as the one of contiguous FR1 known cell or contiguous FR1 active serving cell

However, when the following conditions are fulfilled, no activation requirement will be applied for this unknown SCell and other SCells being activated and counted in  $N_1$ :

- contiguous to an active serving cell in the same band, or to a known SCell in the same band being activated by the same MAC PDU, and

- A single SSB is used in the unknown SCell; or multiple SSBs are used in the unknown SCell and TCI state indication for PDCCH is provided by the same MAC PDU used for SCell activation; and
- its *ssb-PositionInBurst* is same as the one of FR1 known cell or FR1 active serving cell, and
- its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than 260ns with respect to the to-be-activated SCell's SSB numerology or its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than 6dB, and
- its SMTC offset is same as the one of FR1 known cell or FR1 active serving cell

$T_{\text{SMTC\_MAX\_multiple\_scells}}$ :

- In FR1, in case of intra-band SCell activation,  $T_{\text{SMTC\_MAX\_multiple\_scells}}$  is the longest SMTC periodicity between active serving cells and SCells being activated on the same band provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation,  $T_{\text{SMTC\_MAX\_multiple\_scells}}$  is the longest SMTC periodicity of SCells being activated on the same band.
- In FR2,  $T_{\text{SMTC\_MAX\_multiple\_scells}}$  is the longest SMTC periodicity between active serving cells and SCell(s) being activated in FR2 intra-band CA.
- $T_{\text{SMTC\_MAX\_multiple\_scells}}$  is bounded to a minimum value of 10ms.

$T_{\text{FirstSSB\_MAX\_multiple\_scells}}$ : is the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCells being activated are transmitting SSB burst.
- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{\text{uncertainty\_MAC\_multiple\_scells}}$  is the time period between reception of the activation command for PDCCH TCI, PDSCH TCI (when applicable) and SCell activation command of this unknown SCell.

$T_{\text{uncertainty\_SP\_multiple\_scells}}$  is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting and SCell activation command of this unknown SCell.

$T_{\text{uncertainty\_RRC\_multiple\_scells}}$  is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) and SCell activation command of this unknown SCell.

$T_{\text{rs}}$ ,  $T_{\text{FineTiming}}$ , and  $T_{\text{RRC\_delay}}$  is defined in clause 8.3.2.

Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

The condition of known SCell in FR1 or FR2 is defined in clause 8.3.2.

If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the activation command,  $T_{\text{SMTC\_Scell}}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated.

$T_{\text{SMTC\_MAX\_multiple\_scell}}$  follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

The starting point and the end-point of an interruption window on PCell or any activated SCell in MCG for NR standalone mode, or on PSCell or any activated SCell in SCG for EN-DC mode is same as single SCell activation requirement in clause 8.3.2.

Upon receiving SCell activation command in slot  $n$ , if the start of the first complete SSB used in the  $T_x$  in the different bands which have SCells being activated after  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$  are not aligned on time domain among

- SCells in different bands being activated by the same MAC CE if UE does not support per FR gap, or

- SCells in different FR1 bands being activated by the same MAC CE if UE supports per FR gap, additional interruptions may be expected for the activated serving cells, where
- The number of additional interruptions is no more than the number of FR1 bands which have both SCell being activated for which the activation requirements involve  $T_{FirstSSB\_MAX\_multiple\_scells}$  with  $T_{rs}$  and the active serving cell, and
- In each interruption occasion, the interruption length is defined in clause 8.2.2.2.2, and
- Longer activation delay may be expected for multiple SCell activation under one MAC CE with multiple interruptions, and
- $T_X$  is:
  - $T_{FirstSSB}$ , for any scenario where  $T_{activation\_time\_multiple\_scells}$  includes  $T_{FirstSSB}$ ;
  - $T_{FirstSSB\_MAX\_multiple\_scells}$ , for any scenario where  $T_{activation\_time\_multiple\_scells}$  includes  $T_{FirstSSB\_MAX\_multiple\_scells}$ ;
  - $T_{uncertainty\_MAC}+T_{FineTiming}$  or  $T_{uncertainty\_MAC\_multiple\_scells}+T_{FineTiming}$ , for any scenario where  $T_{activation\_time\_multiple\_scells}$  includes  $T_{FineTiming}$ .

Otherwise, no additional interruption is expected due to activation of multiple SCells.

Starting from slot  $n + T_{HARQ} + 3$  ms where slot  $n$  is the slot where SCell activation command is received (as specified in clause 4.3 of TS 38.213 [3]) and until the SCell activation completion at UE, after at least one CSI-RS transmission occasion for the channel measurement and reporting (specified in clause 5.2.2.5 of TS 38.214 [26]), the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

### 8.3.8 SCell Deactivation Delay Requirement for Activated SCell with Multiple Downlink SCells

The requirements in this clause shall apply for the UE configured with multiple downlink SCells in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC, provided that,

- in each single CG, there are no other SCell activation, deactivation, addition or release before deactivation is completed for all the SCells deactivated by the single MAC CE in this clause, and
- in EN-DC and NE-DC, there are no E-UTRAN SCell activation, deactivation, addition or release before multiple SCell deactivation is completed in this clause, and
- in EN-DC, NE-DC, NR-DC and standalone NR, UE only receives one single MAC command for multiple SCell deactivation within the deactivation period defined in this clause, or, in NR-DC, per-FR measurement gap capable UE receives one MAC command per CG for multiple SCell deactivation within the deactivation period defined in this clause

Upon receiving SCell deactivation command in slot  $n$ , the UE shall accomplish the deactivation actions for the SCell being deactivated within the same delay as specified in clause 8.3.3.

The starting point and the end-point of an interruption window on PCell or any activated SCell in MCG for NR standalone mode, or on PSCell or any activated SCell in SCG for EN-DC mode is same as single SCell activation requirement in clause 8.3.3.

### 8.3.9 Direct SCell Activation of Multiple Downlink SCells at SCell addition

The requirements in this clause apply for UE being configured in the RRC reconfiguration message, TS 38.331 [2], with 2 SCells for which the parameter *sCellState* is set to *activated*.

In EN-DC, NE-DC, stand-alone NR, or in one CG of NR-DC, the requirements in this clause shall apply when the following conditions are met:

- UE only receives one RRC reconfiguration message for direct activation of SCells within the activation period defined in this clause,
- in each single CG, there are no other SCell activation, deactivation, addition or release before direct activation is completed for all the SCells activated by the single RRC reconfiguration message in this clause, and
- in EN-DC and NE-DC, there are no E-UTRAN SCell activation, deactivation, addition or release before the direct SCell activation of multiple SCells in this clause is completed.

In two CGs of NR-DC, the requirements in this clause shall apply when the following conditions are met:

- UE receives one RRC message per CG for direct activation of SCells within the activation period defined in this clause,
- UE supports per-FR measurement gap capability, and
- any to-be-activated unknown SCell has active serving cell(s) or known to-be-activated SCell(s) on the same band.

The UE shall configure the SCells in activated state upon successful completion of the RRC reconfiguration procedure within the specified delay. The UE shall be capable to transmit valid CSI report and apply actions for the directly activated SCell no later than in slot  $n + \frac{N_{direct\_multiple\_scells}}{NR\ slot\ length}$ ,

where:

- Slot  $n$  is the last slot overlapping with the PDSCH containing the RRC reconfiguration message.
- $N_{direct\_multiple\_scells} = T_{RRC\_Process} + T_1 + T_{activation\_time\_multiple\_scells} + T_{CSI\_Reporting} - 3ms$  for the cases specified in clause 8.3.7 that TCI state is not indicated within  $T_{activation\_time}$ ; otherwise,  $N_{direct\_multiple\_scells} = T_{RRC\_Process} + T_1 + T_{HARQ} + T_{activation\_time\_multiple\_scells} + T_{CSI\_Reporting}$
- $T_1$  and  $T_{RRC\_Process}$  are specified in clause 8.3.4,
- $T_{HARQ}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3],
- $T_{activation\_time\_multiple\_scells}$  and  $T_{CSI\_Reporting}$  are specified in clause 8.3.7, where the following definition of  $T_{FirstSSB}$ ,  $T_{FirstSSB\_MAX}$ , and  $T_{FirstSSB\_MAX\_multiple\_scells}$  shall override the existing ones:
  - $T_{FirstSSB}$  and  $T_{FirstSSB\_MAX}$ : as specified in clause 8.3.4,
  - $T_{FirstSSB\_MAX\_multiple\_scells}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{T_{RRC\_Process} + T_1}{NR\ slot\ length}$ , further fulfilling:
    - In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCells being activated are transmitting SSB burst.
    - In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS38.321 [7] for an SCell at the first opportunities for the corresponding actions once the SCell is activated.

The UE may be allowed to cause interruptions to serving cells on other component carriers during an interruption window, as specified in clause 8.2. The starting point of an interruption window on spCell or any activated SCell shall not occur before slot  $n+1 + \frac{T_{HARQ}}{NR\ slot\ length}$ , and shall not occur after slot  $n+1 + \frac{T_{RRC\_Process} + T_1 + T_X}{NR\ slot\ length}$ , where NR slot length is with respect to the numerology of the SCell being activated, and  $T_X$  is:

- $T_{FirstSSB}$ , for any scenario where  $T_{activation\_time\_multiple\_scells}$  includes  $T_{FirstSSB}$ ;
- $T_{FirstSSB\_MAX}$ , for any scenario where  $T_{activation\_time\_multiple\_scells}$  includes  $T_{FirstSSB\_MAX}$ ;
- $T_{FirstSSB\_MAX\_multiple\_scell}$ , for any scenario where  $T_{activation\_time\_multiple\_scells}$  includes  $T_{FirstSSB\_MAX\_multiple\_scells}$ ;



- $T_{uncertainty\_MAC} + T_{FineTiming}$ , for any scenario where  $T_{activation\_time\_multiple\_scells}$  includes  $T_{FineTiming}$ .

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

Starting from the slot  $n + \frac{T_{RRC\_Process} + T_1}{NR\ slot\ length}$  until the UE has completed the direct SCell activation, the UE shall report CQI index = 0 (out of range) if the UE has available uplink resources to report CQI for the SCells.

### 8.3.10 Direct SCell Activation of Multiple Downlink SCells at Handover

The requirements in this clause apply for UE being configured in the RRC reconfiguration message, TS 38.331 [2], for handover with 2 SCells for which the parameter  $sCellState$  is set to *activated*.

In MCG of NE-DC, MCG of NR-DC, or in stand-alone NR, the requirements in this clause shall apply when the following conditions are met:

- UE does not receive any RRC reconfiguration message for direct activation of SCells within the activation period defined in this clause,
- there is no other SCell activation, deactivation, addition or release before direct activation is completed for all the SCells activated by the single RRC reconfiguration message in this clause, and
- in NE-DC, there is no E-UTRAN SCell activation, deactivation, addition or release before the direct activation of SCells in this clause is completed.

The UE shall configure the SCells in activated state upon successful completion of the RRC reconfiguration procedure within the specified delay. The UE shall be capable to transmit valid CSI report and apply actions for the directly activated SCells no later than in slot  $n + \frac{N_{direct\_multiple\_scells}}{NR\ slot\ length}$  where:

- Slot  $n$  is the last slot overlapping with the PDSCH containing the RRC reconfiguration message,
- $N_{direct\_multiple\_scells} = T_{RRC\_process} + T_{interrupt} + T_2 + T_3 + T_{activation\_time\_multiple\_scells} + T_{CSI\_Reporting} - 3ms$  for the cases specified in clause 8.3.7 that TCI state is not indicated within  $T_{activation\_time}$ ; otherwise,  $N_{direct\_multiple\_scells} = T_{RRC\_process} + T_{interrupt} + T_2 + T_3 + T_{HARQ} + T_{activation\_time\_multiple\_scells} + T_{CSI\_Reporting}$ 
  - $T_{RRC\_Process}$ ,  $T_{interrupt}$ ,  $T_2$ , and  $T_3$  are specified in clause 8.3.5,
  - $T_{HARQ}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3],
  - $T_{activation\_time\_multiple\_scells}$  and  $T_{CSI\_Reporting}$  are specified in clause 8.3.7, where the following definitions of  $T_{FirstSSB}$ ,  $T_{FirstSSB\_MAX}$ , and  $T_{FirstSSB\_MAX\_multiple\_scells}$  shall override the existing ones:
    - $T_{FirstSSB}$ ,  $T_{FirstSSB\_MAX}$ : as specified in clause 8.3.5,
    - $T_{FirstSSB\_MAX\_multiple\_scell}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{T_{RRC\_Process} + T_{interrupt} + T_2 + T_3}{NR\ slot\ length}$ , further fulfilling:
      - In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCells being activated are transmitting SSB burst.
      - In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.321 [7] for an SCell at the first opportunities for the corresponding actions once the SCell is activated.

The UE may be allowed to cause interruptions to PCell during an interruption window, as specified in clause 8.2. The starting point of an interruption window on PCell shall not occur before slot  $n+1 + \frac{T_{RRC\ Processing} + T_{interrupt} + T_2 + T_3}{NR\ slot\ length}$ , and

not occur after slot  $n+1 + \frac{T_{RRC\ Processing} + T_{interrupt} + T_2 + T_3 + T_X}{NR\ slot\ length}$ , where NR slot length is with respect to the numerology of the SCell being activated, and  $T_X$  is:

- $T_{FirstSSB}$ , for any scenario where  $T_{activation\_time\_multiple\_cells}$  includes  $T_{FirstSSB}$ ;
- $T_{FirstSSB\_MAX}$ , for any scenario where  $T_{activation\_time\_multiple\_cells}$  includes  $T_{FirstSSB\_MAX}$ ;
- $T_{FirstSSB\_MAX\_multiple\_scell}$ , for any scenario where  $T_{activation\_time\_multiple\_cells}$  includes  $T_{FirstSSB\_MAX\_multiple\_scells}$ ;
- $T_{uncertainty\_MAC} + T_{FineTimings}$ , for any scenario where  $T_{activation\_time\_multiple\_cells}$  includes  $T_{FineTiming}$ .

The length of the interruption window depends on the frequency band relation between the aggressor SCell and the victim PCell.

Starting from the slot  $n + \frac{T_{RRC\_Process} + T_{interrupt} + T_2 + T_3}{NR\ slot\ length}$  and until the UE has completed the direct SCell activation, the UE shall report CQI index = 0 (out of range) if the UE has available uplink resources to report CQI for the SCells.

### 8.3.11 Direct SCell Activation of Multiple Downlink SCells at RRC Resume

The requirements in this clause apply for UE being configured in the RRC reconfiguration message in TS38.331 [2] for RRC Resume with 2 SCells for which the parameter  $sCellState$  is set to *activated*.

The requirements in clause 8.3.9 shall apply, except that the definition of  $T_I$  shall be replaced by the corresponding definition in clause 8.3.6.

## 8.3A SCell Activation and Deactivation Delay in Carriers with CCA

### 8.3A.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to activate a deactivated SCell operating with CCA and deactivate an activated SCell operating with CCA in EN-DC or in standalone NR carrier aggregation.

In the requirements of clause 8.3A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period; otherwise the SMTC occasion is considered as available at the UE.

In the requirements of clause 8.3A, the term CSI-RS occasion not available at the UE due to DL CCA failures refers to when the CSI-RS is configured by gNB for the UE but not available at the UE due to DL CCA failures at gNB during the corresponding period.

The requirements shall apply for EN-DC and standalone NR carrier aggregation.

### 8.3A.2 SCell Activation Delay Requirement for Deactivated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell operating with CCA in EN-DC or in standalone NR carrier aggregation and when one SCell operating with CCA is being activated but none of the RRC parameters *CO-DurationPerCell-r16*, *SlotFormatIndicator*, and *CSI-RS-ValidationWith-DCI-r16* is configured and all of the CSI reporting resources for being-activated SCell are available.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot  $n$ , the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot  $n + (T_{HARQ} + T_{activation\_time\_withCCA} + T_{CSI\_reporting\_withCCA})/NR\_slot\_length$ , where:

- $T_{\text{HARQ}}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]. In the event of UE not being able to transmit the acknowledgement due to UL CCA failures:  $T_{\text{HARQ}}$  is extended to also include the time to all next HARQ feedback transmission and retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213 [3]; no extension of  $T_{\text{HARQ}}$  due to UL CCA failures is allowed for Type 2C UL channel access procedure as defined in TS 37.213 [57].
- $T_{\text{activation\_time\_withCCA}}$  is the SCell activation delay in millisecond.
  - If the SCell is known,  $T_{\text{activation\_time\_withCCA}}$  is:
    - $T_{\text{FirstSSB}} + L_1 * T_{\text{rs}} + 5\text{ms}$ , if the SCell measurement cycle is equal to or smaller than 160ms.
    - $T_{\text{FirstSSB\_MAX}} + L_{2,1} * T_{\text{SMTC\_MAX}} + (1 + L_{2,2}) * T_{\text{rs}} + 5\text{ms}$ , if the SCell measurement cycle is larger than 160ms.
  - If the SCell is unknown, provided that the side condition  $\hat{E}_s / I_{\text{ot}} \geq -2$  dB is fulfilled and the SCell can be successfully detected in one attempt,  $T_{\text{activation\_time\_withCCA}}$  is:
    - $T_{\text{FirstSSB\_MAX}} + (1 + L_{3,1}) * T_{\text{SMTC\_MAX}} + (2 + L_{3,2}) * T_{\text{rs}} + 5\text{ms}$ .

Where,

$T_{\text{SMTC\_MAX}}$ :

- In case of intra-band SCell activation,  $T_{\text{SMTC\_MAX}}$  is the longest SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot;
- In case of inter-band SCell activation,  $T_{\text{SMTC\_MAX}}$  is the SMTC periodicity of SCell being activated;
- $T_{\text{SMTC\_MAX}}$  is bounded to a minimum value of 10ms.

$T_{\text{rs}}$  is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise  $T_{\text{rs}}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves  $T_{\text{rs}}$  is applied with  $T_{\text{rs}} = 5\text{ms}$  assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms

$T_{\text{FirstSSB}}$ : is the time to the end of the first complete configured SSB burst indicated by the SMTC after slot  $n + (T_{\text{HARQ}} + 3\text{ms}) / NR\_slot\_length$

$T_{\text{FirstSSB\_MAX}}$ : is the time to the end of first complete configured SSB burst indicated by the SMTC after slot  $n + (T_{\text{HARQ}} + 3\text{ms}) / NR\_slot\_length$  when all active serving cells and SCells being activated or released have configured SSB bursts in the same slot for intra-band scenario. In case of inter-band SCell activation,  $T_{\text{FirstSSB\_MAX}}$  is the time to the end of the first complete configured SSB burst of the SCell being activated.

$L_1$  ( $L_1 \leq L_{1,\text{max}}$ ) is the number of configured SMTC occasions not available at the UE.  $L_{1,\text{max}} = 2$  if  $T_{\text{rs}} \leq 40$  ms; otherwise  $L_{1,\text{max}} = 1$ .

$L_{2,1}$  ( $L_{2,1} \leq L_{2,1,\text{max}}$ ) and  $L_{3,1}$  ( $L_{3,1} \leq L_{3,1,\text{max}}$ ) are the numbers of configured SMTC occasions not available at the UE, for a known and unknown SCell activation respectively,

in the SCell being activated, for inter-band scenario, or

in any of the SCells already activated or being activated provided their cell specific reference signals are configured in the same slot, for intra-band scenario

and  $L_{2,1,\text{max}} = 2$  if  $T_{\text{SMTC\_MAX}} \leq 40$  ms; otherwise  $L_{2,1,\text{max}} = 1$ .  $L_{3,1,\text{max}} = 2$  if  $T_{\text{SMTC\_MAX}} \leq 40$  ms; otherwise  $L_{3,1,\text{max}} = 1$ .

$L_{2,2}$  ( $L_{2,2} \leq L_{2,2,\text{max}}$ ) and  $L_{3,2}$  ( $L_{3,2} \leq L_{3,2,\text{max}}$ ) are the number of configured SMTC occasions not available at the UE in the SCell being activated.  $L_{2,2,\text{max}} = 2$  if  $T_{\text{rs}} \leq 40$  ms; otherwise  $L_{2,2,\text{max}} = 1$ .  $L_{3,2,\text{max}} = 2$  if  $T_{\text{rs}} \leq 40$  ms; otherwise  $L_{3,2,\text{max}} = 1$ .

$T_{\text{CSI\_reporting\_withCCA}} = T_{\text{CSI\_reporting}} + T_{\text{CSI\_ReportingDelay}}$ , where

$T_{\text{CSI\_reporting}}$  is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2].

$T_{\text{CSI\_ReportingDelay}}$  is the additional delay in transmission of CSI reporting due to UL CCA failures at the UE. If there are no uplink resources for reporting the valid CSI, then the UE shall use the next available opportunities for reporting the corresponding valid CSI as specified in TS 38.213 [3].

Upon exceeding any of the maximum numbers  $L_{1,\text{max}}$ ,  $L_{2,1,\text{max}}$ ,  $L_{2,2,\text{max}}$ ,  $L_{3,1,\text{max}}$ , and  $L_{3,2,\text{max}}$  of SMTC occasions or CSI-RS occasions, respectively, not available at the UE, the UE shall abandon the SCell activation procedure.

SCell operating with CCA is known if it has been meeting the following conditions:

- During the period equal to  $\max(5 \text{ measCycleSCell}, 5 \text{ DRX cycles})$  before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable in the SMTC occasions available at the UE, according to the cell identification conditions specified in clause 9.2A and 9.3A.
- the SSB measured during the period equal to  $\max(5 \text{ measCycleSCell}, 5 \text{ DRX cycles})$  also remains detectable - the SSB measured during the period equal to  $\max(5 \text{ measCycleSCell}, 5 \text{ DRX cycles})$  also remains detectable in the SMTC occasions available at the UE during the SCell activation delay according to the cell identification conditions specified in clause 9.2A and 9.3A.

Otherwise SCell operating with CCA is unknown.

If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the activation command,  $T_{\text{SMTC\_Scell}}$  follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated.  $T_{\text{SMTC\_MAX}}$  follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [2] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

For intra-band CA, the starting point of an interruption window on SpCell or any activated SCell as specified in clause 8.2, shall not occur before slot  $n+1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  and not occur after slot  $n+1 + \frac{T_{\text{HARQ}}+3+T_{\text{X}}}{\text{NR slot length}}$ , where  $T_{\text{X}}$  is:

- $T_{\text{FirstSSB}}$ , for known SCell activation when SCell measurement cycle is equal to or smaller than 160ms;
- $T_{\text{FirstSSB\_MAX}} + L_{2,1} * T_{\text{SMTC\_MAX}}$  for known SCell activation when SCell measurement cycle is greater than 160ms;
- $T_{\text{FirstSSB\_MAX}} + L_{3,1} * T_{\text{SMTC\_MAX}}$  for unknown SCell activation

For inter-band CA, the starting point of an interruption window on SpCell or any activated SCell as specified in clause 8.2, shall not occur before slot  $n+1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  and not occur after slot  $n+1 + \frac{T_{\text{HARQ}}+3+T_{\text{X}}}{\text{NR slot length}}$ , where  $T_{\text{X}}$  is:

- $T_{\text{FirstSSB}}$ , for known SCell activation when SCell measurement cycle is equal to, or smaller than, 160ms.

For intra-band CA,

- While the SCell being activated is known with measurement cycle equal to or smaller than 160ms, no more than one interruption is allowed during SCell activation.
- While the SCell being activated is known with measurement cycle greater than 160ms, up to  $1+L_{2,1}$  interruptions are allowed during SCell activation,
- While the SCell being activated is unknown, up to  $1+L_{3,1}$  interruptions are allowed during SCell activation. When  $L_{3,1}>0$ , performance degradation may be expected on any activated intra-band victim cells during the SCell activation
- For a single interruption ( $L=0$ ), interruption window length at SCell activation does not depend on DL CCA failures.

For inter-band CA,

- For any active cell in the same band with the SCell being activated, the interruption requirements (i.e. number of interruptions and starting point of an interruption) for intra-band CA apply.
- For any active cell outside the band with the SCell being activated, a single interruption applies

The number of interruptions and length of each interruption window may be different for different victim cells and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell. For a single interruption ( $L=0$ ), the interruption window length at SCell activation does not depend on DL CCA failures.

Starting from slot  $n + T_{\text{HARQ}} + 3$  ms where slot  $n$  is the slot where SCell activation command is received (as specified in clause 4.3 of TS 38.213 [3]) and until the SCell activation completion at UE, after at least one CSI-RS transmission occasion for the channel measurement and reporting (specified in clause 5.2.2.5 of TS 38.214 [26]), the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

The requirements in this section do not apply when *sCellDeactivationTimer* [2] is not configured and when  $T_{\text{activation\_time\_withCCA}}$  exceeds 1280 ms.

### 8.3A.3 SCell Deactivation Delay Requirement for Activated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell operating with CCA in EN-DC or in standalone NR carrier aggregation.

Upon receiving SCell deactivation command in slot  $n$ , the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot  $n + (T_{\text{HARQ}} + 3\text{ms}) / \text{NR\_slot\_length}$ . The starting point of an interruption window on spCell or any activated SCell, as specified in clause 8.2, shall not occur before slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR\_slot\_length}}$  and not occur after slot  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR\_slot\_length}}$ , where NR slot length is with respect to the numerology used in the SCell being deactivated.

Upon expiry of the *sCellDeactivationTimer* in slot  $n$ , the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot  $n + \frac{3\text{ms}}{\text{NR\_slot\_length}}$ . The starting point of an interruption window on spCell or any activated SCell, as specified in clause 8.2, shall not occur before slot  $n + 1$  and not occur after slot  $n + 1 + \frac{3\text{ms}}{\text{NR\_slot\_length}}$ , where NR slot length is with respect to the numerology used in the SCell being deactivated.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The requirements in this section do not apply when *sCellDeactivationTimer* [2] is not configured and when SCell deactivation delay exceeds 1280 ms.

## 8.4 UE UL carrier RRC reconfiguration delay

### 8.4.1 Introduction

The requirements in this clause apply for a UE being configured or deconfigured with a supplementary UL carrier or NR UL carrier.

## 8.4.2 UE UL carrier configuration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within  $T_{UL\_carrier\_config}$  from the end of the slot  $n$ .

Where

- Slot  $n$  is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL\_carrier\_config}$  equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

## 8.4.3 UE UL carrier deconfiguration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within  $T_{UL\_carrier\_deconfig}$  from the end of the slot  $n$ .

Where

- Slot  $n$  is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL\_carrier\_deconfig}$  equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

# 8.5 Link Recovery Procedures

## 8.5.1 Introduction

The UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set  $\bar{Q}_0$  as specified in TS 38.213 [3] in order to detect beam failure on:

- PCell in SA, NR-DC, or NE-DC operation mode,
- PSCell in NR-DC and EN-DC operation mode,
- SCell in SA, NR-DC, NE-DC or EN-DC operation mode.

The RS resource configurations in the set  $\bar{Q}_0$  on PCell or PSCell can be periodic CSI-RS resources and/or SSBs. RS resource configuration in the set  $\bar{Q}_0$  on SCell shall be periodic CSI-RS. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in clause 8.5.2 and 8.5.3 if UE does not have set  $\bar{Q}_0$ . UE is not required to perform beam failure detection on a deactivated SCell, and also not required to perform beam failure detection on resources which is implicitly configured for a deactivated SCell. When more than 2 periodic CSI-RS resources on a CC are configured in the set  $\bar{Q}_0$  for current SCell or implicitly configured in the set  $\bar{Q}_0$  for other SCell, it is up to UE implementation to select two of CSI-RS resources in active BWP in current CC to perform beam failure detection. UE is not required to perform beam failure detection on a SCell on which  $\bar{Q}_0$  is not configured.

On each RS resource configuration in the set  $\bar{Q}_0$ , the UE shall estimate the radio link quality and compare it to the threshold  $Q_{out\_LR}$  for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold  $Q_{out\_LR}$  is defined as the level at which the downlink radio level link of a given resource configuration on set  $\bar{Q}_0$  cannot be reliably received and shall correspond to the  $BLER_{out} = 10\%$  block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection,  $Q_{out\_LR\_SSB}$  is derived based on the hypothetical PDCCH

transmission parameters listed in Table 8.5.2.1-1. For CSI-RS based beam failure detection,  $Q_{\text{out\_LR\_CSI-RS}}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5.3.1-1.

Upon request the UE shall deliver configuration indexes from the set  $\bar{Q}_1$  as specified in TS 38.213 [3], to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold  $Q_{\text{in\_LR}}$ , which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the  $Q_{\text{in\_LR}}$  threshold to the L1-RSRP measurement obtained from an SSB. The UE applies the  $Q_{\text{in\_LR}}$  threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by higher layer parameter *powerControlOffsetSS*. The RS resource configurations in the set  $\bar{Q}_1$  can be periodic CSI-RS resources or SSBs or both SSB and CSI-RS resources. UE is not required to perform candidate beam detection outside the active DL BWP. UE is not required to perform candidate beam detection on a SCell on which  $\bar{Q}_1$  is not configured.

## 8.5.2 Requirements for SSB based beam failure detection

### 8.5.2.1 Introduction

The requirements in this clause apply for each SSB resource in the set  $\bar{Q}_1$  configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5.2.2. The requirements in this clause could not be applicable if UE is required to perform beam failure detection on more than 1 serving cell per band.

**Table 8.5.2.1-1: PDCCH transmission parameters for beam failure instance**

| Attribute  | Value for BLER                  |
|--|---------------------------------|
| DCI format   | 1-0                             |
| Number of control OFDM symbols                                   | 2                               |
| Aggregation level (CCE)  | 8                               |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 0dB                             |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB                             |
| Bandwidth (PRBs)   | 24                              |
| Sub-carrier spacing (kHz)  | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity  | REG bundle size                 |
| REG bundle size  | 6                               |
| CP length  | Normal                          |
| Mapping from REG to CCE  | Distributed                     |

### 8.5.2.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set  $\bar{Q}_1$  estimated over the last  $T_{\text{Evaluate\_BFD\_SSB}}$  ms period becomes worse than the threshold  $Q_{\text{out\_LR\_SSB}}$  within  $T_{\text{Evaluate\_BFD\_SSB}}$  ms period.

The value of  $T_{\text{Evaluate\_BFD\_SSB}}$  is defined in Table 8.5.2.2-1 for FR1.

The value of  $T_{\text{Evaluate\_BFD\_SSB}}$  is defined in Table 8.5.2.2-2 for FR2 with scaling factor  $N=8$

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{MGRP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.
- $P=1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

- $P = \frac{1}{1 - \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ).
- $P = P_{\text{sharing factor}}$ , when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC period ( $T_{SSB} = T_{SMTCperiod}$ ).
- $P = \frac{1}{1 - \frac{T_{SSB}}{MGRP} - \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP$  and  $T_{SSB} < 0.5 * T_{SMTCperiod}$
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{SSB}}{MGRP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5 * T_{SMTCperiod}$
- $P = \frac{1}{1 - \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when the BFD-RS resource is partially overlapped with measurement gap ( $T_{SSB} < MGRP$ ) and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{SSB}}{MGRP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{\text{sharing factor}} = 1$ , if the BFD-RS resource outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.
  - $P_{\text{sharing factor}} = 3$ , otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter *smtc1*.  $T_{SMTCperiod}$  is the shortest SMTC period among all CCs in the same FR2 band, given the SMTC offset of all CCs in FR2 provided the same offset.

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

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

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



**Table 8.5.2.2-1: Evaluation period  $T_{\text{Evaluate\_BFD\_SSB}}$  for FR1**

| Configuration   | $T_{\text{Evaluate\_BFD\_SSB}}$ (ms)  |
|---|---|
| no DRX  | $\text{Max}(50, \text{Ceil}(5 \times P) \times T_{\text{SSB}})$                               |
| DRX cycle $\leq 320\text{ms}$   | $\text{Max}(50, \text{Ceil}(7.5 \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ |
| DRX cycle $> 320\text{ms}$  | $\text{Ceil}(5 \times P) \times T_{\text{DRX}}$   |
| Note: $T_{\text{SSB}}$ is the periodicity of SSB in the set $\bar{q}_0$ . $T_{\text{DRX}}$ is the DRX cycle length. |   |

**Table 8.5.2.2-2: Evaluation period  $T_{\text{Evaluate\_BFD\_SSB}}$  for FR2**

| Configuration   | $T_{\text{Evaluate\_BFD\_SSB}}$ (ms)   |
|---|--|
| no DRX  | $\text{Max}(50, \text{Ceil}(5 \times P \times N) \times T_{\text{SSB}})$                               |
| DRX cycle $\leq 320\text{ms}$   | $\text{Max}(50, \text{Ceil}(7.5 \times P \times N) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ |
| DRX cycle $> 320\text{ms}$  | $\text{Ceil}(5 \times P \times N) \times T_{\text{DRX}}$   |
| Note: $T_{\text{SSB}}$ is the periodicity of SSB in the set $\bar{q}_0$ . $T_{\text{DRX}}$ is the DRX cycle length. |  |

### 8.5.2.3 Measurement restriction for SSB based beam failure detection

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following scenarios.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

For FR2, when the SSB for BFD measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

For FR2, if the network configures same or mixed numerology between SSB for BFD measurement on one FR2 band and CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the other FR2 band, UE shall be able to perform the related SSB based measurements in one band without any measurement restrictions on the other band, provided that UE is capable of independent beam management on this FR2 band pair.

## 8.5.3 Requirements for CSI-RS based beam failure detection

### 8.5.3.1 Introduction

The requirements in this clause apply for each CSI-RS resource in the set  $\bar{q}_0$  of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set  $\bar{q}_0$  for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5.3.2. UE is not expected to perform beam failure detection measurements on the CSI-RS configured for BFD if the CSI-RS is not QCL-ed, with QCL-TypeD when applicable, with the RS in the active TCI state of any CORESET configured in the UE active BWP. The requirements in this clause apply when UE is required to perform beam failure detection on no more than 1 serving cell per band.

Table 8.5.3.1-1: PDCCH transmission parameters for beam failure instance

| Attribute   | Value for BLER           |
|---|--------------------------|
| DCI format  | 1-0                      |
| Number of control OFDM symbols                                      | 2                        |
| Aggregation level (CCE)   | 8                        |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | 0dB                      |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0dB                      |
| Bandwidth (PRBs)  | 48                       |
| Sub-carrier spacing (kHz)   | SCS of the active DL BWP |
| DMRS precoder granularity   | REG bundle size          |
| REG bundle size   | 6                        |
| CP length   | Normal                   |
| Mapping from REG to CCE   | Distributed              |

### 8.5.3.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set  $\bar{Q}$  estimated over the last  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  ms period becomes worse than the threshold  $Q_{\text{out\_LR\_CSI-RS}}$  within  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  ms period.

The value of  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  is defined in Table 8.5.3.2-1 for FR1.

The value of  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  is defined in Table 8.5.3.2-2 for FR2 with  $N=1$ . The requirements of  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{MGRP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.
- $P = 1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR2,

- $P = 1$ , when the BFD-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{MGRP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is not overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < MGRP$ )
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).
- $P = P_{\text{sharing factor}}$ , when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{MGRP} - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
- $T_{\text{SMTCperiod}} \neq MGRP$  or

- $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} < 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} = 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when the BFD-RS resource is partially overlapped with measurement gap ( $T_{\text{CSI-RS}} < \text{MGRP}$ ) and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < \text{MGRP}$ )
- $P_{\text{sharing factor}} = 1$ , if the BFD-RS resource outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,
- $P_{\text{sharing factor}} = 3$ , otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{\text{SMTCperiod}}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  corresponds to the value of higher layer parameter *smtc1*.  $T_{\text{SMTCperiod}}$  is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Note: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

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

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

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

The values of  $M_{\text{BFD}}$  used in Table 8.5.3.2-1 and Table 8.5.3.2-2 are defined as

- $M_{\text{BFD}} = 10$ , if the CSI-RS resource(s) in set  $\bar{q}_0$  used for BFD is transmitted with Density = 3 and over the bandwidth  $\geq 24$  PRBs.

The values of  $P_{\text{BFD}}$  used in Table 8.5.3.2-1 and Table 8.5.3.2-2 are defined as

For each CSI-RS resource in the set  $\bar{q}_0$  configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{\text{BFD}} = 1$ .

For each CSI-RS resource in the set  $\bar{q}_0$  configured for PSCell in NR-DC

$P_{\text{BFD}} = 2$  if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the set  $\bar{q}_0$  configured for a SCell

- $P_{\text{BFD}} = Z$  in EN-DC or NE-DC or SA.
- $P_{\text{BFD}} = 2 * Z$  in NR-DC.

Where  $Z$  is the number of band(s) on which UE is performing beam failure detection only for SCell

**Table 8.5.3.2-1: Evaluation period  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  for FR1**

| Configuration           | $T_{\text{Evaluate\_BFD\_CSI-RS}}$ (ms)  |
|-------------------------|--|
| no DRX                  | $\text{Max}(50, \text{Ceil}(M_{\text{BFD}} \times P \times P_{\text{BFD}}) \times T_{\text{CSI-RS}})$  |
| DRX cycle $\leq 320$ ms | $\text{Max}(50, \text{Ceil}(1.5 \times M_{\text{BFD}} \times P \times P_{\text{BFD}}) \times \text{Max}(T_{\text{DRX}}, T_{\text{CSI-RS}}))$ |
| DRX cycle $> 320$ ms    | $\text{Ceil}(M_{\text{BFD}} \times P \times P_{\text{BFD}}) \times T_{\text{DRX}}$   |
| Note:                   | $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$ . $T_{\text{DRX}}$ is the DRX cycle length.                 |

**Table 8.5.3.2-2: Evaluation period  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  for FR2**

| Configuration           | $T_{\text{Evaluate\_BFD\_CSI-RS}}$ (ms)   |
|-------------------------|---|
| no DRX                  | $\text{Max}(50, \text{Ceil}(M_{\text{BFD}} \times P \times N \times P_{\text{BFD}}) \times T_{\text{CSI-RS}})$  |
| DRX cycle $\leq 320$ ms | $\text{Max}(50, \text{Ceil}(1.5 \times M_{\text{BFD}} \times P \times N \times P_{\text{BFD}}) \times \text{Max}(T_{\text{DRX}}, T_{\text{CSI-RS}}))$ |
| DRX cycle $> 320$ ms    | $\text{Ceil}(M_{\text{BFD}} \times P \times N \times P_{\text{BFD}}) \times T_{\text{DRX}}$   |
| Note:                   | $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$ . $T_{\text{DRX}}$ is the DRX cycle length.                          |

### 8.5.3.3 Measurement restrictions for CSI-RS beam failure detection

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

For both FR1 and FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

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

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

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

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

For FR2, when the CSI-RS for BFD measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD or L1-RSRP measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for BFD measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for BFD measurement and the other CSI-RS. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.
  - The CSI-RS for BFD measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in set  $\bar{q}_1$  and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

## 8.5.4 Minimum requirement for L1 indication

When the radio link quality on all the RS resources in set  $\bar{q}_0$  is worse than  $Q_{\text{out\_LR}}$ , layer 1 of the UE shall send a beam failure instance indication to the higher layers.

The beam failure instance evaluation for the RS resources in set  $\bar{q}_0$  shall be performed as specified in clause 6 in TS 38.213 [3]. Two successive indications from layer 1 shall be separated by at least  $T_{\text{Indication\_interval\_BFD}}$ .

When DRX is not used,  $T_{\text{Indication\_interval\_BFD}}$  is  $\max(2\text{ms}, T_{\text{SSB-RS,M}})$  or  $\max(2\text{ms}, T_{\text{CSI-RS,M}})$ , where  $T_{\text{SSB-RS,M}}$  and  $T_{\text{CSI-RS,M}}$  is the shortest periodicity of all RS resources in set  $\bar{q}_0$  for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set  $\bar{q}_0$  or CSI-RS resource in the set  $\bar{q}_0$ .

When DRX is used, for SSB based link quality measurement,

- $T_{\text{Indication\_interval\_BFD}} = \text{Max}(1.5 \times \text{DRX\_cycle\_length}, 1.5 \times T_{\text{SSB-RS,M}})$ , if  $\text{DRX\_cycle\_length} \leq 320\text{ms}$ ,
- $T_{\text{Indication\_interval\_BFD}} = \text{DRX\_cycle\_length}$ , if  $\text{DRX\_cycle\_length} > 320\text{ms}$ .

When DRX is used, for CSI-RS based link quality measurement,

- $T_{\text{Indication\_interval\_BFD}} = \text{Max}(1.5 \times \text{DRX\_cycle\_length}, 1.5 \times T_{\text{CSI-RS,M}})$ , if  $\text{DRX\_cycle\_length} \leq 320\text{ms}$ ,
- $T_{\text{Indication\_interval\_BFD}} = \text{DRX\_cycle\_length}$ , if  $\text{DRX\_cycle\_length} > 320\text{ms}$ .

## 8.5.5 Requirements for SSB based candidate beam detection

### 8.5.5.1 Introduction

The requirements in this clause apply for each SSB resource in the set  $\bar{q}_1$  configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.5.2. The requirements in this clause apply when UE is required to perform beam failure detection on no more than 1 serving cell per band.

### 8.5.5.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set  $\bar{q}_1$  estimated over the last  $T_{\text{Evaluate\_CBD\_SSB}}$  ms period becomes better than the threshold  $Q_{\text{in\_LR}}$  provided SSB\_RP and SSB  $\hat{E}_s/I_{\text{ot}}$  are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 8.5.5.2-1 and 8.5.5.2-2 corresponding to the non-DRX mode, if the configured DRX cycle  $\leq 320\text{ms}$ .

The value of  $T_{\text{Evaluate\_CBD\_SSB}}$  is defined in Table 8.5.5.2-1 for FR1.

The value of  $T_{\text{Evaluate\_CBD\_SSB}}$  is defined in Table 8.5.5.2-2 for FR2 with scaling factor  $N=8$ .

where,

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB,
- $P = 1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{T_{\text{SMTCperiod}}}}$ , when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ).
- $P$  is  $P_{\text{sharing factor}}$ , when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC period ( $T_{\text{SSB}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}} - \frac{T_{\text{SSB}}}{T_{\text{SMTCperiod}}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{\text{SMTCperiod}} \neq \text{MGRP}$  or
  - $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{SSB}} < 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{SSB}} = 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{T_{\text{SMTCperiod}}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{SSB}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{SSB}}}{\text{MGRP}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ( $T_{\text{SSB}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < \text{MGRP}$ )
- $P_{\text{sharing factor}} = 1$ , if the candidate beam detection RS outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured
- $P_{\text{sharing factor}} = 3$ , otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is present,  $T_{\text{SMTCperiod}}$  follows *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  follows *smtc1*.  $T_{\text{SMTCperiod}}$  is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

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

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

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

The values of  $P_{\text{CBD}}$  used in Table 8.5.5.2-1 and Table 8.5.5.2-2 are defined as

For each SSB resource in the set  $\bar{q}_1$  configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{\text{CBD}} = 1$ .

For each SSB resource in the set  $\bar{q}_1$  configured for PSCell in NR-DC

- $P_{\text{CBD}} = 2$  if UE is configured for candidate beam detection on SCell, 1 otherwise.

For each SSB resource in the set  $\bar{q}_1$  configured for a SCell

- $P_{\text{CBD}} = Z$  in EN-DC or NE-DC or SA.
- $P_{\text{CBD}} = 2 * Z$  in NR-DC.

Where  $Z$  is the number of band(s) on which UE is performing beam failure detection only for SCell

**Table 8.5.5.2-1: Evaluation period  $T_{\text{Evaluate\_CBD\_SSB}}$  for FR1**

| Configuration                          | $T_{\text{Evaluate\_CBD\_SSB}}$ (ms)  |
|--|---|
| non-DRX, DRX cycle $\leq 320\text{ms}$ | $\text{Max}(25, \text{Ceil}(3 \times P \times P_{\text{CBD}}) \times T_{\text{SSB}})$                         |
| DRX cycle $> 320\text{ms}$             | $\text{Ceil}(3 \times P \times P_{\text{CBD}}) \times T_{\text{DRX}}$   |
| Note:                                  | $T_{\text{SSB}}$ is the periodicity of SSB in the set $\bar{q}_1$ . $T_{\text{DRX}}$ is the DRX cycle length. |

**Table 8.5.5.2-2: Evaluation period  $T_{\text{Evaluate\_CBD\_SSB}}$  for FR2**

| Configuration                          | $T_{\text{Evaluate\_CBD\_SSB}}$ (ms)  |
|--|---|
| non-DRX, DRX cycle $\leq 320\text{ms}$ | $\text{Max}(25, \text{Ceil}(3 \times P \times N \times P_{\text{CBD}}) \times T_{\text{SSB}})$                |
| DRX cycle $> 320\text{ms}$             | $\text{Ceil}(3 \times P \times N \times P_{\text{CBD}}) \times T_{\text{DRX}}$                                |
| Note:                                  | $T_{\text{SSB}}$ is the periodicity of SSB in the set $\bar{q}_1$ . $T_{\text{DRX}}$ is the DRX cycle length. |

### 8.5.5.3 Measurement restriction for SSB based candidate beam detection

For FR1, when the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for CBD measurement without any restrictions;
- If SSB and CSI-RS have different SCS-es,
- If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for CBD measurement without any restriction;

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

For FR2, when the SSB for CBD measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

For FR2, if the network configures same or mixed numerology between SSB for CBD measurement on one FR2 band and CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the other FR2 band, UE shall be able to perform the related SSB based measurements in one band without any measurement restrictions in the other band, provided that UE is capable of independent beam management on this FR2 band pair.

## 8.5.6 Requirements for CSI-RS based candidate beam detection

### 8.5.6.1 Introduction

The requirements in this clause apply for each CSI-RS resource in the set  $\bar{q}_1$  configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.6.2. The requirements in this clause apply when UE is required to perform beam failure detection on no more than 1 serving cell per band.

### 8.5.6.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set  $\bar{q}_1$  estimated over the last  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_LR}}$  within  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period provided CSI-RS  $\hat{E}_s/I_{\text{ot}}$  is according to Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in table 8.5.6.2-1 and 8.5.6.2-2 corresponding to the non-DRX mode, if the configured DRX cycle  $\leq 320$ ms.

The value of  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  is defined in Table 8.5.6.2-1 for FR1.

The value of  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  is defined in Table 8.5.6.2-2 for FR2 with scaling factor  $N=8$ .

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{MGRP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- $P = 1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR2,

- $P = 1$ , when candidate beam detection RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{MGRP}}$  when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is not overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < MGRP$ )
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).
- $P = P_{\text{sharing factor}}$ , when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ).



- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}} - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{\text{SMTCperiod}} \neq \text{MGRP}$  or
  - $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} < 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} = 0.5 \times T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- $P = \frac{3}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < \text{MGRP}$ )
- $P_{\text{sharing factor}} = 1$ , if the candidate beam detection RS outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.
- $P_{\text{sharing factor}} = 3$ , otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is present,  $T_{\text{SMTCperiod}}$  follows *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  follows *smtc1*.  $T_{\text{SMTCperiod}}$  is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Note: The overlap between CSI-RS for CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

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

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in clause 8.5.6.3.

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

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

The values of  $M_{\text{CBD}}$  used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

- $M_{\text{CBD}} = 3$ , if the CSI-RS resource configured in the set  $\bar{q}_1$  is transmitted with Density = 3 and over the bandwidth  $\geq 24$  PRBs.

The values of  $P_{\text{CBD}}$  used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

For each CSI-RS resource in the set  $\bar{q}_1$  configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{\text{CBD}} = 1$ .

For each CSI-RS resource in the set  $\bar{q}_1$  configured for PSCell in NR-DC

- $P_{\text{CBD}} = 2$  if UE configured for candidate beam detection on SCell, 1 otherwise.

For each CSI-RS resource in the set  $\bar{q}_1$  configured for a SCell

- $P_{\text{CBD}} = Z$  in EN-DC or NE-DC or SA.
- $P_{\text{CBD}} = 2 * Z$  in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

**Table 8.5.6.2-1: Evaluation period  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  for FR1**

| Configuration                          | $T_{\text{Evaluate\_CBD\_CSI-RS}}$ (ms)  |
|--|--|
| non-DRX, DRX cycle $\leq 320\text{ms}$ | $\text{Max}(25, \text{Ceil}(M_{\text{CBD}} \times P \times P_{\text{CBD}}) \times T_{\text{CSI-RS}})$                        |
| DRX cycle $> 320\text{ms}$             | $\text{Ceil}(M_{\text{CBD}} \times P \times P_{\text{CBD}}) \times T_{\text{DRX}}$   |
| Note:                                  | $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource in the set $\bar{q}_1$ . $T_{\text{DRX}}$ is the DRX cycle length. |

**Table 8.5.6.2-2: Evaluation period  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  for FR2**

| Configuration                          | $T_{\text{Evaluate\_CBD\_CSI-RS}}$ (ms)  |
|--|--|
| non-DRX, DRX cycle $\leq 320\text{ms}$ | $\text{Max}(25, \text{Ceil}(M_{\text{CBD}} \times P \times N \times P_{\text{CBD}}) \times T_{\text{CSI-RS}})$               |
| DRX cycle $> 320\text{ms}$             | $\text{Ceil}(M_{\text{CBD}} \times P \times N \times P_{\text{CBD}}) \times T_{\text{DRX}}$                                  |
| Note:                                  | $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource in the set $\bar{q}_1$ . $T_{\text{DRX}}$ is the DRX cycle length. |

### 8.5.6.3 Measurement restriction for CSI-RS based candidate beam detection

For both FR1 and FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for CBD measurement in the PRBs that overlap with an SSB.

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

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

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS based CBD measurement for without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer measurement period for CSI-RS based CBD measurement is expected, and no requirements are defined.

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

For FR2, when the CSI-RS for CBD measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for CBD measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both CSI-RS for CBD measurement and the other CSI-RS. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

## 8.5.7 Scheduling availability of UE during beam failure detection

Scheduling availability restrictions when the UE is performing beam failure detection are described in the following clauses.

### 8.5.7.1 Scheduling availability of UE performing beam failure detection with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

### 8.5.7.2 Scheduling availability of UE performing beam failure detection with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to beam failure detection when SSB is configured as BFD. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to beam failure detection when SSB is configured as BFD.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for beam failure detection.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on FR1 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which PCell or PSCell is configured.

### 8.5.7.3 Scheduling availability of UE performing beam failure detection on FR2

The following scheduling restriction applies due to beam failure detection.

- For the case where no RSs are provided for BFD, or when CSI-RS is configured for BFD is explicitly configured and is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON
  - There are no scheduling restrictions due to beam failure detection performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on BFD-RS resource symbols to be measured for beam failure detection.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to beam failure detection performed on FR2 serving cell(s) in different band(s), provided that UE is capable of independent beam management on this FR2 band pair. Additionally, there is no scheduling restriction if the UE is configured with different numerology between SSB on one FR2 band and data on the other FR2 band provided the UE is configured for IBM operation for the band pair.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for BFD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for BFD measurement.

#### 8.5.7.4 Scheduling availability of UE performing beam failure detection on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR DC

There are no scheduling restrictions on FR1 serving cell(s) due to beam failure detection performed on FR2 serving PCell and/or PSCell.

There are no scheduling restrictions on FR2 serving cell(s) due to beam failure detection performed on FR1 serving PCell and/or PSCell.

### 8.5.8 Scheduling availability of UE during candidate beam detection

Scheduling availability restrictions when the UE is performing L1-RSRP measurement for candidate beam detection are described in the following clauses.

#### 8.5.8.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

#### 8.5.8.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured as link recovery detection resource.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, TRS, CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on one serving cell apply to all other serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands.

#### 8.5.8.3 Scheduling availability of UE performing L1-RSRP measurement on FR2

The following scheduling restriction applies due to candidate beam detection

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, CSI-RS for tracking or CSI-RS for CQI on reference symbols to be measured for candidate beam detection.

When intra-band carrier aggregation in FR2 is configured, the scheduling restrictions on to one serving cell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to candidate beam detection performed on FR2 serving cell(s) in different band(s), provided that the FR2 serving cell(s) and the FR2 serving cell(s) for candidate beam detection are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair. Additionally, there is no scheduling restriction if the UE is configured with different numerology between SSB on one FR2 band and data on the other FR2 band provided the UE is configured for IBM operation for the band pair.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for CBD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for CBD measurement.

#### 8.5.8.4 Scheduling availability of UE performing L1-RSRP measurement on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR-DC

There are no scheduling restrictions on FR1 serving cell(s) due to L1-RSRP measurement performed on FR2 serving cell(s).

There are no scheduling restrictions on FR2 serving cell(s) due to L1-RSRP measurement performed on FR1 serving cell(s).

### 8.5.9 Requirements for Beam Failure Recovery in SCell

#### 8.5.9.1 Introduction

For the UE provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [3], if beam recovery procedure is triggered for any of SCells, the UE shall transmit SR for UL resource, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than  $Q_{out,LR}$ , and the index  $q_{new}$  for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS38.321 [7], if any, for a corresponding SCell.

For the UE not provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [3], if beam recovery procedure is triggered for any of SCells, the UE shall transmit preamble for UL-SCH resource application, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than  $Q_{out,LR}$ , and the index  $q_{new}$  for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS38.321 [7], if any, for a corresponding SCell.

#### 8.5.9.2 Requirement

Provided that UE is configured by *schedulingRequestIDForBFR* a configuration for LRR in a PUCCH transmission, after BFR is triggered on any of SCells as described in clause 5.17 of TS38.321 [7], UE shall be capable of transmit PUCCH with a LRR within a period of T, where

- $T = T_1 \times \text{Ceil}((T_2+D) / T_1)$  in which  $T_1$ ,  $T_2$  and D are defined as
  - $T_1$  is equal to the periodicity of PUCCH configured with *schedulingRequestIDForBFR*.
  - $T_2 = T_{\text{Evaluate\_CBD}}$  is the evaluation period specified in clause 8.5.5 or 8.5.6 for SSB or CSI-RS based candidate beam detection, that is  $T_{\text{Evaluate\_CBD\_SSB}}$  or  $T_{\text{Evaluate\_CBD\_CSI-RS}}$ , depending on the applicable reference signal configured for candidate beam detection.

- $D = 2\text{ms}$  is the UE Processing time.

## 8.5.10 Minimum requirement at transitions for beam failure detection

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each BFD-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each BFD-RS resource.

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

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for BFD present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition.

## 8.5A Link Recovery Procedures when CCA is used on target frequency

### 8.5A.1 Introduction

The requirements for link recovery procedure in the clause apply when CCA is used on a serving frequency on the downlink.

The UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set  $\bar{q}_0$  as specified in TS 38.213 [3] in order to detect beam failure on:

- PCell in SA operation mode,
- PSCell in EN-DC operation mode.

The RS resource configurations in the set  $\bar{q}_0$  can be periodic SSBs. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in clause 8.5A.2 and 8.5A.3 if UE does not have set  $\bar{q}_0$ .

On each RS resource configuration in the set  $\bar{q}_0$ , the UE shall estimate the radio link quality and compare it to the threshold  $Q_{\text{out\_LR,CCA}}$  for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold  $Q_{\text{out\_LR,CCA}}$  is defined as the level at which the downlink radio level link of a given resource configuration on set  $\bar{q}_0$  cannot be reliably received and shall correspond to the  $\text{BLER}_{\text{out,CCA}} = 10\%$  block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection,  $Q_{\text{out\_LR,SSB,CCA}}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5A.2.1-1.

Upon request the UE shall deliver configuration indexes from the set  $\bar{q}_1$  as specified in TS 38.213 [3], to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold  $Q_{\text{in\_LR,CCA}}$ , which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the  $Q_{\text{in\_LR,CCA}}$  threshold to the L1-RSRP measurement obtained from an SSB. The RS resource configurations in the set  $\bar{q}_1$  can be periodic SSBs. UE is not required to perform candidate beam detection outside the active DL BWP.

In the requirements of clause 8.5A, the term CBD-RS SSB occasions not available at the UE refers to when the CBD-RS SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the set of configured CBD-RS resources are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation period; otherwise the CBD-RS SSB is considered as available at the UE.

The requirements in clause 8.5A apply for any *channelAccessMode* configuration [TS 38.331, 2].

## 8.5A.2 Requirements for SSB based beam failure detection

### 8.5A.2.1 Introduction

The requirements in this clause apply for each SSB resource in the set  $\bar{q}_0$  configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5A.2.2, but occasionally may not be transmitted due to CCA operation.

**Table 8.5A.2.1-1: PDCCH transmission parameters for beam failure instance**

| Attribute  | Value for BLER                  |
|--|---------------------------------|
| DCI format   | 1-0                             |
| Number of control OFDM symbols                                   | 2                               |
| Aggregation level (CCE)  | 8                               |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 0dB                             |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB                             |
| Bandwidth (PRBs)   | 24                              |
| Sub-carrier spacing (kHz)  | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity  | REG bundle size                 |
| REG bundle size  | 6                               |
| CP length  | Normal                          |
| Mapping from REG to CCE  | Distributed                     |

### 8.5A.2.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured BFD-RS SSB resource in set  $\bar{q}_0$  estimated over the last  $T_{\text{Evaluate\_BFD\_SSB\_CCA}}$  ms period becomes worse than the threshold  $Q_{\text{out\_LR\_SSB\_CCA}}$  within  $T_{\text{Evaluate\_BFD\_SSB\_CCA}}$  ms period.

The value of  $T_{\text{Evaluate\_BFD\_SSB\_CCA}}$  is defined in Table 8.5A.2.2-1, where

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the BFD-RS SSB.
- $P=1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the BFD-RS SSB.

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{\text{SMTCPERIOD}}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{\text{SMTCPERIOD}}$  corresponds to the value of higher layer parameter *smtc1*.

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

**Table 8.5A.2.2-1: Evaluation period  $T_{\text{Evaluate\_BFD\_SSB\_CCA}}$**

| Configuration           | $T_{\text{Evaluate\_BFD\_SSB\_CCA}}$ (ms)  |   |
|-------------------------|--|---|
|                         | BFD-RS SSB Es/lot <sup>Note2</sup> $\geq -7$ dB  | BFD-RS SSB Es/lot <sup>Note2</sup> $< -7$ dB  |
| no DRX                  | $\text{Max}(50, \text{Ceil}((10 \times P) \times T_{\text{SSB}}))$                                     | $\text{Max}(50, \text{Ceil}((12 \times P) \times T_{\text{SSB}}))$                                      |
| DRX cycle $\leq 320$ ms | $\text{Max}(50, \text{Ceil}(1.5 \times 8 \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ | $\text{Max}(50, \text{Ceil}(1.5 \times 10 \times P) \times \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}))$ |
| DRX cycle $> 320$ ms    | $\text{Ceil}(7 \times P) \times T_{\text{DRX}}$  | $\text{Ceil}(8 \times P) \times T_{\text{DRX}}$   |

Note 1:  $T_{\text{SSB}}$  is the periodicity of SSB in the set  $\bar{q}_0$ .  $T_{\text{DRX}}$  is the DRX cycle length.  
Note 2: BFD-RS SSB Es/lot is the averaged BFD-RS SSB Es/lot over the most recent previous evaluation period.

### 8.5A.2.3 Measurement restriction for SSB based beam failure detection

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

When the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for BFD measurement.

### 8.5A.4 Minimum requirement for L1 indication

When the radio link quality on all the RS resources in set  $\bar{q}_0$  is worse than  $Q_{\text{out\_LR,CCA}}$ , layer 1 of the UE shall send a beam failure instance indication to the higher layers.

The beam failure instance evaluation for the RS resources in set  $\bar{q}_0$  shall be performed as specified in clause 6 in TS 38.213 [3]. Two successive indications from layer 1 shall be separated by at least  $T_{\text{Indication\_interval\_BFD\_CCA}}$ .

When DRX is not used,  $T_{\text{Indication\_interval\_BFD\_CCA}}$  is  $\max(2\text{ms}, T_{\text{SSB-RS,M}})$ , where  $T_{\text{SSB-RS,M}}$  is the shortest periodicity of all RS resources in set  $\bar{q}_0$  for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set  $\bar{q}_0$ .

When DRX is used, for SSB based link quality measurement,

- $T_{\text{Indication\_interval\_BFD\_CCA}} = \text{Max}(1.5 \times \text{DRX\_cycle\_length}, 1.5 \times T_{\text{SSB-RS,M}})$ , if  $\text{DRX\_cycle\_length} \leq 320\text{ms}$ ,
- $T_{\text{Indication\_interval\_BFD\_CCA}} = \text{DRX\_cycle\_length}$ , if  $\text{DRX\_cycle\_length} > 320\text{ms}$ .

### 8.5A.5 Requirements for SSB based candidate beam detection

#### 8.5A.5.1 Introduction

The requirements in this clause apply for each CBD-RS SSB resource in the set  $\bar{q}_1$  configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5A.5.2, but occasionally may not be transmitted due to CCA operation.

#### 8.5A.5.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CBD-RS SSB resource in set  $\bar{q}_1$  estimated over the last  $T_{\text{Evaluate\_CBD\_SSB\_CCA}}$  ms period becomes better than the threshold  $Q_{\text{in\_LR,CCA}}$  provided  $\text{SSB\_RP}$  and  $\text{SSB } \hat{E}_s/\text{Iot}$  are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 8.5A.5.2-1 corresponding to the non-DRX mode, if the configured DRX cycle  $\leq 320\text{ms}$ .

The value of  $T_{\text{Evaluate\_CBD\_SSB\_CCA}}$  is defined in Table 8.5A.5.2-1, where

- $P = \frac{1}{1 - \frac{T_{\text{SSB}}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CBD-RS SSB,
- $P = 1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the CBD-RS SSB.



**Table 8.5A.5.2-1: Evaluation period  $T_{\text{Evaluate\_CBD\_SSB\_CCA}}$** 

| Configuration                    | $T_{\text{Evaluate\_CBD\_SSB\_CCA}}$ (ms)   |
|----------------------------------|---|
| non-DRX, DRX cycle $\leq 320$ ms | $\text{Max}(25, \text{Ceil}((3 + L_{\text{CBD}}) \times P) \times T_{\text{SSB}})$  |
| DRX cycle $> 320$ ms             | $\text{Ceil}((3 + L_{\text{CBD}}) \times P) \times T_{\text{DRX}}$  |
| Note 1:                          | $T_{\text{SSB}}$ is the periodicity of SSB in the set $\bar{q}_1$ . $T_{\text{DRX}}$ is the DRX cycle length.   |
| Note 2:                          | When DRX is not configured, $L_{\text{CBD}}$ is the number of CBD-RS SSB occasions not available at the UE during $T_{\text{Evaluate\_CBD\_SSB\_CCA}}$ where $L_{\text{CBD}} \leq L_{\text{CBD,max}}$ . When DRX is configured, $L_{\text{CBD}}$ is the number of DRX cycles in which at least one of the CBD-RS SSB occasions not available at the UE during $T_{\text{Evaluate\_CBD\_SSB\_CCA}}$ where $L_{\text{CBD}} \leq L_{\text{CBD,max}}$ . The UE, which is configured with DRX, is not required to determine the availability of SSB occasions more frequent than<br>Once per $\text{Max}(25\text{ms}, P \times T_{\text{SSB}})$ if DRX cycle $\leq 320$ ms,<br>Once per $P \times T_{\text{DRX}}$ if DRX cycle $> 320$ ms. |
| Note 3:                          | $L_{\text{CBD,max}}=7$ for $\text{Max}(T_{\text{DRX}}, T_{\text{SSB}}) \leq 40$ assuming $T_{\text{DRX}}=0$ for non-DRX,<br>$L_{\text{CBD,max}}=5$ for $40 < \text{Max}(T_{\text{DRX}}, T_{\text{SSB}}) \leq 320$ ,<br>$L_{\text{CBD,max}}=3$ for $T_{\text{DRX}} > 320$ .  |
| Note 4:                          | If $L_{\text{CBD}} > L_{\text{CBD,max}}$ , the UE shall assume no new candidate beams are found for this evaluation period.   |

### 8.5A.5.3 Measurement restriction for SSB based candidate beam detection

When the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for CBD measurement without any restrictions;
- If SSB and CSI-RS have different SCS-es,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for CBD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for CBD measurement.

### 8.5A.7 Scheduling availability of UE during beam failure detection

Scheduling availability restrictions when the UE is performing beam failure detection are described in the following clauses.

#### 8.5A.7.1 Scheduling availability of UE performing beam failure detection with a same subcarrier spacing as PDSCH/PDCCH

In this clause, the same requirements apply as in Clause 8.5.7.1.

#### 8.5A.7.2 Scheduling availability of UE performing beam failure detection with a different subcarrier spacing than PDSCH/PDCCH

In this clause, the same requirements apply as in Clause 8.5.7.2.

### 8.5A.8 Scheduling availability of UE during candidate beam detection

Scheduling availability restrictions when the UE is performing L1-RSRP measurement for candidate beam detection are described in the following clauses.

### 8.5A.8.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH

In this clause, the same requirements apply as in Clause 8.5.8.1.

### 8.5A.8.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH

In this clause, the same requirements apply as in Clause 8.5.8.2.

## 8.6 Active BWP switch delay

### 8.6.1 Introduction

The requirements in this clause apply for a UE configured PCell or any activated SCell in standalone NR or NE-DC, PCell, PSCell or any activated SCell in MCG or SCG in NR-DC, or PSCell or any activated SCell in SCG in EN-DC. The requirements in this clause also apply for a UE configured with more than one BWP on PCell or any activated SCell with CCA in standalone NR, or PSCell or any activated SCell with CCA in SCG in EN-DC. The requirements in 8.6.4 apply for a UE which is capable of *ul-LBT-FailureDetectionRecovery-r16* configured with more than one UL BWP on PCell with CCA in standalone NR or PSCell with CCA in EN-DC.

UE shall complete the switch of active DL and/or UL BWP within the delay defined in this clause.

### 8.6.2 DCI and timer based BWP switch delay on a single CC

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with more than one BWP configurations configured.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot  $n$  on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of  $T_{\text{BWPswitchDelay}} + Y$  which starts from the beginning of DL slot  $n$ . Where,

- $Y=0$ , if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.
- $Y$  equals to the length of 1 slot, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. In this scenario,  $T_{\text{BWPswitchDelay}} + Y$  shall follow the smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of  $T_{\text{BWPswitchDelay}}$  which starts from the beginning of DL slot  $n$  except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot  $n$ , where slot  $n$  is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [2] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of  $T_{\text{BWPswitchDelay}}$  which starts from the beginning of DL slot  $n$ .

The UE is not required to transmit UL signals or receive DL signals during time duration  $T_{\text{BWPswitchDelay}}$  after *bwp-InactivityTimer* [2] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{\text{BWPswitchDelay}}$  defined in Table 8.6.2-1.

**Table 8.6.2-1: BWP switch delay**

| $\mu$  | NR Slot length (ms) | BWP switch delay $T_{\text{BWPswitchDelay}}$ (slots) |                          |
|--|---------------------|--|--------------------------|
|  |                     | Type 1 <sup>Note 1</sup>                             | Type 2 <sup>Note 1</sup> |
| 0  | 1                   | 1  | 3                        |
| 1  | 0.5                 | 2  | 5                        |
| 2  | 0.25                | 3  | 9                        |
| 3  | 0.125               | 6  | 18                       |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. |                     |  |                          |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in the new BWP.

If the BWP switch is triggered within or outside DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 7], UE shall be able to complete active BWP switching within the time duration of

- $T_{\text{dormantBWPswitchDelay}} = T_{\text{BWPswitchDelay}} + X$ , provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or
- $T_{\text{dormantBWPswitchDelay}} = T_{\text{BWPswitchDelay}} + X + Z$ , provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where
- $T_{\text{BWPswitchDelay}}$  is defined in Table 8.6.2-1 corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs;
- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.
- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where UE receives dormancy indication.

For DCI-based BWP switch, if the new BWP is a dormant BWP, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive CSI-RS (for DL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL slot occurs right after a time duration of  $T_{\text{dormantBWPswitchDelay}}$  which starts from the beginning of DL slot n.

## 8.6.2A DCI based BWP switch delay on multiple CCs

The requirements in this clause only apply to the case when the same type of BWP switch (DCI based BWP switch) is performed on multiple CCs simultaneously or over partially overlapping time period.

### 8.6.2A.1 Simultaneous DCI based BWP switch delay on multiple CCs

The delay requirements for simultaneous DCI based BWP switch on multiple CCs in this clause apply only if the timing difference among the first symbol of slot carrying DCI for all CCs is received within the MRTD for inter-band CA as defined in clause 7.6.4.

For DCI-based BWP switch on multiple CCs, after the UE receives BWP switching request, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of  $T_{\text{MultipleBWPswitchDelay}}$  which starts from the beginning of DL slot  $n$ , where slot  $n$  is slot which UE receives the earliest BWP switching request among CCs on which UE is performing simultaneous DCI-based BWP switching.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of  $T_{\text{MultipleBWPswitchDelay}}$  which starts from the beginning of DL slot  $n$  except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths on any serving cell.

UE shall finish BWP switch within the time duration  $T_{\text{MultipleBWPswitchDelay}} + Y$ , which is defined as:

$$T_{\text{MultipleBWPswitchDelay}} = T_{\text{BWPswitchDelay}} + D \cdot (N-1)$$

Where:

- $T_{\text{BWPswitchDelay}}$  is the BWP switching delay on single CC defined in Table 8.6.2-1 depending on UE capability *bwp-SwitchingDelay* [2].  $T_{\text{BWPswitchDelay}}$  shall be based on the smallest SCS among SCS of all involved CCs before and after BWP switch. If the BWP switch on multiple CCs results in the change of the SCS on any CC among involved CCs,  $T_{\text{BWPswitchDelay}}$  should be based on the smallest SCS among all SCS values of all involved CCs.
- $D$  is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [TS 38.306, 14] for switching between non-dormant BWPs, and *bwp-SwitchingMultiDormancyCCs-r16* for switching between non-dormant and dormant BWPs.
- For UE which is capable of per-FR gap, and no BWP switch involves SCS change,  $N$  is the number of CCs in same FR; For UE which is not capable of per-FR gap, or the BWP switches on any CC involves SCS changing,  $N$  is the number of CCs undergoing simultaneous BWP switch.
- $Y=0$ , if the serving cell where UE receives DCI for BWP switch is same as the serving cell on which BWP switch occurs for each involved serving cell.

$Y$  equals to the length of one slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change,

- if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in the new BWP.

If the BWP switch is triggered on multiple CCs simultaneously within or outside DRX active time, and one of the two BWPs on each CC in a BWP switching is a dormant BWP [TS 38.321, 7], UE shall be able to complete active BWP switching within the time duration of

- $T_{\text{DormantMultipleBWPswitchDelay}} = T_{\text{MultipleBWPswitchDelay}} + X$ , provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or
- $T_{\text{DormantMultipleBWPswitchDelay}} = T_{\text{MultipleBWPswitchDelay}} + X + Z$ , provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where
- $T_{\text{MultipleBWPswitchDelay}}$  is defined above corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs;

- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.
- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where DCI for dormancy indication is received.

The number of CCs, N, on which the UE can simultaneously switch BWPs while still meeting the requirements, if any, related to allocations on downlink, uplink, or transmission of HARQ-ACK, depends on the UE reported capabilities related to BWP switching, the network configuration and the BWP switch method.

### 8.6.2A.2 Non-simultaneous DCI based BWP switch delay on multiple CCs

In non-simultaneous case, the DCI-based BWP switch on multiple CCs is triggered over partially overlapping time period between CCs or multiple CCs in different Cell groups. The delay requirements for non-simultaneous DCI based BWP switch on multiple CCs in this clause apply only if:

- the timing difference among the first symbol of slot carrying DCI for all CCs involved in non-simultaneous BWP switch is received exceeds the MRTD for inter-band CA as defined in clause 7.6.4, and
- UE is operating in NR-DC (FR1+FR2), and
- UE is capable of per-FR gap, and
- BWP switch does not involve SCS change

For non-simultaneous DCI based BWP switch on multiple CCs, BWP switching delay requirements defined in clause 8.6.2 apply when BWP switching occurs on single CC in the cell group. BWP switching delay requirements defined in clause 8.6.2A.1 apply when simultaneous BWP switching occurs on multiple CCs in the cell group.

### 8.6.2B Timer based BWP switch delay on multiple CCs

The requirements in this clause only apply to the case when the same type of BWP switch (timer based BWP switch) is performed on multiple CCs simultaneously or over partially overlapping time period.

#### 8.6.2B.1 Simultaneous timer based BWP switch delay on multiple CCs

The delay requirements for simultaneous timer based BWP switch on multiple CCs in this clause apply only if the timing difference among the beginning of the slot where timer based BWP switching starts for all CCs is within the MRTD for inter-band CA as defined in clause 7.6.4.

For timer-based BWP switch on multiple CCs, UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (in FR1) or DL half-subframe ((in FR2) immediately after the earliest BWP-inactivity timer *bwp-InactivityTimer* [2] expiration occurs on multiple serving cells, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of  $T_{\text{MultipleBWPswitchDelay}}$  which starts from the beginning of DL slot n, where  $T_{\text{MultipleBWPswitchDelay}}$  is defined in 8.6.2A.1.

The UE is not required to transmit UL signals or receive DL signals during time duration  $T_{\text{MultipleBWPswitchDelay}}$  after *bwp-InactivityTimer* [2] expires on the cell where timer-based BWP switch occurs.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in the new BWP.

### 8.6.2B.2 Non-simultaneous timer based BWP switch delay on multiple CCs

In non-simultaneous case, the timer-based BWP switch on multiple CCs is triggered over partially overlapping time period.

The delay requirements for non-simultaneous timer based BWP switch on multiple CCs in this clause apply if the timing difference among the beginning of the slot where timer based BWP switching starts for all CCs is exceeds the MRTD for inter-band CA as defined in clause 7.6.4, and the BWP switch does not involve SCS change. The UE performs the non-simultaneous timer-based BWP switch on the CCs sequentially.

For non-simultaneous timer-based BWP switch, the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of  $T_{\text{MultipleBWPswitchDelayTotal}}$  which starts from the beginning of DL slot  $n$ , where slot  $n$  is the first slot of a DL subframe (in FR1) or DL half-subframe (in FR2) immediately after the earliest BWP-inactivity timer *bwp-InactivityTimer* [2] expires.

$$T_{\text{MultipleBWPswitchDelayTotal}} = T_{\text{Delay}} + T_{\text{MultipleBWPswitchDelay}}$$

Where:

$T_{\text{Delay}}$  is the time required to complete the ongoing timer-based BWP switching on other CCs.

$T_{\text{MultipleBWPswitchDelay}}$  is the timer-based BWP switch delay on current single CC defined in clause 8.6.2 or simultaneously triggered on multiple CCs defined in clause 8.6.2B.1.

The UE is not required to transmit UL signals or receive DL signals during time duration  $T_{\text{MultipleBWPswitchDelayTotal}}$  after *bwp-InactivityTimer* [2] expires on the cell where timer-based BWP switch occurs.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in the new BWP.

### 8.6.3 RRC based BWP switch delay on a single CC

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with one or more than one BWP configuration(s) configured, with

- Active BWP switch or parameter change of its active BWPs for SpCell
- Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCell

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of  $\frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$  slots which begins from the beginning of DL slot  $n$ , where

DL slot  $n$  is the last slot overlapping with the PDSCH containing the RRC command, and

*NR Slot length* is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{\text{RRCprocessingDelay}}$  is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [2], and

$T_{BWPswitchDelayRRC} = 6ms$  is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  on the cell where RRC-based BWP switch occurs. When  $T_{HARQ} > T_{RRCprocessingDelay}$  a longer switching delay is allowed. Where  $T_{HARQ}$  is the time between DL data transmission and acknowledgement as specified in TS 38.213 [3].

### 8.6.3A RRC based BWP switch delay on multiple CCs

The requirements in this clause only apply to the case when the same type of BWP switch (RRC based BWP switch) is performed on multiple CCs simultaneously or over partially overlapping time period.

The requirements in this clause shall apply:

- Active BWP switching or parameter change of its active BWPs for SpCell
- Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCells

#### 8.6.3A.1 Simultaneous RRC based BWP switch delay on multiple CCs

Requirements in this clause apply only if RRC based BWP switching on multiple CCs for NR-CA is triggered by a single RRC command.

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWPs, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch occurs on the first DL or UL slot right after a time duration of  $\frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC} * (N - 1)}{NR\ slot\ length}$  slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3, and

$D_{RRC} = 0$  for UE which is capable of type 1 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [2],  $D_{RRC} = D$  for UE which is capable of type 2 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [2], where D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability [TS 38.306, 14].

N is the number of CCs within the NR-CA configured for performing simultaneous BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC} * (N - 1)$  on the cells where RRC-based BWP switch occurs.

#### 8.6.3A.2 Non-simultaneous RRC based BWP switch delay on multiple CCs

In non-simultaneous case, the RRC-based BWP switch on multiple CCs is triggered over partially overlapping time period in different Cell groups. The delay requirements in this clause apply only if:

BWP switching on multiple CCs in different cell groups are triggered by separate RRC commands, and

UE is operating in NR-DC (FR1+FR2), and

UE is capable of per-FR gap, and

BWP switch does not involve SCS change.

For non-simultaneous RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWPs, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch

occurs on the first DL or UL slot right after a time duration of  $\frac{T_{Waiting} + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC} * (M - 1)}{NR\ slot\ length}$  slots which begins from the beginning of DL slot  $n$ , where

DL slot  $n$  is the last slot containing the RRC command,

$T_{Waiting}$  is the waiting time for RRC based BWP switch which is upper bounded by the ongoing BWP switch time in the first CG defined in clause 8.6.3A.1,

$M$  is the number of CCs within the NR-CA configured for performing simultaneous BWP switch in the second CG;  $M=1$  if the BWP switch is performed on single CC,

$T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3, and

$D_{RRC}$  is defined in clause 8.6.3A.1.

The UE is not required to transmit UL signals or receive DL signals during the time defined by  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC} * (M - 1)$  on the cells in the second CG where RRC-based BWP switch occurs.

## 8.6.4 BWP switch delay on Consistent UL CCA recovery

Upon detection of consistent UL CCA failure is slot# $n$  in SpCell when UE detects *lbt-FailureInstanceMaxCount* number of CCA failure within *lbt-FailureDetectionTimer*, the UE shall switch the active UL BWP to an UL BWP configured with PRACH occasion and for which consistent CCA failure has not been triggered as defined in TS 38.321 clause 5.21 [7]. The UE shall be ready to transmit PRACH on the new UL BWP of the SpCell on the first UL slot occurs right after slot  $n + T_{BWPswitchDelay} + 1$ , where  $T_{BWPswitchDelay}$  is defined in Table 8.6.2-1. The UE shall finish the UL BWP switch within the time duration  $T_{BWPswitchDelay}$  depending on UE capability *bwp-SwitchingDelay* [2].

Note: Additional delay in acquiring the first available RACH occasion will be derived in a way similar to that in handover in clause 6.1B.1.

The UE is not required to transmit UL signals or receive DL signals during time duration  $T_{BWPswitchDelay}$  on the SpCell in the UL BWP switch. The UE is not required to follow the requirements defined in this clause when performing a UL BWP switch between the UL BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

## 8.7 Void

## 8.8 NE-DC: E-UTRAN PSCell Addition and Release Delay

### 8.8.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to configure an E-UTRAN PSCell in NR - E-UTRA dual connectivity. The requirements are applicable to an NR - E-UTRA dual connectivity capable UE.

### 8.8.2 E-UTRAN PSCell Addition Delay Requirement

The requirements in this clause shall apply for the UE, which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving E-UTRAN PSCell addition in subframe  $n$ , the UE shall be capable to transmit PRACH preamble towards E-UTRAN PSCell no later than in subframe  $n + T_{config\_EUTRAN-PSCell}$ :

Where:

$$T_{config\_EUTRAN-PSCell} = T_{RRC\_delay} + T_{activation\_time} + 50ms + T_{E-UTRAN-PSCell\_DU}$$

$T_{RRC\_delay}$  is the RRC procedure delay as specified in TS 38.331 [2].



$T_{\text{activation\_time}}$  is the E-UTRAN PSCell activation delay. If the E-UTRAN PSCell is known, then  $T_{\text{activation\_time}}$  is 20ms. If the E-UTRAN PSCell is unknown, then  $T_{\text{activation\_time}}$  is 30ms provided the E-UTRAN PSCell can be successfully detected on the first attempt.

$T_{\text{E-UTRAN-PSCell\_DU}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell.  $T_{\text{E-UTRAN-PSCell\_DU}}$  is up to 30ms.

E-UTRAN PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the E-UTRAN PSCell configuration command:
  - the UE has sent a valid measurement report for the E-UTRAN PSCell being configured and
  - the E-UTRAN PSCell being configured remains detectable according to the cell identification conditions specified in clause 8.8 of TS 36.133 [15],
- E-UTRAN PSCell being configured also remains detectable during the E-UTRAN PSCell configuration delay  $T_{\text{config\_EUTRAN-PSCell}}$  according to the cell identification conditions specified in clause 8.8 of TS 36.133 [15].

otherwise it is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

### 8.8.3 E-UTRAN PSCell Release Delay Requirement

The requirements in this clause shall apply for a UE which is configured with PCell and E-UTRAN PSCell and may also be configured with one or more SCells and/or E-UTRAN SCells.

Upon receiving E-UTRAN PSCell release in subframe  $n$ , the UE shall accomplish the release actions specified in TS 38.331 [2] no later than in subframe  $n + T_{\text{RRC\_delay}}$ :

Where

$T_{\text{RRC\_delay}}$  is the RRC procedure delay as specified in TS 38.331 [2].

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

## 8.9 NR-DC: PSCell Addition and Release Delay

### 8.9.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to configure an PSCell in NR dual connectivity. The requirements are applicable to an NR dual connectivity capable UE.

### 8.9.2 PSCell Addition Delay Requirement

The requirements in this clause shall apply for the UE configured with only PCell in FR1.

Upon receiving PSCell addition in subframe  $n$ , the UE shall be capable to transmit PRACH preamble towards PSCell in FR2 no later than in slot  $n + \frac{T_{\text{config\_PSCell}}}{\text{NR slot length}}$ .

where:

$$T_{\text{config\_PSCell}} = T_{\text{RRC\_delay}} + T_{\text{processing}} + T_{\text{search}} + T_{\Delta} + T_{\text{PSCell\_DU}} + 2 \text{ ms}$$

$T_{\text{RRC\_delay}}$  is the RRC procedure delay as specified in TS 38.331 [2].

$T_{\text{processing}}$  is the SW processing time needed by UE, including RF warm up period.  $T_{\text{processing}} = 40 \text{ ms}$ .

$T_{\text{search}}$  is the time for AGC settling and PSS/SSS detection. If the target cell is known,  $T_{\text{search}} = 0 \text{ ms}$ . If the target cell is unknown and the target cell  $\hat{E}_s/I_{ot} \geq -2\text{dB}$ ,  $T_{\text{search}} = 24 * T_{\text{rs}}$  ms.

$T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = 1 * T_{rs}$  ms for a known or unknown PSCell.

$T_{PSCell\_DU}$  is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell.  $T_{PSCell\_DU}$  is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [3].

$T_{rs}$  is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise  $T_{rs}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{rs} = 5$  ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the PSCell configuration command:
  - the UE has sent a valid measurement report for the PSCell being configured and
  - One of the SSBs measured from the PSCell being configured remains detectable according to the cell identification conditions specified in clause 9.3.
- One of the SSBs measured from PSCell being configured also remains detectable during the PSCell configuration delay  $T_{config\_PSCell}$  according to the cell identification conditions specified in clause 9.3.

otherwise it is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

### 8.9.3 PSCell Release Delay Requirement

The requirements in this clause shall apply for a UE which is configured with PCell and one PSCell.

Upon receiving PSCell release in subframe  $n$ , the UE shall accomplish the release actions specified in TS 38.331 [2] no later than in slot  $n + \frac{T_{RRC\_delay}}{NR\ slot\ length}$ :

where

$T_{RRC\_delay}$  is the RRC procedure delay as specified in TS 38.331 [2].

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

## 8.10 Active TCI state switching delay

### 8.10.1 Introduction

The requirements in this clause apply for a UE configured with one or more TCI state configurations on serving cell in MR-DC or standalone NR. UE shall complete the switch of active TCI state within the delay defined in this clause.

### 8.10.2 Known conditions for TCI state

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state
  - TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
- The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command

- The TCI state remains detectable during the TCI state switching period
- The SSB associated with the TCI state remain detectable during the TCI switching period
  - SNR of the TCI state  $\geq -3\text{dB}$

Otherwise, the TCI state is unknown.

### 8.10.3 MAC-CE based TCI state switch delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot  $n$ , UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe},\mu} + \text{TO}_k * (T_{\text{first-SSB}} + T_{\text{SSB-proc}}) / NR \text{ slot length}$ . The UE shall be able to receive PDCCH with the old TCI state until slot  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe},\mu}$ . Where  $T_{\text{HARQ}}$  is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3];

- $T_{\text{first-SSB}}$  is time to first SSB transmission after MAC CE command is decoded by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{\text{SSB-proc}} = 2 \text{ ms}$ ;
- $\text{TO}_k = 1$  if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise.

If the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot  $n$ , UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe},\mu} + T_{\text{L1-RSRP}} + \text{TO}_{\text{uk}} * (T_{\text{first-SSB}} + T_{\text{SSB-proc}}) / NR \text{ slot length}$ . The UE shall be able to receive PDCCH with the old TCI state until slot  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe},\mu}$ .

Where

- $T_{\text{L1-RSRP}} = 0$  in FR1 or when the TCI state switching not involving QCL-TypeD in FR2. Otherwise,
- $T_{\text{L1-RSRP}}$  is the time for Rx beam refinement in FR2, defined as
  - $T_{\text{L1-RSRP\_Measurement\_Period\_SSB}}$  for SSB as specified in clause 9.5.4.1,
    - with the assumption of  $M=1$
    - with  $T_{\text{Report}} = 0$
  - $T_{\text{L1-RSRP\_Measurement\_Period\_CSI-RS}}$  for CSI-RS as specified in clause 9.5.4.2
    - configured with higher layer parameter *repetition* set to ON
    - with the assumption of  $M=1$  for periodic CSI-RS
    - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
    - with  $T_{\text{Report}} = 0$
- $\text{TO}_{\text{uk}} = 1$  for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD
- $\text{TO}_{\text{uk}} = 1$  when TCI state switching involves other QCL types only
- $T_{\text{first-SSB}}$  is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;
- $T_{\text{first-SSB}}$  is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;
- The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

## 8.10.4 DCI based TCI state switch delay

If the target TCI state is known, when a UE is configured with the higher layer parameter *tcj-PresentInDCI* which is set as 'enabled' for the CORESET scheduling PDSCH at slot *n*, UE shall be able to receive PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + \text{timeDurationForQCL}$ , where, *timeDurationForQCL* is the time required by the UE to perform PDCCH reception and applying spatial QCL information received in DCI for PDSCH processing as described in TS 38.214 [26], the value of *timeDurationForQCL* is defined in TS 38.331 [2].

The known condition for TCI state defined in clause 8.10.2 is applied.

## 8.10.5 RRC based TCI state switch delay

If the target TCI state is known, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + (T_{\text{RRC\_processing}} + \text{TO}_k * (T_{\text{first-SSB}} + T_{\text{SSB-proc}})) / \text{NR slot length}$ , The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot *n* is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{\text{RRC\_processing}}$  is the RRC processing delay defined in Clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in Clause 12 of TS 38.331 [2].
- $T_{\text{first-SSB}}$  is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state.
- $T_{\text{SSB-proc}}$  and  $\text{TO}_k$  are defined in clause 8.10.3.

If the target TCI state is unknown, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + (T_{\text{RRC\_processing}} + T_{\text{L1-RSRP}} + \text{TO}_{\text{uk}} * (T_{\text{first-SSB}} + T_{\text{SSB-proc}})) / \text{NR slot length}$ , The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot *n* is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{\text{RRC\_processing}}$  is the RRC processing delay defined in Clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in Clause 12 of TS 38.331 [2].
- $T_{\text{first-SSB}}$  is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;
- $T_{\text{first-SSB}}$  is time to first SSB transmission after RRC processing time at the UE for other QCL types;
  - The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{\text{L1-RSRP}}$ ,  $\text{TO}_{\text{uk}}$  and  $T_{\text{SSB-proc}}$  are defined in clause 8.10.3.

The requirements for RRC based TCI state switch delay apply when only 1 TCI state is configured in RRC TCI state list. When  $T_{\text{HARQ}} > T_{\text{RRC\_processing}}$  a longer switching delay is allowed. Where  $T_{\text{HARQ}}$  is the time between DL data transmission and acknowledgement as specified in TS 38.213 [3].

## 8.10.6 Active TCI state list update delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE active TCI state list update at slot *n*, UE shall be able to receive PDCCH to schedule PDSCH with the new target TCI state at the first slot that is after  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe}, \mu} + \text{TO}_k * (T_{\text{first-SSB}} + T_{\text{SSB-proc}}) / \text{NR slot length}$ . Where  $T_{\text{HARQ}}$ ,  $T_{\text{first-SSB}}$ ,  $T_{\text{SSB-proc}}$  and  $\text{TO}_k$  are defined in clause 8.10.3.

## 8.10A Active TCI state switching delay with CCA

### 8.10A.1 Introduction

The requirements in this clause apply for a UE configured with one or more TCI state configurations on serving cell in EN-DC with PSCell on a carrier frequency with CCA or SA NR with PCell on a carrier frequency with CCA. UE shall complete the switch of active TCI state within the delay defined in this clause.

In the requirements of clause 8.10A, the term SSB occasion not available at the UE refers to when the SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period; otherwise the SSB occasion is considered as available at the UE.

### 8.10A.2 Known conditions for TCI state

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state
- TCI state switch command is received within 1280 ms of the last transmission of the RS resource for beam reporting or measurement
- The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command
- The TCI state remain detectable during the TCI state switching period in the SSB occasions available at the UE
- The SSB associated with the TCI state remain detectable during the TCI switching period in the SSB occasions available at the UE
  - SNR of the TCI state is  $\geq -3\text{dB}$

Otherwise, the TCI state is unknown.

### 8.10A.3 MAC-CE based TCI state switch delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command at slot  $n$ , UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + 3N_{\text{slot}}^{\text{subframe},\mu} + (T_{\text{HARQ}} + \text{TO}_k * (T_{\text{first-SSB}} + T_{\text{SSB-proc}} + T_{\text{SSB}} * L_{\text{MAC,known}})) / NR \text{ slot length}$ . The UE shall be able to receive on the old TCI state until slot  $n + 3N_{\text{slot}}^{\text{subframe},\mu} + (T_{\text{HARQ}} + \text{TO}_k * (T_{\text{first-SSB}} + T_{\text{SSB}} * L_{\text{MAC,known}})) / NR \text{ slot length}$ , where

$T_{\text{HARQ}}$  (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures:  $T_{\text{HARQ}}$  is extended to also include the time to all next HARQ feedback transmissions and retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213 [3]; no extension of  $T_{\text{HARQ}}$  due to UL CCA failures is allowed for Type 2C UL channel access in TS 37.213;

$T_{\text{first-SSB}}$  is time to first SSB transmission occasion after MAC CE command is decoded by the UE, during which some SSB occasions may not be available at the UE due to DL CCA failures;

The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state;

$T_{\text{SSB-proc}} = 2 \text{ ms}$ ;

$\text{TO}_k = 1$  if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise;

$T_{\text{SSB}} = \text{ssb-periodicityServingCell}$ ;

$L_{\text{MAC,known}} \leq L_{\text{MAC,known,max}}$  is the corresponding number of SSB occasions not available at the UE;

$L_{MAC,known,max} = 2$  for  $T_{SSB} \leq 40$  ms,  $L_{MAC,known,max} = 1$  for  $T_{SSB} > 40$  ms.

If the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command at slot  $n$ , UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + 3N_{slot}^{subframe,\mu} + (T_{HARQ} + TO_{uk} * (T_{first-SSB} + T_{SSB-proc} + T_{SSB} * L_{MAC,unknown})) / NR\ slot\ length$ . The UE shall be able to receive on the old TCI state until slot  $n + 3N_{slot}^{subframe,\mu} + (T_{HARQ} + TO_{uk} * (T_{first-SSB} + T_{SSB} * L_{MAC,unknown})) / NR\ slot\ length$ , where:

$L_{MAC,unknown} \leq L_{MAC,unknown,max}$  is the corresponding number of SSB occasions not available at the UE;

$L_{MAC,unknown,max} = 2$  for  $T_{SSB} \leq 40$  ms,  $L_{MAC,unknown,max} = 1$  for  $T_{SSB} > 40$  ms;

$TO_{uk} = 1$ .

## 8.10A.4 DCI based TCI state switch delay

If the target TCI state is known, when a UE is configured with the higher layer parameter *tci-PresentInDCI* which is set as 'enabled' for the CORESET scheduling the PDSCH at slot  $n$ , UE shall be able to receive PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + timeDurationForQCL$ , where, *timeDurationForQCL* is the time required by the UE to perform PDCCH reception and applying spatial QCL information received in DCI for PDSCH processing as described in TS 38.214 [26], the value of *timeDurationForQCL* is defined in TS 38.306 [14].

The known condition for TCI state defined in clause 8.10A.2 is applied.

## 8.10A.5 RRC based TCI state switch delay

If the target TCI state is known, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + (T_{RRC\_processing} + TO_k * (T_{first-SSB} + T_{SSB-proc} + T_{SSB} * L_{RRC,known})) / NR\ slot\ length$ . The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot  $n$  is last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC\_processing}$  is the RRC processing delay defined in Clause 11.2 of 36.331 [16] is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in Clause 12 of TS38.331 [2]
- $T_{first-SSB}$  is time to first SSB transmission occasion after RRC processing by the UE, during which some of the SSB occasions may not be available due to DL CCA failures;
  - The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state;
- $L_{RRC,known} \leq L_{RRC,known,max}$  is the corresponding number of SSB occasions not available at the UE;
  - $L_{RRC,known,max} = 2$  for  $T_{SSB} \leq 40$  ms,  $L_{RRC,known,max} = 1$  for  $T_{SSB} > 40$  ms.
- $T_{SSB-proc}$ ,  $TO_k$ , and  $T_{SSB}$  are as defined in clause 8.10A.3.

If the target TCI state is unknown, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot  $n + (T_{RRC\_processing} + TO_{uk} * (T_{first-SSB} + T_{SSB-proc} + T_{SSB} * L_{RRC,unknown})) / NR\ slot\ length$ . The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where,

- Slot  $n$  is the last slot overlapping with the PDSCH carrying RRC activation command.

- $T_{RRC\_processing}$  is the RRC processing delay defined in Clause 11.2 of 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in Clause 12 of TS38.331 [2].
- $T_{first-SSB}$  is time to first SSB transmission occasion after RRC processing time at the, during which some SSB occasions may not be available at the UE due to DL CCA failures;
  - The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state;
- $L_{RRC,unknown} \leq L_{RRC,unknown,max}$  is the corresponding number of SSB occasions not available at the UE;
  - $L_{RRC,unknown,max} = 2$  for  $T_{SSB} \leq 40$  ms,  $L_{RRC,unknown,max} = 1$  for  $T_{SSB} > 40$  ms.
- $T_{Ok}$ ,  $T_{SSB-proc}$ , and  $T_{SSB}$  are as defined in clause 8.10A.3

The requirements for RRC based TCI state switch delay apply when only 1 TCI state is configured in RRC TCI state list. When  $T_{HARQ} > T_{RRC\_processing}$  a longer switching delay is allowed. Where  $T_{HARQ}$  is the time between DL data transmission and acknowledgement as specified in TS 38.213 [3].

### 8.10A.6 Active TCI state list update delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE active TCI state list update at slot  $n$ , UE shall be able to receive PDCCH to schedule PDSCH with the new target TCI state at the first slot that is after  $n + 3N_{slot}^{subframe,\mu} + (T_{HARQ} + T_{Ok} * (T_{first-SSB} + T_{SSB-proc} + T_{SSB} * L_{MAC,known})) / NR\ slot\ length$ . Where  $T_{HARQ}$ ,  $T_{first-SSB}$ ,  $T_{SSB-proc}$ ,  $T_{SSB}$ ,  $L_{MAC,known}$  and  $T_{Ok}$  are as defined in clause 8.10A.3.

## 8.11 PSCell Change

This clause defines requirements for the delay within which the UE shall be able to change PSCell to other cell in EN-DC or NR-DC. The requirements in this clause are applicable to EN-DC and NR-DC.

The UE shall be capable of transmitting PRACH preamble towards the target PSCell no later than specified in clause 8.9.2 for the case of NR-DC and in TS 36.133 clause 7.31.2 for the case of EN-DC, where the following values for slot  $n$ ,  $T_{processing}$  and  $T_{RRC\_delay}$  shall override the existing ones:

- Slot  $n$  is the last slot overlapping with the PDSCH containing PSCell change,
- $T_{processing} = 20$  ms when source and target cells are in the same FR,
- $T_{processing} = 40$  ms when source and target cells are in different FRs.
- $T_{RRC\_delay}$  is the RRC procedure delay as specified in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC procedure delay as specified in TS 38.331 [2].

If the SMTC periodicity of the target cell is not provided within the PSCell change message, and measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC,  $T_{rs}$  is the periodicity of one of the SMTC which is up to UE implementation.

The target PSCell is known if it has been meeting the conditions in clause 8.9.2 for the case of NR-DC and in TS36.133 clause 7.31.2 for the case of EN-DC.

The interruption on PCell and other serving cells specified in TS36.133 clause 7.32.2.1 for EN-DC and in TS38.133 clause 8.2.4.2.1 for NR-DC is allowed only during the RRC reconfiguration procedure [2].

## 8.11A void

## 8.11B Conditional PSCell Change

### 8.11B.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to perform conditional PSCell change in EN-DC or NR-DC. The requirements in this clause are applicable to EN-DC and NR-DC.

### 8.11B.2 Conditional PSCell Change delay

The requirements in this clause shall apply for the UE configured with only PCell in FR1.

The UE shall be capable to transmit PRACH preamble towards the new target PSCell no later than in slot  $n + T_{\text{config\_PSCell\_Conditional}}$ .

Where:

- Slot  $n$  is the last slot overlapping with the PDSCH containing conditional PSCell change.
- $T_{\text{config\_PSCell\_Conditional}} = T_{\text{RRC\_delay}} + T_{\text{Event\_DU}} + T_{\text{measure}} + T_{\text{UE\_preparation}} + T_{\text{processing}} + T_{\Delta} + T_{\text{PSCell\_DU}} + 2 \text{ ms}$ 
  - $T_{\text{RRC\_delay}}$  is the RRC processing delay defined in Clause 11.2 in 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC procedure delay defined in clause 12 in TS 38.331 [2] for processing the conditional PSCell change command.
  - $T_{\text{Event\_DU}}$  is the delay uncertainty which is the time from when the UE successfully decodes a conditional PSCell change command until a condition exists at the measurement reference point which will trigger the conditional PSCell change.
  - $T_{\text{measure}}$  is the measurements time stated in clause 8.11B.2.1.
  - $T_{\text{UE\_preparation}}$  is the UE preparation time for conditional PSCell change, and starts after UE realizes the condition of PSCell change is met and identity of new PSCell is determined.  $T_{\text{UE\_preparation}}$  is up to 10ms.
  - $T_{\text{processing}}$  is the SW processing time needed by UE, including RF warm up period.  $T_{\text{processing}} = 20 \text{ ms}$  when source and target cells are in the same FR, and  $T_{\text{processing}} = 40 \text{ ms}$  when source and target cells are in different FRs.
  - $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = 1 * T_{\text{rs}}$  ms.
    - $T_{\text{rs}}$  is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise  $T_{\text{rs}}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with  $T_{\text{rs}} = 5 \text{ ms}$  assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.
  - $T_{\text{PSCell\_DU}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell.  $T_{\text{PSCell\_DU}}$  is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [3].

The PCell interruption specified in clause 8.2 is allowed only after the UE starts to execute a conditional PSCell change.

#### 8.11B.2.1 Measurement time

The measurement time delay is defined from the end of  $T_{\text{Event\_DU}}$  until UE executes a PSCell change to a target cell and interruption time starts.

For intra-frequency PSCell change, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than  $T_{\text{identify\_intra\_with\_index}}$  or  $T_{\text{identify\_intra\_without\_index}}$  defined in clause 9.2.5.1 or clause 9.2.6.2.



For inter-frequency PSCell change, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than  $T_{\text{identify\_inter\_without\_index}}$  or  $T_{\text{identify\_inter\_with\_index}}$  defined in clause 9.3.4. When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period  $T_{\text{identify\_intra\_without\_index}}$  or  $T_{\text{identify\_intra\_with\_index}}$  for intra-frequency PSCell change or the time period  $T_{\text{identify\_inter\_without\_index}}$  or  $T_{\text{identify\_inter\_with\_index}}$  for inter-frequency PSCell change. If a cell, which has been detectable at least for the time period  $T_{\text{identify\_intra\_without\_index}}$  or  $T_{\text{identify\_intra\_with\_index}}$  for intra-frequency PSCell change or the time period  $T_{\text{identify\_inter\_without\_index}}$  or  $T_{\text{identify\_inter\_with\_index}}$  for inter-frequency PSCell change, becomes undetectable for a period and then the cell becomes detectable again and triggers a PSCell change, the measurement time delay shall be less than  $T_{\text{SSB\_measurement\_period\_intra}}$  or  $T_{\text{SSB\_measurement\_period\_inter}}$  provided the timing to that cell has not changed more than  $\pm 3200/2^\mu$  Tc while the measurement gap has not been available and the L3 filter has not been used, where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

## 8.12 Uplink spatial relation switch delay

### 8.12.1 Introduction

The requirements in this clause apply for a UE configured with one or more spatial relation configurations on serving cell in MR-DC or standalone NR. There is no requirement when the UE is requested to switch to a spatial relation with the higher layer parameter *spatialRelationInfo* associated to SRS. UE shall complete the switch of active spatial relation within the delay defined in this clause when the UE is requested to switch to a spatial relation with the higher layer parameter *spatialRelationInfo* associated to a DL RS.

### 8.12.2 Known conditions for spatial relation when associated with DL-RS

The spatial relation associated to DL RS is known if the following conditions are met:

- During the period from the last transmission of the DL RS resource used for the L1-RSRP measurement reporting for the target spatial relation to the completion of active spatial relation, where the DL RS resource for L1-RSRP measurement is the DL RS in target spatial relation or QCLed to the target spatial relation with QCL type-D.
  - Spatial relation switch command is received within 1280 ms upon the last transmission of the DL RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target spatial relation before the spatial relation switch command
  - The DL RS configured in spatial relation remains detectable during the spatial relation switching period
    - SNR of the DL RS configured in spatial relation  $\geq -3\text{dB}$
  - The SSB associated with the spatial relation remain detectable during the spatial relation switching period
    - SNR of the SSB associated with the spatial relation  $\geq -3\text{dB}$

Otherwise, the spatial relation is unknown.

### 8.12.3 MAC-CE based spatial relation switch delay

If the target spatial relation associated to DL RS is known, upon receiving PDSCH carrying MAC-CE activation command in slot  $n$ , for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial relation in the slot  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe},\mu} + 1$  when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1 where  $T_{\text{HARQ}}$  is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3].

If the target spatial relation associated to DL RS is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot  $n$ , for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial

relation in the slot  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe},\mu} + T_{\text{LI-RSRP}} + 1$  when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- $T_{\text{HARQ}}$  is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3],
- $T_{\text{LI-RSRP}}$  is the time for Rx beam refinement in FR2, defined as
  - $T_{\text{LI-RSRP\_Measurement\_Period\_SSB}}$  for SSB as specified in clause 9.5.4.1,
    - with the assumption of  $M=1$
    - with  $T_{\text{Report}} = 0$
  - $T_{\text{LI-RSRP\_Measurement\_Period\_CSI-RS}}$  for CSI-RS as specified in clause 9.5.4.2
    - configured with higher layer parameter *repetition* set to ON
    - with the assumption of  $M=1$  for periodic CSI-RS
    - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
    - with  $T_{\text{Report}} = 0$

The UE shall be able to transmit with the old UL spatial relation until slot  $n + T_{\text{HARQ}} + 3N_{\text{slot}}^{\text{subframe},\mu}$ .

When the UL spatial relation info switch for PUCCH changes both the associated DL RS and *pucch-PathlossReferenceRS* with the same MAC-CE activation, and if both the DL RS and *pucch-PathlossReferenceRS* are known as specified in clause 8.12.2 and 8.14.2 respectively, the UE shall be able to transmit PUCCH with the target UL spatial relation after the delay specified in clause 8.14.3. If either the associated DL RS or *pucch-PathlossReferenceRS* are unknown, a longer switching delay is allowed. The UE is not required to transmit PUCCH with the target UL spatial relation until the DL RS and pathloss reference RS switch are completed.

#### 8.12.4 DCI based spatial relation switch delay

If the target spatial relation associated to DL RS is known, when a UE receives the DCI triggering aperiodic SRS at slot  $n$  with the higher layer parameter *spatialRelationInfo*, UE shall be able to transmit aperiodic SRS with target spatial

relation of the serving cell on which spatial relation switch occurs in the slot  $\left\lfloor n \cdot \frac{2^{\mu_{\text{SRS}}}}{2^{\mu_{\text{PDCCH}}}} \right\rfloor + k + 1$ , where,  $k$  is configured

via higher layer parameter *slotOffset[2]* for each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission,  $\mu_{\text{SRS}}$  and  $\mu_{\text{PDCCH}}$  are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively in TS 38.214 [26].

The known condition for spatial relation associated to DL RS defined in clause 8.12.2 is applied.

#### 8.12.5 RRC based spatial relation switch delay

If the target spatial relation associated to DL RS is known, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured in the slot  $n + T_{\text{RRC\_processing}} / \text{NR slot length} + 1$  when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1

Where

- Slot  $n$  is the last slot overlapping with the PDSCH carrying RRC activation command,
- $T_{\text{RRC\_processing}}$  is the RRC processing delay defined in 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS38.331 [2].

If the target spatial relation associated to DL RS is unknown, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured in the slot  $n + T_{\text{RRC\_processing}} / \text{NR slot length} + T_{\text{LI-RSRP}} + 1$  when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- Slot  $n$  is the last slot overlapping with the PDSCH carrying RRC activation command,
- $T_{RRC\_processing}$  is the RRC processing delay defined in 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS38.331 [2].
- $T_{L1-RSRP}$  is defined in clause 8.12.3

## 8.13 UE-specific CBW change

### 8.13.1 Introduction

The requirements in this clause apply for a UE receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

### 8.13.2 UE-specific CBW change delay

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on an active DL BWP or transmit PUSCH on an active UL BWP of the new CBW right after a time duration of  $\frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$  slots which begins from the beginning of DL slot  $n$ , where

DL slot  $n$  is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$  is the length of the RRC procedure delay in millisecond as defined in clause 11.2 in TS 36.331 [6] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in millisecond as defined in clause 12 in TS 38.331 [2], and

$T_{CBWchangeDelayRRC} = 6ms$  is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration  $\frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$  on the cell where UE-specific CBW change occurs. When  $T_{HARQ} >$

$T_{RRCprocessingDelay}$  a longer switching delay is allowed. Where  $T_{HARQ}$  is the time between DL data transmission and acknowledgement as specified in TS 38.213 [3].

## 8.14 Pathloss reference signal switching delay

### 8.14.1 Introduction

The requirements in this clause apply for pathloss reference signal activated or updated on serving cell in MR-DC or standalone NR in clause 7.1.1 in TS 38.213 [3].

UE shall complete the switch of pathloss reference signal within the delay defined in this clause.

### 8.14.2 Known conditions for pathloss reference signal

The pathloss reference signal is known if the following conditions are met during the period between the last transmission of the RS resource used for L1-RSRP measurement reporting and the completion of pathloss reference signal switch, where the RS resource is the target pathloss reference signal or QCLed (with Type D) to the target pathloss reference signal.

- Pathloss reference signal switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
- The UE has sent at least 1 L1-RSRP report for the target pathloss reference signal before the pathloss reference signal switch command
- The target pathloss reference signal remains detectable during the pathloss reference signal switching period

- SNR of the target pathloss reference signal  $\geq -3\text{dB}$
- The associated SSBs with the target pathloss reference signal remain detectable during the pathloss reference signal switching period
- SNR of the associated SSB  $\geq -3\text{dB}$

Otherwise, the pathloss reference signal is unknown.

### 8.14.3 MAC-CE based pathloss reference signal switch delay

The requirements in this clause apply for a UE to update a pathloss reference signal by MAC-CE for PUCCH, PUSCH, semi-persistent SRS and aperiodic SRS.

If the target pathloss reference signal is known, upon receiving PDSCH carrying MAC-CE activation in slot  $n$ , UE shall be able to apply the target pathloss reference signal of the serving cell on which pathloss reference signal switch occurs no later than the slot  $n + T_{HARQ} + 3N_{slot}^{subframe,\mu} + NM * \left\lceil \frac{5 * T_{target\_PL-RS} + 2\text{ms}}{NR\ slot\ length} \right\rceil$ . The UE shall be able to apply old pathloss reference signals until the slot  $n + T_{HARQ} + 3N_{slot}^{subframe,\mu}$ . Where

- $T_{HARQ}$  is the timing between pathloss reference MAC-CE activation command and acknowledgement as specified in TS 38.321 [7].
- $NM = 1$ , if the target PL-RS is not maintained by the UE, 0 otherwise.
- $T_{target\_PL-RS}$  is the periodicity of the target pathloss reference signal which would be SSB or NZP CSI-RS.

Note: longer application time is expected if measurement sample is not available due to measurement gap, DRX or other UE activities.

Note: longer application time is expected if the pathloss reference signal is unknown.

## 9 Measurement Procedure

### 9.1 General measurement requirement

#### 9.1.1 Introduction

This clause contains general requirements on the UE regarding measurement reporting in RRC\_CONNECTED state. The requirements are split in intra-frequency, inter-frequency, inter-RAT E-UTRAN FDD, inter-RAT E-UTRAN TDD, and L1-RSRP measurements requirements. These measurements may be used by the NG-RAN. The measurement quantities are defined in TS38.215 [4], the measurement model is defined in TS38.300 [10], TS37.340 [17] and measurement accuracies are specified in clause 10. Control of measurement reporting is specified in TS 38.331 [2].

In the requirements of clause 9, the exceptions for side conditions apply as follows:

- for the UE capable of CA but not configured with any SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1 for UE supporting CA in FR1, and clause B.3.2.3 for UE supporting CA in FR2, respectively;
- for the UE capable of CA and configured with at least one SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.2 for UE configured with CA in FR1, and clause B.3.2.4 for UE supporting CA in FR2, respectively;
- for the UE capable of SUL but not configured with SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1;
- for the UE capable of SUL and configured with at least one SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.2 for UE configured with SUL in FR1.

## 9.1.2 Measurement gap

If the UE requires measurement gaps to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE does not support independent measurement gap patterns for different frequency ranges as specified in Table 5.1-1 in [18, 19, 20], in order for the requirements in the following clauses to apply the network must provide a single per-UE measurement gap pattern for concurrent monitoring of all frequency layers.

If the UE requires measurement gaps to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE supports independent measurement gap patterns for different frequency ranges as specified in Table 5.1-1 in [18, 19, 20], in order for the requirements in the following clauses to apply the network must provide either per-FR measurement gap patterns for frequency range where UE requires per-FR measurement gap for concurrent monitoring of all frequency layers of each frequency range independently, or a single per-UE measurement gap pattern for concurrent monitoring of all frequency layers of all frequency ranges.

If the UE is configured via LPP [34] to measure PRS for any RSTD, PRS-RSRP, and UE Rx-Tx time difference measurement defined in TS 38.215 [4], in order for the requirements in clauses 9.9.2, 9.9.3, and 9.9.4 to apply, the network must provide

- a single per-UE measurement gap pattern for concurrent monitoring of all positioning frequency layers and intra-frequency, inter-frequency and/or inter-RAT frequency layers of all frequency ranges, or

During the per-UE measurement gaps the UE:

- is not required to conduct reception/transmission from/to the corresponding E-UTRAN PCell, E-UTRAN SCell(s) and NR serving cells for E-UTRA-NR dual connectivity except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to TS38.321 [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells for SA (with single carrier or CA configured) except the reception of signals used for RRM measurement(s), PRS measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding PCell, SCell(s) and E-UTRAN serving cells for NR-E-UTRA dual connectivity except the reception of signals used for RRM measurement(s), PRS measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells for NR-DC except the reception of signals used for RRM measurement(s), PRS measurement(s) and the signals used for random access procedure according to [7].

During the per-FR measurement gaps the UE:

- is not required to conduct reception/transmission from/to the corresponding E-UTRAN PCell, E-UTRAN SCell(s) and NR serving cells in the corresponding frequency range for E-UTRA-NR dual connectivity except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to TS38.321 [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells in the corresponding frequency range for SA (with single carrier or CA configured) except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to TS38.321 [7].
- is not required to conduct reception/transmission from/to the corresponding PCell, SCell(s) and E-UTRAN serving cells in the corresponding frequency range for NR-E-UTRA dual connectivity except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to TS38.321 [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells in the corresponding frequency range for NR-DC except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to TS38.321 [7].

UEs shall support the measurement gap patterns listed in Table 9.1.2-1 based on the applicability specified in table 9.1.2-2 and 9.1.2-3. UE determines measurement gap timing based on gap offset configuration and measurement gap timing advance configuration provided by higher layer signalling as specified in TS 38.331 [2] and TS 36.331 [16].

Table 9.1.2-1: Gap Pattern Configurations

| Gap Pattern Id | Measurement Gap Length (MGL, ms) | Measurement Gap Repetition Period (MGRP, ms) |
|----------------|----------------------------------|--|
| 0              | 6                                | 40   |
| 1              | 6                                | 80   |
| 2              | 3                                | 40   |
| 3              | 3                                | 80   |
| 4              | 6                                | 20   |
| 5              | 6                                | 160  |
| 6              | 4                                | 20   |
| 7              | 4                                | 40   |
| 8              | 4                                | 80   |
| 9              | 4                                | 160  |
| 10             | 3                                | 20   |
| 11             | 3                                | 160  |
| 12             | 5.5                              | 20   |
| 13             | 5.5                              | 40   |
| 14             | 5.5                              | 80   |
| 15             | 5.5                              | 160  |
| 16             | 3.5                              | 20   |
| 17             | 3.5                              | 40   |
| 18             | 3.5                              | 80   |
| 19             | 3.5                              | 160  |
| 20             | 1.5                              | 20   |
| 21             | 1.5                              | 40   |
| 22             | 1.5                              | 80   |
| 23             | 1.5                              | 160  |
| 24             | 10                               | 80   |
| 25             | 20                               | 160  |

**Table 9.1.2-2: Applicability for Gap Pattern Configurations supported by the E-UTRA-NR dual connectivity UE or NR-E-UTRA dual connectivity UE**

| Measurement gap pattern configuration   | Serving cell   | Measurement Purpose <sup>Note 5</sup>                              | Applicable Gap Pattern Id     |
|---|--|--|-------------------------------|
| Per-UE Measurement gap  | E-UTRA + FR1, or E-UTRA + FR2, or E-UTRA + FR1 + FR2 | non-NR RAT <sup>Note1,2</sup>                                      | 0,1,2,3                       |
|   |  | FR1 and/or FR2 <sup>Note 7</sup>                                   | 0-11, 24, 25                  |
|   |  | non-NR RAT <sup>Note1,2</sup> and FR1 and/or FR2 <sup>Note 7</sup> | 0, 1, 2, 3, 4, 6, 7, 8,10, 24 |
| Per-FR measurement gap  | E-UTRA and, FR1 if configured                        | non-NR RAT <sup>Note1,2</sup>                                      | 0,1,2,3                       |
|   | FR2 if configured                                    |  | No gap                        |
|   | E-UTRA and, FR1 if configured                        | FR1 only   | 0-11                          |
|   | FR2 if configured                                    |  | No gap                        |
|   | E-UTRA and, FR1 if configured                        | FR2 only   | No gap                        |
|   | FR2 if configured                                    |  | 12-23                         |
|   | E-UTRA and, FR1 if configured                        | non-NR RAT <sup>Note1,2</sup> and FR1                              | 0, 1, 2, 3, 4, 6, 7, 8,10     |
|   | FR2 if configured                                    |  | No gap                        |
|   | E-UTRA and, FR1 if configured                        | FR1 and FR2  | 0-11                          |
|   | FR2 if configured                                    |  | 12-23                         |
|   | E-UTRA and, FR1 if configured                        | non-NR RAT <sup>Note1,2</sup> and FR2                              | 0, 1, 2, 3, 4, 6, 7, 8,10     |
|   | FR2 if configured                                    |  | 12-23                         |
|   | E-UTRA and, FR1 if configured                        | non-NR RAT <sup>Note1,2</sup> and FR1 and FR2                      | 0, 1, 2, 3, 4, 6, 7, 8,10     |
|   | FR2 if configured                                    |  | 12-23                         |
| <p>Note: In E-UTRA-NR dual connectivity mode, if GSM or UTRA TDD or UTRA FDD inter-RAT frequency layer is configured to be monitored, only measurement gap pattern #0 and #1 can be used for per-FR gap in E-UTRA and FR1 if configured, or for per-UE gap. In NR-E-UTRA dual connectivity mode, if UTRA FDD inter-RAT frequency layer is configured to be monitored for SRVCC, only measurement gap pattern #0 and #1 can be used for per-FR gap in E-UTRA and FR1 if configured, or for per-UE gap.</p> <p>NOTE 1: In E-UTRA-NR dual connectivity mode, non-NR RAT includes E-UTRA, UTRA and/or GSM. In NR-E-UTRA dual connectivity mode, non-NR RAT means E-UTRA, and UTRA for SRVCC.</p> <p>NOTE 2: Void</p> <p>NOTE 3: When E-UTRA inter-frequency RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, only Gap Pattern #0 can be used.</p> <p>NOTE 4: For UE supporting <i>supportedGapPattern-NRonly-NEDC</i> or <i>measGapPatterns-NRonly-ENDC-r16</i> but not supporting <i>supportedGapPattern</i> for the corresponding gap patterns among GP2-11, the corresponding gap patterns are not applicable to measurement of non-NR RATs as defined in NOTE 1.</p> <p>NOTE 5: Inclusion of positioning measurements: Measurement purpose which includes E-UTRA measurements includes also E-UTRA RSRP and E-UTRA RSRQ measurements for E-CID.</p> <p>NOTE 6: Measurement gap patterns #24 and #25 can be requested [2] only when the UE is configured at least with any of RSTD, UE Rx-Tx, or PRS-RSRP measurements requiring such gaps and can only be used during the corresponding positioning measurement period</p> <p>NOTE 7: Inclusion of positioning measurements for per-UE measurement gaps: Measurement purpose which includes any of FR1 and FR2 measurements includes also RSTD, UE Rx-Tx, and PRS-RSRP measurements.</p> |  |  |                               |

In E-UTRA-NR dual connectivity mode,

- if per-UE measurement gap is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap starts at time  $T_{MG}$  ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.

- if per-FR measurement gap for FR1 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR1 starts at time  $T_{MG}$  ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measurement gap for FR2 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR2 starts at time  $T_{MG}$  ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among SCG serving cells subframes in FR2.

In NR-E-UTRA dual connectivity mode,

- if per-UE measurement gap is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap starts at time  $T_{MG}$  ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measurement gap for FR1 is configured with MG timing advance of  $T_{MG}$  ms and UE has NR serving cell in FR1, the measurement gap for FR1 starts at time  $T_{MG}$  ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes in FR1.
- if per-FR measurement gap for FR1 is configured with MG timing advance of  $T_{MG}$  ms and UE doesn't have NR serving cell in FR1, the measurement gap for FR1 starts at time  $T_{MG}$  ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among SCG serving cells subframes.
- if per-FR measurement gap for FR2 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR2 starts at time  $T_{MG}$  ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes in FR2.

In NR-NR dual connectivity mode,

- If per-UE measurement gap is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap starts at time  $T_{MG}$  ms advanced to the end of the latest MCG subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- If per-FR measurement gap for FR1 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR1 starts at time  $T_{MG}$  ms advanced to the end of the latest MCG subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- If per-FR measurement gap for FR2 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR2 starts at time  $T_{MG}$  ms advanced to the end of the latest SCG subframe occurring immediately before the configured measurement gap among SCG serving cells subframes in FR2.

$T_{MG}$  is the MG timing advance value provided in *mgta* according to TS38.331 [2].

In determining the measurement gap starting point, UE shall use the DL timing of the latest E-UTRA or NR subframe occurring immediately before the configured measurement gap among E-UTRA or NR serving cells.

For per-FR measurement gap capable UE configured with E-UTRA-NR dual connectivity or NR-E-UTRA dual connectivity, when serving cells are in E-UTRA and FR1, measurement objects are in both E-UTRA/FR1 and FR2,

- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN;
- If MN indicates UE that the measurement gap from MN applies to only LTE/FR1 serving cell(s),
  - UE fulfils the measurement requirements for FR1/LTE measurement objects based on the configured measurement gap pattern;
  - UE fulfils the requirements for FR2 measurement objects based on effective MGRP=20ms;

For per-FR measurement gap capable configured with E-UTRA-NR dual connectivity, NR-E-UTRA dual connectivity or NR-NR dual connectivity, when serving cells are in E-UTRA, FR1 and FR2, or in E-UTRA and FR2, or in FR1 and FR2, measurement objects are in both E-UTRA /FR1 and FR2,



- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN.

**Table 9.1.2-3: Applicability for Gap Pattern Configurations supported by the UE with NR standalone operation (with single carrier, NR CA and NR-DC configuration)**

| Measurement gap pattern configuration | Serving cell                           | Measurement Purpose <sup>NOTE 2</sup>              | Applicable Gap Pattern Id     |
|---------------------------------------|--|--|-------------------------------|
| Per-UE measurement gap                | FR1 <sup>NOTE5</sup> , or<br>FR1 + FR2 | non-NR RAT <sup>NOTE3,6</sup>                      | 0,1,2,3                       |
|                                       |  | FR1 and/or FR2 <sup>NOTE 9</sup>                   | 0-11, 24, 25                  |
|                                       |  | non-NR RAT and FR1 and/or FR2 <sup>NOTE3,6,9</sup> | 0, 1, 2, 3, 4, 6, 7, 8,10, 24 |
|                                       | FR2 <sup>NOTE5</sup>                   | non-NR RAT only <sup>NOTE3,6</sup>                 | 0,1,2,3                       |
|                                       |  | FR1 only <sup>NOTE 9</sup>                         | 0-11, 24, 25                  |
|                                       |  | FR1 and FR2 <sup>NOTE 9</sup>                      | 0-11, 24, 25                  |
|                                       |  | non-NR RAT and FR1 and/or FR2 <sup>NOTE3,6,9</sup> | 0, 1, 2, 3, 4, 6, 7, 8,10, 24 |
|                                       |  | FR2 only <sup>NOTE 9</sup>                         | 12-23                         |
| Per-FR measurement gap                | FR1 if configured                      | non-NR RAT only <sup>NOTE3,6</sup>                 | 0,1,2,3                       |
|                                       | FR2 if configured                      |  | No gap                        |
|                                       | FR1 if configured                      | FR1 only   | 0-11                          |
|                                       | FR2 if configured                      |  | No gap                        |
|                                       | FR1 if configured                      | FR2 only   | No gap                        |
|                                       | FR2 if configured                      |  | 12-23                         |
|                                       | FR1 if configured                      | non-NR RAT and FR1 <sup>NOTE3,6</sup>              | 0, 1, 2, 3, 4, 6, 7, 8,10     |
|                                       | FR2 if configured                      |  | No gap                        |
|                                       | FR1 if configured                      | FR1 and FR2  | 0-11                          |
|                                       | FR2 if configured                      |  | 12-23                         |
|                                       | FR1 if configured                      | non-NR RAT and FR2 <sup>NOTE3,6</sup>              | 0, 1, 2, 3, 4, 6, 7, 8,10     |
|                                       | FR2 if configured                      |  | 12-23                         |
|                                       | FR1 if configured                      | non-NR RAT and                                     | 0, 1, 2, 3, 4, 6, 7, 8,10     |
| FR2 if configured                     | FR1 and FR2 <sup>NOTE3,6</sup>         | 12-23  |                               |

|         |   |
|---------|---|
| NOTE 1: | When E-UTRA inter-RAT RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, only Gap Pattern #0 can be used.  |
| NOTE 2: | Measurement purpose which includes E-UTRA measurements includes also inter-RAT E-UTRA RSRP and RSRQ measurements for E-CID; measurement purpose which includes E-UTRA measurements includes also E-UTRA RSRP and E-UTRA RSRQ measurements for E-CID.  |
| NOTE 3: | Void  |
| NOTE 4: | If per-UE measurement gap is configured with MG timing advance of $T_{MG}$ ms, the measurement gap starts at time $T_{MG}$ ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among all serving cells subframes.<br>If per-FR measurement gap for FR1 is configured with MG timing advance of $T_{MG}$ ms, the measurement gap for FR1 starts at time $T_{MG}$ ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among serving cells subframes in FR1.<br>If per-FR measurement gap for FR2 is configured with MG timing advance of $T_{MG}$ ms, the measurement gap for FR2 starts at time $T_{MG}$ ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among serving cells subframes in FR2.<br>$T_{MG}$ is the MG timing advance value provided in <i>mgta</i> according to [2].<br>In determining the measurement gap starting point, UE shall use the DL timing of the latest subframe occurring immediately before the configured measurement gap among serving cells. |
| NOTE 5: | NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.  |
| NOTE 6: | In NR single carrier, NR CA, and NR-DC mode, non-NR RAT means E-UTRA, and UTRA for SRVCC. In NR single carrier, NR CA, and NR-DC mode, if UTRA FDD inter-RAT frequency layer is configured to be monitored for SRVCC, only measurement gap pattern #0 and #1 can be used for per-FR gap in E-UTRA and FR1 if configured, or for per-UE gap.   |
| NOTE 7: | For UE only supporting <i>supportedGapPattern-NRonly</i> for any gap patterns among GP2-11, the corresponding gap patterns are not applicable to measurement of non-NR RATs as defined in NOTE 6.   |
| NOTE 8: | Measurement gap patterns #24 and #25 can be requested [2] only when the UE is configured with any of RSTD, UE Rx-Tx, or PRS-RSRP measurements requiring such gaps and can only be used during the corresponding positioning measurement period.   |
| NOTE 9: | Inclusion of positioning measurements for per-UE measurement gaps: Measurement purpose which includes any of FR1 and FR2 measurements includes also RSTD, UE Rx-Tx, and PRS-RSRP measurements.  |

For per-FR measurement gap capable UE in NR standalone operation (with single carrier, NR CA and NR-DC configuration), for per-FR gap based measurement, when there is no serving cell in a particular FR, where measurement objects are configured, regardless if explicit per-FR measurement gap is configured in this FR, the effective MGRP in this FR is used to determine requirements;

- 20 ms for FR2 NR measurements
- 40 ms for FR1 NR measurements
- 40 ms for LTE measurements
- 40 ms for FR1+LTE measurements

For per-FR measurement gap capable UE in NR standalone operation (with single carrier, NR CA and NR-DC configuration), when serving cells are in FR1 or FR2, measurement objects are in both E-UTRA /FR1 and FR2,

- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN;

If measurement gap is configured in one FR but measurement object is not configured in the FR, the scheduling opportunity in the FR depends on the configured measurement gap pattern.

For single carrier or CA with aligned frame boundaries,

For E-UTRA-NR dual connectivity (with NR single carrier, NR CA configuration), if UE is not capable of per-FR-gap, total interruption time on SCG during MGL is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 6\text{ms}, 4\text{ms}$  and  $3\text{ms}$ . And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells in SCG during MGL

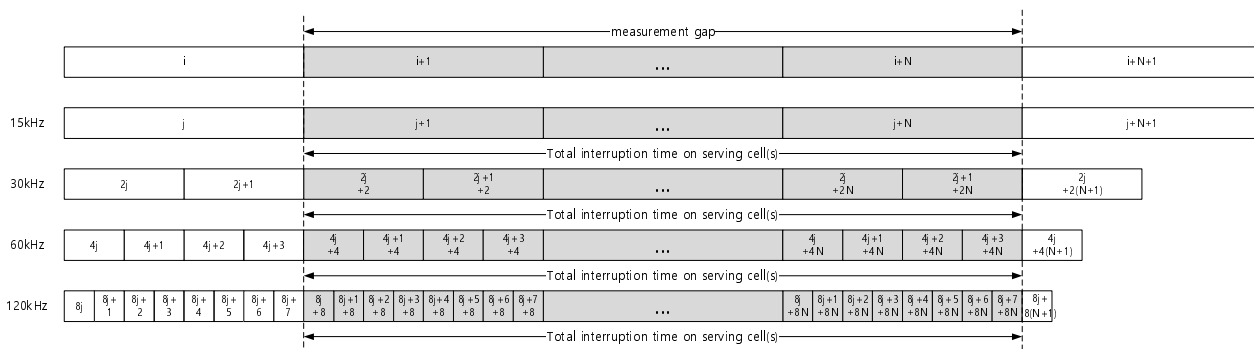
is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 6\text{ms}, 4\text{ms}$  and  $3\text{ms}$ , and total interruption time on FR2 serving cells in SCG during MGL is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 5.5\text{ms}, 3.5\text{ms}$  and  $1.5\text{ms}$ .

For NR standalone operation (with single carrier, NR CA and NR-DC configuration), if UE is not capable of per-FR-gap, total interruption time on a serving cell during MGL is defined when  $MGL(N) = 20\text{ms}, 10\text{ms}, 6\text{ms}, 5.5\text{ms}, 4\text{ms}, 3.5\text{ms}, 3\text{ms}$ , and  $1.5\text{ms}$ . And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells during MGL is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 6\text{ms}, 4\text{ms}$ , and  $3\text{ms}$ , and total interruption time on FR2 serving cells during MGL is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 5.5\text{ms}, 3.5\text{ms}$ , and  $1.5\text{ms}$ .

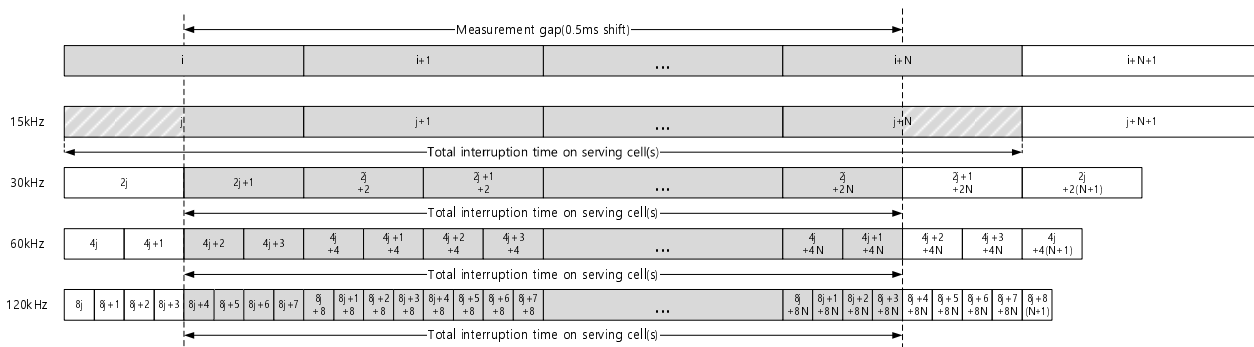
For NR-E-UTRA dual connectivity (with NR single carrier, NR CA configuration), if UE is not capable of per-FR-gap, total interruption time on MCG during MGL is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 6\text{ms}, 4\text{ms}$ , and  $3\text{ms}$ . And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells in MCG during MGL is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 6\text{ms}, 4\text{ms}$ , and  $3\text{ms}$ , and total interruption time on FR2 serving cells in MCG during MGL is defined only when  $MGL(N) = 20\text{ms}, 10\text{ms}, 5.5\text{ms}, 3.5\text{ms}$ , and  $1.5\text{ms}$ .

For CA with non-aligned frame boundaries,

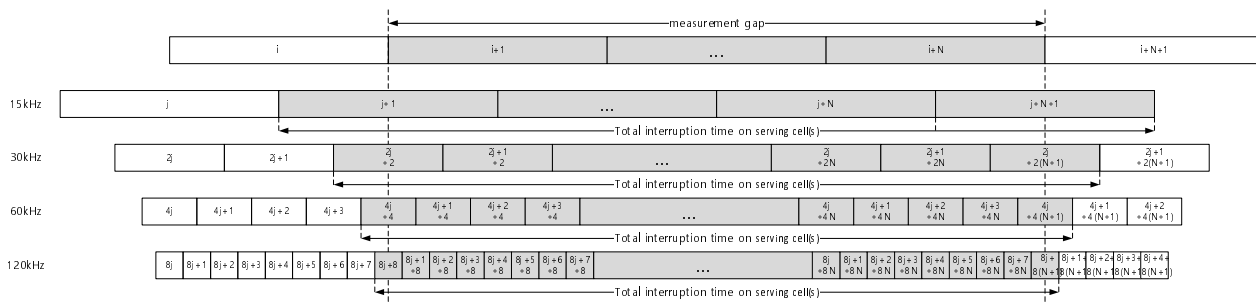
- The total interruption time on an SCC is the same as the case CA with aligned frame boundaries, if no SCC slots are partially overlapped with the measurement gap.
- The total interruption time on an SCC will be additionally extended by one SCC slot, if there exist SCC slots partially overlapped with the measurement gap.



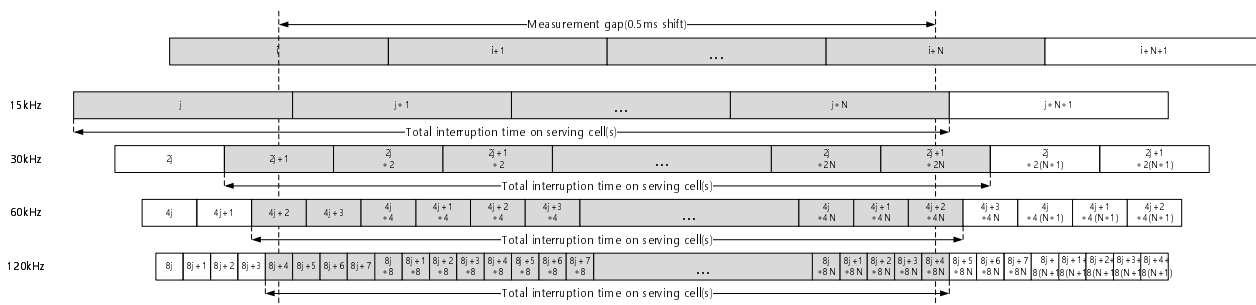
(a) Measurement gap with  $MGL = N(\text{ms})$  with MG timing advance of 0ms for all serving cells in synchronous EN-DC, NR standalone operation (with single carrier, NR CA and synchronous NR-DC configuration) and synchronous NE-DC, and for serving cells in MCG in NR standalone operation (with asynchronous NR-DC configuration)



(b) Measurement gap with  $MGL = N(\text{ms})$  with MG timing advance of 0.5ms for all serving cells in synchronous EN-DC, NR standalone operation (with single carrier, NR CA and synchronous NR-DC configuration) and synchronous NE-DC, and for serving cells in MCG in NR standalone operation (with asynchronous NR-DC configuration)



(c) Measurement gap with MGL = N(ms) with MG timing advance of 0ms for all serving cells in asynchronous EN-DC and asynchronous NE-DC, and for serving cells in SCG in NR standalone operation (with asynchronous NR-DC configuration)



(d) Measurement gap with MGL = N(ms) with MG timing advance of 0.5ms for all serving cells in asynchronous EN-DC and asynchronous NE-DC, and for serving cells in SCG in NR standalone operation (with asynchronous NR-DC configuration)

**Figure 9.1.2-1: Measurement GAP and total interruption time on serving cells for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC**

The corresponding total number of interrupted slots on serving cells is listed in Table 9.1.2-4 for all serving cells in synchronous EN-DC, NR standalone (with single carrier, NR CA and synchronous NR-DC configuration) and NE-DC, and for serving cells in MCG in NR standalone operation (with asynchronous NR-DC configuration). The corresponding total number of interrupted slots on serving cells is listed in Table 9.1.2-4a for asynchronous EN-DC, and for serving cells in SCG in NR standalone operation (with asynchronous NR-DC configuration).

**Table 9.1.2-4: Total number of interrupted slots on all serving cells during MGL for Synchronous EN-DC, NR standalone operation (with single carrier, NR CA and synchronous NR-DC configuration) and NE-DC, and on all serving cells in MCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1**

| NR SC S (kHz) | Total number of interrupted slots on serving cells |           |          |          |          |  |                     |                    |                    |                    |
|---------------|--|-----------|----------|----------|----------|--|---------------------|--------------------|--------------------|--------------------|
|               | When MG timing advance of 0ms is applied           |           |          |          |          | When MG timing advance of 0.5ms is applied |                     |                    |                    |                    |
|               | MGL=20 ms  | MGL=10 ms | MGL=6 ms | MGL=4 ms | MGL=3 ms | MGL=20 ms                                  | MGL=10 ms           | MGL=6 ms           | MGL=4 ms           | MGL=3 ms           |
| 15            | 20   | 10        | 6        | 4        | 3        | 21 <sup>Note3</sup>                        | 11 <sup>Note3</sup> | 7 <sup>Note3</sup> | 5 <sup>Note3</sup> | 4 <sup>Note3</sup> |
| 30            | 40   | 20        | 12       | 8        | 6        | 40   | 20                  | 12                 | 8                  | 6                  |
| 60            | 80   | 40        | 24       | 16       | 12       | 80   | 40                  | 24                 | 16                 | 12                 |
| 120           | 160  | 80        | 48       | 32       | 24       | 160  | 80                  | 48                 | 32                 | 24                 |

NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.

NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap.

NOTE 3: Non-overlapped half-slots occur before and after the measurement gap. Whether a Rel-15 UE can receive and/or transmit in those half-slots is up to UE implementation.

**Table 9.1.2-4a: Total number of interrupted slots on serving cells during MGL for Asynchronous EN-DC, and on all serving cells in SCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1**

| NR<br>SCS<br>(kHz) | Total number of interrupted slots on serving cells |              |             |             |             |  |              |             |             |             |
|--------------------|--|--------------|-------------|-------------|-------------|--|--------------|-------------|-------------|-------------|
|                    | When MG timing advance of 0ms is applied           |              |             |             |             | When MG timing advance of 0.5ms is applied |              |             |             |             |
|                    | MGL=20<br>ms                                       | MGL=10<br>ms | MGL=6<br>ms | MGL=4<br>ms | MGL=3<br>ms | MGL=20<br>ms                               | MGL=10<br>ms | MGL=6<br>ms | MGL=4<br>ms | MGL=3<br>ms |
| 15                 | 21   | 11           | 7           | 5           | 4           | 21   | 11           | 7           | 5           | 4           |
| 30                 | 41   | 21           | 13          | 9           | 7           | 41   | 21           | 13          | 9           | 7           |
| 60                 | 81   | 41           | 25          | 17          | 13          | 81   | 41           | 25          | 17          | 13          |
| 120                | 161  | 81           | 49          | 33          | 25          | 161  | 81           | 49          | 33          | 25          |

NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.

NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap.

In case that UE capable of per-FR measurement gap is configured with per-FR measurement gap for FR2 serving cells, total number of interrupted slots on FR2 serving cells during MGL is listed in Table 9.1.2-4b.

**Table 9.1.2-4b: Total number of interrupted slots on FR2 serving cells during MGL for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC with per-UE measurement gap or per-FR measurement gap for FR2**

| NR<br>SCS<br>(kHz) | Total number of interrupted slots on FR2 serving cells |              |               |               |               |   |              |               |               |               |
|--------------------|--|--------------|---------------|---------------|---------------|---|--------------|---------------|---------------|---------------|
|                    | When MG timing advance of 0ms is applied               |              |               |               |               | When MG timing advance of 0.25ms is applied |              |               |               |               |
|                    | MGL=<br>20ms   | MGL=<br>10ms | MGL=<br>5.5ms | MGL=<br>3.5ms | MGL=<br>1.5ms | MGL=<br>20ms                                | MGL=<br>10ms | MGL=<br>5.5ms | MGL=<br>3.5ms | MGL=<br>1.5ms |
| 60                 | 80   | 40           | 22            | 14            | 6             | 80  | 40           | 22            | 14            | 6             |
| 120                | 160  | 80           | 44            | 28            | 12            | 160   | 80           | 44            | 28            | 12            |

NOTE 1: The total number of interrupted slots is based on that SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter *refServCellIndicator* is an FR2 serving cell.

NOTE 2: Slot occurs before or after the measurement gap may be interrupted additionally if SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter *refServCellIndicator* is an FR1 serving cell.

It is up to UE implementation whether or not the UE is able to conduct transmission in the following slot(s),

- when MGTA is not applied, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after measurement gap
- when MGTA is applied and the SCS of the UL carrier is other than 15kHz, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after measurement gap
- when MGTA is applied and the SCS of the UL carrier is 15kHz, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after the slot partially overlapped with measurement gap

where UL slot denotes that all the symbols in the slot are uplink symbols, and  $L=1$  if  $(N_{TA} + N_{TAoffset}) \times T_c$  for the UL transmission is less than the length of one slot;  $L=2$  otherwise.

Note: Network is supposed to take into account the possible difference between the estimated TA at network and actual TA at UE when scheduling UE in the above slot(s).

**Table 9.1.2-5: (Void)**

### 9.1.2.1 EN-DC: Measurement Gap Sharing

For E-UTRA-NR dual connectivity UE configured with per-UE measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers for both SSB and CSI-RS based L3 measurement or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-UE measurement gaps, E-UTRA gap-needed inter-frequency carriers and inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR1 inter-frequency carriers for both SSB and CSI-RS based L3 measurement or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR1 measurement gaps, E-UTRA gap-needed inter-frequency carriers, inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR2 inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR2 measurement gaps.

When network signals “01”, “10” or “11” with RRC parameter *MeasGapSharingScheme* [2][16] and the value of X is defined as in Table 9.1.2.1-1, and

- $K_{\text{intra}} = 1 / X * 100$ ,
- $K_{\text{inter}} = 1 / (100 - X) * 100$ ,

When network signals “00” indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.1.

**Table 9.1.2.1-1: Value of parameter X for EN-DC measurement gap sharing**

| <i>measGapSharingScheme</i> | Value of X (%)  |
|-----------------------------|---|
| '00'                        | Equal splitting   |
| '01'                        | 25  |
| '10'                        | 50  |
| '11'                        | 75  |
| Note:                       | It is left to UE implementation to determine which measurement gap sharing scheme in the table <i>to be applied</i> , when <i>MeasGapSharingScheme</i> is absent and there is no stored value in the field. |

#### 9.1.2.1a SA: Measurement Gap Sharing

For NR standalone UE without NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-UE measurement gaps, and/or inter-RAT E-UTRAN carriers, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers.

For NR standalone UE without NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1



measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR1 inter-frequency carriers for both SSB and CSI-RS based L3 measurement and/or inter-RAT E-UTRAN carriers, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR1 measurement gaps, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers in FR1.

For NR standalone UE without NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR2 inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR2 measurement gaps, and when UE is configured to measure positioning frequency layers in FR2.

When network signals “01”, “10” or “11” with RRC parameter *MeasGapSharingScheme* [2] and the value of X is defined as in Table 9.1.2.1a-1, and

- $K_{\text{intra}} = 1 / X * 100$ ,
- $K_{\text{inter}} = 1 / (100 - X) * 100$ ,

When network signals “00” indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.2.

**Table 9.1.2.1a-1: Value of parameter X for NR standalone measurement gap sharing**

| <i>measGapSharingScheme</i> | Value of X (%)  |
|-----------------------------|---|
| '00'                        | Equal splitting   |
| '01'                        | 25  |
| '10'                        | 50  |
| '11'                        | 75  |
| Note:                       | It is left to UE implementation to determine which measurement gap sharing scheme in the table <i>to be applied</i> , when <i>MeasGapSharingScheme</i> is absent and there is no stored value in the field. |

### 9.1.2.1b NE-DC: Measurement Gap Sharing

For NR-E-UTRA dual connectivity UE configured with per-UE measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers for both SSB and CSI-RS based L3 measurement, E-UTRA gap-needed inter-frequency carriers, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-UE measurement gaps, and/or inter-RAT E-UTRA carriers, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers.

For NR-E-UTRA dual connectivity UE configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR1 measurement gaps, E-UTRA gap-needed inter-frequency carriers, and/or inter-RAT E-UTRA carriers, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers in FR1.

For NR-E-UTRA dual connectivity UE configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR2 inter-frequency carriers for both SSB and

CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR2 measurement gaps, and when UE is configured to measure positioning frequency layers in FR2.

When network signals “01”, “10” or “11” with RRC parameter *measGapSharingConfig* [2][16] and the value of X is defined as in Table 9.1.2.1b-1, and

- $K_{intra} = 1 / X * 100$ ,
- $K_{inter} = 1 / (100 - X) * 100$ ,

When network signals “00” indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.3.

**Table 9.1.2.1b-1: Value of parameter X for NE-DC measurement gap sharing**

| <i>measGapSharingScheme</i> | Value of X (%)  |
|-----------------------------|---|
| ‘00’                        | Equal splitting   |
| ‘01’                        | 25  |
| ‘10’                        | 50  |
| ‘11’                        | 75  |
| Note:                       | It is left to UE implementation to determine which measurement gap sharing scheme in the table <i>to be applied</i> , when <i>MeasGapSharingScheme</i> is absent and there is no stored value in the field. |

### 9.1.2.1c NR-DC: Measurement Gap Sharing

For UE with NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE requires measurement gaps to identify and measure cells on inter-frequency carriers for both SSB and CSI-RS based L3 measurement, and/or inter-RAT E-UTRAN carriers, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-UE measurement gaps, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers.

For UE with NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR1 inter-frequency carriers for both SSB and CSI-RS based L3 measurement and/or inter-RAT E-UTRAN carriers, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR1 measurement gaps, and/or inter-RAT UTRAN carriers for SRVCC, and when UE is configured to measure positioning frequency layers in FR1.

For UE with NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE requires measurement gaps to identify and measure cells on FR2 inter-frequency carriers for both SSB and CSI-RS based L3 measurement, or when all of SMTC configured for inter-frequency SSB based measurement without measurement gaps are fully overlapping with per-FR2 measurement gaps, and when UE is configured to measure positioning frequency layers in FR2.

When network signals “01”, “10” or “11” with RRC parameter *measGapSharingConfig* [2] and the value of X is defined as in Table 9.1.2.1c-1, and

- $K_{intra} = 1 / X * 100$ ,
- $K_{inter} = 1 / (100 - X) * 100$ ,

When network signals “00” indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.4.

**Table 9.1.2.1c-1: Value of parameter X for NR-DC measurement gap sharing**

| <i>measGapSharingConfig</i> | Value of X (%)  |
|-----------------------------|---|
| '00'                        | Equal splitting   |
| '01'                        | 25  |
| '10'                        | 50  |
| '11'                        | 75  |
| Note:                       | It is left to UE implementation to determine which measurement gap sharing scheme in the table <i>to be applied</i> , when <i>MeasGapSharingScheme</i> is absent and there is no stored value in the field. |

### 9.1.3 UE Measurement capability

#### 9.1.3.1 EN-DC: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE capable of and configured with the EN-DC operation mode.

When monitoring of multiple inter-frequency E-UTRAN, inter-RAT NR, GSM, UTRA FDD and UTRA TDD carriers as configured by E-UTRA PCell, and inter-frequency NR carriers (with or without CCA) as configured by PSCell using gaps (or without using gaps provided the UE supports such capability or the effective MGRP is applied for per-FR measurement gap capable UE) is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, CSI-RSRP, CSI-RSRQ, CSI-SINR, SFTD, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRAN RS-SINR measurements, UTRAN TDD P-CCPCH RSCP, UTRAN FDD CPICH measurements, GSM carrier RSSI, etc.) of detected cells on all the layers.

For UE configured with the EN-DC operation, the effective total number of frequencies excluding the frequencies of the PSCell, SCells, E-UTRA PCell, and E-UTRA SCells being monitored is  $N_{\text{freq, EN-DC}}$ , which is defined as:

$$N_{\text{freq, EN-DC}} = N_{\text{freq, EN-DC, NR}} + N_{\text{freq, EN-DC, E-UTRA}} + N_{\text{freq, EN-DC, UTRA}} + M_{\text{EN-DC, GSM}},$$

where

$N_{\text{freq, EN-DC, E-UTRA}}$  is the number of E-UTRA inter-frequency carriers being monitored (FDD and TDD) as configured by E-UTRA PCell or via LPP [22],

$$N_{\text{freq, EN-DC, NR}} \leq N_{\text{freq, EN-DC, NR, inter-RAT}} + N_{\text{freq, EN-DC, NR, inter-freq}}$$

where

$N_{\text{freq, EN-DC, NR, inter-RAT}}$  is the number of NR inter-RAT carriers excluding NR serving carrier(s) being monitored as configured by E-UTRA PCell [15],

$N_{\text{freq, EN-DC, NR, inter-freq}}$  is the number of NR inter-frequency carriers being monitored as configured by PSCell,

$N_{\text{freq, EN-DC, UTRA}}$  is the number of UTRA inter-RAT carriers being monitored as configured by E-UTRA PCell (FDD and TDD).

$M_{\text{EN-DC, GSM}}$  is an integer which is a function of the number of GSM inter-RAT carriers as configured by E-UTRA PCell on which measurements are being performed.  $M_{\text{EN-DC, GSM}}$  is equal to 0 if no GSM carrier is being monitored. For a MGRP of 40 ms,  $M_{\text{EN-DC, GSM}}$  is equal to 1 if cells on up to 32 GSM carriers are being measured. For a MGRP of 80 ms,  $M_{\text{EN-DC, GSM}}$  is equal to  $\text{ceil}(N_{\text{carriers, GSM}}/20)$  where  $N_{\text{carriers, GSM}}$  is the number of GSM carriers on which cells are being measured.

#### 9.1.3.1a SA: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE configured with SA NR operation mode.

When monitoring of multiple inter-RAT E-UTRAN carriers, inter-frequency NR carriers (with or without CCA) and inter-RAT UTRA FDD carriers using gaps (or without using gaps provided the UE supports such capability or the effective MGRP is applied for per-FR measurement gap capable UE) is configured by PCell, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, CSI-RSRP, CSI-RSRQ, CSI-SINR, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRAN RS-SINR measurements, UTRAN FDD CPICH measurement, etc.) of detected cells on all the layers.

For UE configured with the NR SA operation, the effective total number of frequencies, excluding the frequencies of the PCell, PSCell and SCells being monitored, is  $N_{\text{freq, SA}}$ , which is defined as:

$$N_{\text{freq, SA}} = N_{\text{freq, SA, NR}} + N_{\text{freq, SA, E-UTRA}} + N_{\text{freq, SA, UTRA}}$$

where

$N_{\text{freq, SA, E-UTRA}}$  is the number of E-UTRA inter-RAT carriers being monitored (FDD and TDD) as configured by PCell or via LPP [22],

- $N_{\text{freq, SA, UTRA}}$  is the number of UTRA FDD inter-RAT carriers being monitored as configured by PCell,

$N_{\text{freq, SA, NR}}$  is the number of NR inter-frequency carriers being monitored as configured by PCell.

### 9.1.3.1b NE-DC: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE capable of and configured with the NE-DC operation mode.

UTRAN carriers as configured by PCell, inter-RAT UTRA FDD carriers as configured by PCell, and inter-frequency NR carriers as configured by PCell using gaps (or without using gaps provided the UE supports such capability or the effective MGRP is applied for per-FR measurement gap capable UE) is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, CSI-RSRP, CSI-RSRQ, CSI-SINR, SFTD, E-UTRAN RSRP, E-UTRAN RSRQ, and E-UTRAN RS-SINR measurements, UTRAN FDD CPICH measurements, etc.) of detected cells on all the layers.

For UE configured with the NE-DC operation, the effective total number of frequencies excluding the frequencies of the PCell, SCells, E-UTRA PSCell, and E-UTRA SCells being monitored is  $N_{\text{freq, NE-DC}}$ , which is defined as:

$$N_{\text{freq, NE-DC}} = N_{\text{freq, NE-DC, NR}} + N_{\text{freq, NE-DC, E-UTRA}} + N_{\text{freq, NE-DC, UTRA}}$$

where

$N_{\text{freq, NE-DC, NR}}$  is the number of NR inter-frequency carriers being monitored as configured by PCell,

$N_{\text{freq, NE-DC, UTRA}}$  is the number of UTRA FDD inter-RAT carriers being monitored as configured by PCell,

$$N_{\text{freq, NE-DC, E-UTRA}} \leq N_{\text{freq, NE-DC, E-UTRA, inter-RAT}} + N_{\text{freq, NE-DC, E-UTRA, inter-freq}}$$

where

$N_{\text{freq, NE-DC, E-UTRA, inter-RAT}}$  is the number of E-UTRA inter-RAT carriers (FDD and TDD) excluding E-UTRA serving carrier(s) being monitored as configured by PCell or via LPP [22],

$N_{\text{freq, NE-DC, E-UTRA, inter-freq}}$  is the number of E-UTRA inter-frequency carriers (FDD and TDD) being monitored as configured by E-UTRA PSCell [15] or via LPP [22].

### 9.1.3.1c NR-DC: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE configured with NR-DC operation mode.

When monitoring of multiple inter-RAT E-UTRAN carriers and inter-frequency NR carriers using gaps (or without using gaps provided the UE supports such capability or the effective MGRP is applied for per-FR measurement gap capable UE) as configured by PCell, inter-RAT UTRA FDD carriers as configured by PCell, and inter-frequency NR carriers as configured by PSCell is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, CSI-RSRP, CSI-RSRQ, CSI-SINR, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRAN RS-SINR measurements, UTRAN FDD CPICH measurements, etc.) of detected cells on all the layers.

For UE configured with the NR-DC operation, the effective total number of frequencies, excluding the frequencies of the PCell, PSCell and SCells being monitored, is  $N_{\text{freq, NR-DC}}$ , which is defined as:

$$N_{\text{freq, NR-DC}} = N_{\text{freq, NR-DC, NR}} + N_{\text{freq, NR-DC, E-UTRA}} + N_{\text{freq, NR-DC, UTRA}},$$

where

- $N_{\text{freq, NR-DC, E-UTRA}}$  is the number of E-UTRA inter-RAT carriers being monitored (FDD and TDD) as configured by PCell or via LPP [22].
- $N_{\text{freq, NR-DC, UTRA}}$  is the number of UTRA FDD inter-RAT carriers being monitored as configured by PCell,
- $N_{\text{freq, NR-DC, NR}}$  is the number of NR inter-frequency carriers being monitored as configured by PCell and PSCell.

### 9.1.3.2 EN-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with EN-DC operation, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR SSB inter-frequency carriers configured by PSCell, and
- Depending on UE capability, 8 NR inter-frequency carriers including SSB and CSI-RS in total configured by PSCell, and
- Depending on UE capability, 7 NR SSB inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA TDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA FDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 3 FDD UTRA carriers, and
- Depending on UE capability, 3 TDD UTRA carriers, and
- Depending on UE capability, 32 GSM carriers (one GSM layer corresponds to 32 carriers), and
- Depending on UE capability, 1 E-UTRA FDD inter-frequency carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-frequency carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, E-UTRA TDD, UTRA FDD, UTRA TDD and GSM (one GSM layer corresponds to 32 carriers) layers. The UE shall be capable of monitoring a total of at least  $7 + N_{\text{CSI}}$  effective NR carrier frequency layers excluding NR serving carrier(s), comprising of any above defined combination of NR inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell and NR inter-frequency carriers configured by PSCell,  $N_{\text{CSI}}$  equals 1 if UE supports CSI-RS based L3 measurement, and  $N_{\text{CSI}} = 0$  otherwise.

The number of SSB frequency layers configured by PSCell equals to the total number of MOs with

- *ssb-ConfigMobility* configured, or
- *ssb-ConfigMobility* not configured but *csi-rs-ResourceConfigMobility* configured with *associatedSSB*.

If *ssbfrequency*, *smtc1*, *smtc2* and *ssbSubcarrierSpacing* are same in multiple MOs, the multiple MOs are counted as one SSB frequency layer.

The number of CSI-RS frequency layers equals to the number of MOs with *csi-rs-ResourceConfigMobility* configured assuming single MO is configured per frequency layer.

When the E-UTRA PCell and PSCell configures the same NR carrier frequency layer to be monitored by the UE in synchronous intra-band EN-DC, this layer shall be counted only once to the total number of effective carrier frequency layers provided that the SFN-s and slot boundaries are aligned, unless the configured NR carrier frequency layers to be monitored have

- different RSSI measurement resources or
- different *deriveSSB-IndexFromCell* indications or
- different SMTc configurations or
- different *ssb-PositionQCL-Common-r16* indications or cell list of *ssb-PositionQCL* on NR carrier frequency layer with CCA or
- different *rmtc-Config-r16* indication on NR carrier frequency layer with CCA.

Note 1: The E-UTRA-NR dual connectivity capable UE configured with PSCell shall fulfil the requirements defined in only one of clause 9.1.3.2 and clause 8.1.2.1.1b.1 of TS 36.133 [15].

### 9.1.3.2a SA: Maximum allowed layers for multiple monitoring

If a UE is configured with SA NR operation mode, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR SSB inter-frequency carriers configured by PCell, and
- Depending on UE capability, 8 NR inter-frequency carriers including SSB and CSI-RS in total configured by PCell, and
- Depending on UE capability, 7 E-UTRA TDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 3 UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 1 E-UTRA FDD inter-RAT carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-RAT carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least [13] effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, E-UTRA TDD and UTRA FDD layers.

The number of SSB frequency layers equals to the total number of MOs with

- *ssb-ConfigMobility* configured, or
- *ssb-ConfigMobility* not configured but *csi-rs-ResourceConfigMobility* configured with *associatedSSB*.

If *ssbfrequency*, *smtc1*, *smtc2* and *ssbSubcarrierSpacing* are same in multiple MOs, the multiple MOs are counted as one SSB frequency layer.

The number of CSI-RS frequency layers equals to the number of MOs with *csi-rs-ResourceConfigMobility* configured assuming single MO is configured per frequency layer.

### 9.1.3.2b NE-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with NE-DC operation mode, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR SSB inter-frequency carriers configured by PCell, and
- Depending on UE capability, 8 NR inter-frequency carriers including SSB and CSI-RS in total configured by PCell, and
- Depending on UE capability, 6 E-UTRA TDD inter-RAT carriers excluding E-UTRA serving carriers configured by PCell, and
- Depending on UE capability, 6 E-UTRA FDD inter-RAT carriers excluding E-UTRA serving carriers configured by PCell, and

- Depending on UE capability, 6 E-UTRA TDD inter-frequency carriers configured by E-UTRA PSCell [15], and
- Depending on UE capability, 6 E-UTRA FDD inter-frequency carriers configured by E-UTRA PSCell [15], and
- Depending on UE capability, 3 UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 1 E-UTRA FDD inter-frequency carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-frequency carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, E-UTRA TDD and UTRA FDD layers. The UE shall be capable of monitoring a total of at least 6 effective E-UTRA carrier frequency layers, excluding E-UTRA serving carrier(s), comprising of any above defined combination of E-UTRA inter-RAT carriers excluding E-UTRA serving carrier(s) configured by PCell and E-UTRA inter-frequency carriers configured by E-UTRA PSCell.

The number of SSB frequency layers configured by PCell equals to the total number of MOs with

- *ssb-ConfigMobility* configured, or
- *ssb-ConfigMobility* not configured but *csi-rs-ResourceConfigMobility* configured with *associatedSSB*.

If *ssbfrequency*, *smtc1*, *smtc2* and *ssbSubcarrierSpacing* are same in multiple MOs, the multiple MOs are counted as one SSB frequency layer.

The number of CSI-RS frequency layers equals to the number of MOs with *csi-rs-ResourceConfigMobility* configured assuming single MO is configured per frequency layer.

### 9.1.3.2c NR-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with NR-DC operation, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR SSB inter-frequency carriers configured by PCell, and
- Depending on UE capability, 8 NR inter-frequency carriers including SSB and CSI-RS in total configured by PCell, and
- Depending on UE capability, 7 NR SSB inter-frequency carriers configured by PSCell, and
- Depending on UE capability, 8 NR inter-frequency carriers including SSB and CSI-RS in total configured by PSCell, and
- Depending on UE capability, 7 E-UTRA TDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 3 UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 1 E-UTRA FDD inter-RAT carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-RAT carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, E-UTRA TDD and UTRA FDD layers. The UE shall be capable of monitoring a total of at least  $7 + N_{\text{CSI}}$  effective NR carrier frequency layers excluding NR serving carrier(s), which are configured by PCell and PSCell,  $N_{\text{CSI}}$  equals 1 if UE supports CSI-RS based L3 measurement, and  $N_{\text{CSI}}=0$  otherwise.

The number of SSB frequency layers equals to the total number of MOs with

- *ssb-ConfigMobility* configured, or

- *ssb-ConfigMobility* not configured but *csi-rs-ResourceConfigMobility* configured with *associatedSSB*.

If *ssbfrequency*, *smtc1*, *smtc2* and *ssbSubcarrierSpacing* are same in multiple MOs, the multiple MOs are counted as one SSB frequency layer.

The number of CSI-RS frequency layers equals to the number of MOs with *csi-rs-ResourceConfigMobility* configured assuming single MO is configured per frequency layer.

When PCell and PSCell configures the same NR carrier frequency layer to be monitored by the UE in NR-DC, this layer shall be counted only once to the total number of effective carrier frequency layers provided that the SFN-s and slot boundaries are aligned, unless the configured NR carrier frequency layers to be monitored have

- different RSSI measurement resources or
- different *deriveSSB-IndexFromCell* indications or
- different SMTC configurations or
- different *ssb-PositionQCL-Common-r16* indications or cell list of *ssb-PositionQCL* on NR carrier frequency layer with CCA or
- different *rmtc-Config-r16* indication on NR carrier frequency layer with CCA.

### 9.1A.3.2 Void

## 9.1.3A UE Measurement capability under operation mode with CCA

### 9.1.3A.1 EN-DC: Monitoring of multiple layers using gaps under CCA

The requirements in clause 9.1.3.1 are also applicable for the UE capable of and configured with the EN-DC operation mode with CCA on PSCC.

#### 9.1.3A.1A SA: Monitoring of multiple layers using gaps under CCA

The requirements in clause 9.1.3.1a are also applicable for UE configured with SA NR operation mode with CCA on PCC.

### 9.1.3A.2 EN-DC: Maximum allowed layers for multiple monitoring under CCA

If a UE is configured with EN-DC operation when CCA is used on PSCell, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PSCell, and
- Depending on UE capability, 7 NR inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA TDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA FDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 3 FDD UTRA carriers, and
- Depending on UE capability, 3 TDD UTRA carriers, and
- Depending on UE capability, 32 GSM carriers (one GSM layer corresponds to 32 carriers), and

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, E-UTRA TDD, UTRA FDD, UTRA TDD and GSM (one GSM layer corresponds to 32 carriers) layers. The UE shall be capable of monitoring a total of at least 7 effective NR carrier frequency layers excluding NR serving carrier(s), comprising of any above defined combination of NR inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell and NR inter-frequency carriers configured by PSCell.



When the E-UTRA PCell and PSCell configures the same NR carrier frequency layer to be monitored by the UE in synchronous intra-band EN-DC, this layer shall be counted only once to the total number of effective carrier frequency layers provided that the SFN-s and slot boundaries are aligned, unless the configured NR carrier frequency layers to be monitored have

- different RSSI measurement resources or
- different *deriveSSB-IndexFromCell* indications or
- different SMTC configurations or
- different *ssb-PositionQCL-Common-r16* indications or cell list of *ssb-PositionQCL* on NR carrier frequency layer with CCA or
- different *rmtc-Config-r16* indication on NR carrier frequency layer with CCA.

#### 9.1A.3.2a Void

#### 9.1.3A.2A SA: Maximum allowed layers for multiple monitoring under CCA

If a UE is configured with SA NR operation mode when CCA is used on PCell or SCell only, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA TDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA FDD inter-RAT carriers configured by PCell, and

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least [13] effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD and E-UTRA TDD layers.

### 9.1.4 Capabilities for Support of Event Triggering and Reporting Criteria

#### 9.1.4.1 Introduction

This clause contains requirements on UE capabilities for support of event triggering and reporting criteria. As long as the measurement configuration does not exceed the requirements stated in clause 9.1.4.2, the UE shall meet all other performance requirements defined in clause 9 and clause 10. The requirements in this clause also apply for a UE in EN-DC with PSCell on a carrier frequency with CCA or SA NR with PCell on a carrier frequency with CCA.

The UE can be requested to make measurements under different measurement identities defined in TS 38.331 [2]. Each measurement identity corresponds to either event-based reporting, periodic reporting, or no reporting. In case of event-based reporting, each measurement identity is associated with an event triggering criterion. In case of periodic reporting, a measurement identity is associated with one periodic reporting criterion. In case of no reporting, a measurement identity is associated with one no reporting criterion.

The purpose of this clause is to set some limits on the number of different event triggering, periodic, and no reporting criteria the UE may be requested to track in parallel.

#### 9.1.4.2 Requirements

In this clause a reporting criterion corresponds to either one event (in the case of event-based reporting), or one periodic reporting criterion (in case of periodic reporting), or one no reporting criterion (in case of no reporting). For event-based reporting, each instance of event, with the same or different event identities, is counted as separate reporting criterion in Table 9.1.4.2-1.

The UE shall be able to support in parallel per category up to  $E_{cat}$  reporting criteria according to Table 9.1.4.2-1. For the measurement categories belonging to intra-frequency, inter-frequency, and inter-RAT measurements (i.e. without counting other categories that the UE shall always support in parallel), the UE need not support more than the total number of reporting criteria as follows:

- For UE configured with EN-DC:  $E_{cat,EN-DC,NR} + E_{cat,EN-DC,E-UTRA}$ , where

$E_{cat,EN-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria configured by PSCell (NR intra- and inter-frequency reporting criteria) and by E-UTRA PCell on NR serving frequencies (NR intra-frequency reporting criteria) applicable for UE configured with EN-DC according to Table 9.1.4.2-1, and  $n$  is the number of configured NR serving frequencies, including PSCell and SCells carrier frequencies,

$E_{cat,EN-DC,E-UTRA}$  is the total number of reporting criteria configured by E-UTRA PCell except PSCell and SCells carrier frequencies, as specified in TS 36.133 [15] for UE configured with EN-DC.

- For UE configured with NE-DC:  $E_{cat,NE-DC,NR} + E_{cat,NE-DC,E-UTRA}$ , where

$E_{cat,NE-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and  $n$  is the number of configured NR serving frequencies, including PCell and SCells carrier frequencies,

$E_{cat,NE-DC,E-UTRA} = E_{cat,NE-DC,E-UTRA,inter-RAT} + E_{cat,NE-DC,E-UTRA,intra-RAT}$ , where

$E_{cat,NE-DC,E-UTRA,inter-RAT}$  is the total number of inter-RAT E-UTRA reporting criteria configured by PCell except E-UTRA PSCell and E-UTRA SCells carrier frequencies, according to Table 9.1.4.2-1,

$E_{cat,NE-DC,E-UTRA,intra-RAT}$  is the total number of E-UTRA reporting criteria including E-UTRA PSCell and E-UTRA SCells carrier frequencies as specified in TS 36.133 [15] for UE configured with NE-DC.

- For UE configured with SA operation mode:  $E_{cat,SA,NR} + E_{cat,SA,E-UTRA}$ , where

$E_{cat,SA,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and  $n$  is the number of configured NR serving frequencies, including PCell, and SCells carrier frequencies,

$E_{cat,SA,E-UTRA}$  is the total number of inter-RAT E-UTRA reporting criteria according to Table 9.1.4.2-1.

- For UE configured with NR-DC:  $E_{cat,NR-DC,NR} + E_{cat,NR-DC,E-UTRA}$ , where

$E_{cat,NR-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and  $n$  is the number of configured NR serving frequencies, including PCell, PSCell and SCells carrier frequencies,

$E_{cat,NR-DC,E-UTRA}$  is the total number of inter-RAT E-UTRA reporting criteria according to Table 9.1.4.2-1.

**Table 9.1.4.2-1: Requirements for reporting criteria per measurement category**

| Measurement category  | E <sub>cat</sub> | Note   |
|---|------------------|--|
| Intra-frequency <sup>Note 1,2,3,4,5</sup>   | 9                | Events for any one or a combination of intra-frequency SS-RSRP, SS-RSRQ, SS-SINR, CSI-RSRP, CSI-RSRQ, and CSI-SINR for NG-RAN intra-frequency cells  |
| Inter-frequency <sup>Note 2,3,4,5</sup>   | 10               | Events for any one or a combination of inter-frequency SS-RSRP, SS-RSRQ, SS-SINR, CSI-RSRP, CSI-RSRQ, and CSI-SINR for NG-RAN inter-frequency cells  |
| Inter-RAT (E-UTRA FDD, E-UTRA TDD) <sup>Note 2,4,5</sup>                                      | 10               | Only applicable for UE with this (inter-RAT) capability. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.  |
| Inter-RAT (E-UTRA FDD, E-UTRA TDD) RSTD <sup>Note 2,4,5</sup>                                 | 1                | Inter-RAT RSTD measurement reporting for UE supporting OTDOA; 1 report capable of minimum 16 inter-RAT cell measurements. Only applicable for UE with this (inter-RAT RSTD via LPP [22]) capability. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.  |
| Inter-RAT (E-UTRA FDD, E-UTRA TDD) RSRP and RSRQ measurements for E-CID <sup>Note 2,4,5</sup> | 1                | Inter-RAT RSRP and RSRQ measurements for E-CID reported to E-SMLC via LPP [22]. One report capable of at least in total 10 inter-RAT RSRP and RSRQ measurements. Applicable to UE capable of reporting inter-RAT RSRP and RSRQ to E-SMLC via LPP. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell. |
| Intra-frequency RSSI and channel occupancy measurements with CCA <sup>Note 1,2,3</sup>        | 1                | One report capable of one RSSI and one channel occupancy measurements over a channel [TS 37.213] with CCA. Applicable for UE capable of performing and reporting RSSI and channel occupancy on carrier frequencies under CCA.  |
| Inter-frequency RSSI and channel occupancy measurements with CCA <sup>Note 2,3</sup>          | 1                | One report capable of one RSSI and one channel occupancy measurements over a channel [TS 37.213] with CCA. Applicable for UE capable of performing and reporting RSSI and channel occupancy on carrier frequencies under CCA.  |
| Intra-frequency SSB-based measurements for NR E-CID <sup>Note 1,2,3,4,5</sup>                 | 1                | Intra-frequency SS-RSRP and SS-RSRQ measurements for NR E-CID reported to LMF via LPP [34]. One report capable of at least in total 9 intra-frequency SS-RSRP and SS-RSRQ measurements. Applicable to UE capable of reporting at least one of SS-RSRP and SS-RSRQ to LMF via LPP.  |
| Intra-frequency CSI-RS based measurements for NR E-CID <sup>Note 1,2,3,4,5</sup>              | 1                | Intra-frequency CSI-RSRP and CSI-RSRQ measurements for NR E-CID reported to LMF via LPP [22]. One report capable of at least in total 9 intra-frequency CSI-RSRP and/or CSI-RSRQ measurements. Applicable to UE capable of reporting any of CSI-RSRP and CSI-RSRQ to LMF via LPP, as indicated in <i>nr-ECID-MeasSupported-r16</i> .   |
| Inter-frequency SSB-based measurements for NR E-CID <sup>Note 2,3,4,5</sup>                   | 1                | Inter-frequency SS-RSRP and SS-RSRQ measurements for NR E-CID reported to LMF via LPP [34]. One report capable of at least in total 10 inter-frequency SS-RSRP and SS-RSRQ measurements. Applicable to UE capable of reporting at least one of SS-RSRP and SS-RSRQ to LMF via LPP.   |

|  |   |   |
|--|---|---|
| Inter-frequency CSI-RS based measurements for NR E-CID <sup>Note 2,3,4,5</sup>   | 1 | Inter-frequency CSI-RSRP and CSI-RSRQ measurements for NR E-CID reported to LMF via LPP [22]. One report capable of at least in total 10 inter-frequency CSI-RSRP and CSI-RSRQ measurements. Applicable to UE capable of reporting any of CSI-RSRP and CSI-RSRQ to LMF via LPP, as indicated in <i>nr-ECID-MeasSupported-r16</i> .  |
| DL RSTD <sup>Note 2,4,5</sup>  | 1 | DL RSTD measurement reporting; 1 report capable of multiple (within the UE PRS measurement capability, <i>nr-DL-TDOA-MeasCapability</i> , indicated via LPP [34]) DL RSTD measurements and if supported also multiple corresponding DL PRS-RSRP measurements configured for DL-TDOA. Only applicable for UE capable of reporting measurements for DL-TDOA to LMF via LPP [34].                    |
| UE Rx-Tx <sup>Note 2,4,5</sup>   | 1 | UE Rx-Tx measurement reporting; 1 report capable of multiple (within the UE PRS measurement capability, <i>nr-DL-PRS-MeasCapability</i> , indicated via LPP [34] for multi-RTT) UE Rx-Tx measurements and if supported also multiple corresponding DL PRS-RSRP measurements configured for multi-RTT. Only applicable for UE capable of reporting measurements for multi-RTT to LMF via LPP [34]. |
| DL PRS-RSRP <sup>Note 2,4,5</sup>  | 1 | DL PRS-RSRP measurement reporting; 1 report capable of multiple (within the UE PRS measurement capability, <i>nr-DL-PRS-MeasCapability</i> , indicated via LPP [34] for AoD) DL PRS-RSRP measurements configured for DL-AoD. Only applicable for UE capable of reporting measurements for DL-AoD to LMF via LPP [34].   |
| SRS-RSRP <sup>Note 2,3,4,5</sup>   | 1 | SRS-RSRP measurement reporting for CLI; 1 report capable of up to 32 SRS resources measurements. Only applicable for UE supporting <i>cli-SRS-RSRP-Meas-r16</i> .   |
| CLI-RSSI <sup>Note 2,3,4,5</sup>   | 1 | CLI-RSSI measurement reporting for CLI; 1 report capable of up to 64 CLI-RSSI resources measurements. Only applicable for UE supporting <i>cli-RSSI-Meas-r16</i> .  |
| <p>NOTE 1: When the UE is configured with PCell and SCell carrier frequencies, <math>E_{cat}</math> for Intra-frequency is applied per corresponding NR serving frequency.</p> <p>NOTE 2: Applicable for UE configured with SA NR operation mode.</p> <p>NOTE 3: Applicable for UE configured with EN-DC operation mode.</p> <p>NOTE 4: Applicable for UE configured with NE-DC operation mode.</p> <p>NOTE 5: Applicable for UE configured with NR-DC operation mode.</p> |   |   |

## 9.1.5 Carrier-specific scaling factor

This clause specifies the derivation of carrier-specific scaling factor (CSSF) values, which scales the measurement delay requirements given in clause 9.2, 9.2A, 9.3, 9.3A 9.4, and NR PRS-based positioning measurements in clause 9.9 and CSI-RS based L3 measurement in clause 9.10 when UE is configured to monitor multiple measurement objects. The CSSF values are categorized into  $CSSF_{outside\_gap,i}$  and  $CSSF_{within\_gap,i}$ , for the measurements conducted outside measurement gaps and within measurement gaps, respectively.

### 9.1.5.1 Monitoring of multiple layers outside gaps

The carrier-specific scaling factor  $CSSF_{outside\_gap,i}$  for measurement object  $i$  derived in this chapter is applied to following measurement types:

- SSB-based intra-frequency measurement with no measurement gap in clause 9.2.5 and 9.2A.5, when none of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.
- SSB-based intra-frequency measurement with no measurement gap in clause 9.2.5 and 9.2A.5, when part of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.
- For a UE in E-UTRA-NR dual connectivity operation, NR SSB-based inter-RAT measurement object configured by the E-UTRAN PCell on an NR serving carrier
  - the SSB is completely contained in the active BWP of the UE, and
  - none or part of the SMTC occasions of this inter-RAT measurement object are overlapped by the measurement gap;
- CSI-RS based intra-frequency measurement in clause 9.10.2, when none of CSI-RS resources for L3 measurement of this intra-frequency measurement object are overlapped by the measurement gap.
- CSI-RS based intra-frequency measurement in clause 9.10.2, when all CSI-RS resources for L3 measurement of this intra-frequency measurement object are partially overlapped by the measurement gap.
- SSB-based inter-frequency measurement with no measurement gap in clause 9.3.9, when none of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, if UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network.
- SSB-based inter-frequency measurement with no measurement gap in clause 9.3.9, when part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, if UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network.
- Intra-frequency RSSI and channel occupancy measurement with no measurement gap on a carrier subject to CCA when SMTC and RMTC are overlapping and RMTCs are not fully overlapped with measurement gap.

For a UE in E-UTRA-NR dual connectivity operation, if a measurement object configured by PCell and an NR inter-RAT measurement object configured by E-UTRAN PCell are on the same serving carrier, they shall be counted as one intra-frequency measurement object, provided that they meet the measurement object merging conditions [in clause 9.1.3.2].

The number of frequency layers for SSB measurements shall include the total number of MOs with

- *ssb-ConfigMobility* configured, or
- *ssb-ConfigMobility* not configured but *csi-rs-ResourceConfigMobility* configured with *associatedSSB*.

If *ssbfrequency*, *smtc1*, *smtc2* and *ssbSubcarrierSpacing* are same in multiple MOs, the multiple MOs are counted as one SSB frequency layer.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps,  $CSSF_{\text{outside\_gap},i}$  and requirements derived from  $CSSF_{\text{outside\_gap},i}$  are not specified.

The UE cell identification and measurement periods derived based on  $CSSF_{\text{outside\_gap},i}$  in clauses 9.2.5.1, 9.2.5.2 and 9.10.2 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with  $T_{\text{measure\_SFTD1}}$  specified in clause 9.3.8 when no measurement gaps are provided.

The requirements in this clause apply provided that

- The SMTC on all CCs and inter-frequency layers without measurement gap in FR2 have the same offset, and one of following conditions is met
  - If *smtc2* is configured on any FR2 CC,
    - All CCs have the same configuration for *smtc1*, and
    - All CCs configured with *smtc2* have the same configuration for *smtc2*
  - If *smtc2* is not configured on any FR2 CC,

- The total number of different SMTC periodicities on all serving CCs and inter-frequency layers without measurement gap does not exceed 4
- The starting point of the first 5ms window for CSI-RS measurement as defined in clause 9.10.1 on all CCs in FR2 is same and one of following conditions is met
  - If any CSI-RS resource is configured in the second 5ms window for CSI-RS measurement as defined in clause 9.10.1 on any FR2 CC,
    - All CCs with CSI-RS resources only in the first 5ms window have the same CSI-RS resource periodcity, and
    - All CCs with CSI-RS resources both in the first and the second 5ms window have the same CSI-RS resource periodcity
  - If no CSI-RS resource is configured in the second 5ms window for CSI-RS measurement as defined in clause 9.10.1 on any FR2 CC,
    - The total number of different CSI-RS resources periodicities on all serving CCs does not exceed 3

Note: Longer delays for cell identification and measurement periods derived based on  $CSSF_{\text{outside\_gap},i}$  in clauses 9.2.5.1, 9.2.5.2, can be expected, if the UE is configured with more than 4 different SMTC periodicities on FR2 serving carriers. The longer delay applies for the FR2 intra-frequency measurement objects with the longest SMTC periodicity/periodicities.

#### 9.1.5.1.1 EN-DC mode: carrier-specific scaling factor for SSB-based, CSI-RS based L3 measurements and RSSI and channel occupancy measurements performed outside gaps

For UE configured with the E-UTRA-NR dual connectivity operation, the carrier-specific scaling factor  $CSSF_{\text{outside\_gap},i}$  for intra-frequency SSB-based measurements, inter-frequency SSB-based measurements performed outside measurements gaps, intra-frequency CSI-RS L3 measurement and RSSI/channel occupancy measurement with no measurement gap on a carrier subject to CCA when SMTC and RMTC are overlapping will be as specified in Table 9.1.5.1.1-1.

Table 9.1.5.1.1-1:  $CSSF_{outside\_gap,i}$  scaling factor for EN-DC mode

| Scenario  | $CSSF_{outside\_gap,i}$ for FR1 PSCC         | $CSSF_{outside\_gap,i}$ for FR1 SCC                                 | $CSSF_{outside\_gap,i}$ for FR2 PSCC | $CSSF_{outside\_gap,i}$ for FR2 SCC where neighbour cell measurement is required <sup>Note 2</sup> | $CSSF_{outside\_gap,i}$ for FR2 SCC where neighbour cell measurement is not required | $CSSF_{outside\_gap,i}$ for inter-frequency MO with no measurement gap |
|---|--|---|--------------------------------------|--|--|--|
| EN-DC with FR1 only CA  | $1+N_{PSCC\_CSIRS}+N_{PSCC\_CCA\_RS\ SI/CO}$ | $N_{SCC\_SSB}+Y+2X$<br>$N_{SCC\_CSIRS}+$<br>$N_{SCC\_CCA\_RSSI/CO}$ | N/A                                  | N/A  | N/A  | $N_{SCC\_SSB}+Y+2X$<br>$N_{SCC\_CSIRS}$                                |
| EN-DC with FR2 only intra band CA   | N/A  | N/A   | $1+N_{PSCC\_CSIRS}$                  | N/A  | $N_{SCC\_SSB}+Y+2X$<br>$N_{SCC\_CSIRS}$  | $N_{SCC\_SSB}+Y+2X$<br>$N_{SCC\_CSIRS}$                                |
| EN-DC with FR2 only inter band CA   | N/A  | N/A   | $1+N_{PSCC\_CSIRS}$                  | $2x(1+N_{SCC\_CSIRS\_FR2\_NC\ M})$ <sup>Note 3,5</sup>   | $2x(N_{SCC\_SSB}+Y+2X N_{SCC\_CSIRS}-1-N_{SCC\_CSIRS\_FR2\_NCM})$                    | $2x(N_{SCC\_SSB}+Y+2X N_{SCC\_CSIRS}-1-N_{SCC\_CSIRS\_FR2\_NCM})$      |
| EN-DC with FR1 +FR2 CA (FR1 PSCell) <sup>Note 1</sup>   | $1+N_{PSCC\_CSIRS}$                          | $2x(N_{SCC\_SSB}+Y+2X N_{SCC\_CSIRS}-1-N_{SCC\_CSIRS\_FR2\_NCM})$   | N/A                                  | $2x(1+N_{SCC\_CSIRS\_FR2\_NCM})$ <sup>Note 3</sup>   | $2x(N_{SCC\_SSB}+Y+2X N_{SCC\_CSIRS}-1-N_{SCC\_CSIRS\_FR2\_NCM})$                    | $2x(N_{SCC\_SSB}+Y+2X N_{SCC\_CSIRS}-1-N_{SCC\_CSIRS\_FR2\_NCM})$      |
| EN-DC with FR1 +FR2 CA (FR2 PSCell) <sup>Note 1</sup>   | N/A  | $N_{SCC\_SSB}+Y+2X$<br>$N_{SCC\_CSIRS}$                             | $1+N_{PSCC\_CSIRS}$                  | N/A  | $N_{SCC\_SSB}+Y+2X$<br>$N_{SCC\_CSIRS}$  | $N_{SCC\_SSB}+Y+2X$<br>$N_{SCC\_CSIRS}$                                |
| <p>Note 1: Only one NR FR1 operating band and one NR FR2 operating band are included for FR1+FR2 inter-band EN-DC.</p> <p>Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.</p> <p>Note 3: <math>CSSF_{outside\_gap,i}=1</math> if only one SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on SCC; <math>CSSF_{outside\_gap,i}=2</math> if only one SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on SCC.</p> <p>Note 4: Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG; otherwise, it is 0.</p> <p>Note 5: Only two NR FR2 operating band are included for EN-DC with FR2 only inter-band CA</p> <p>Note 6: <math>N_{PSCC\_CSIRS}=1</math> if PSCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, <math>N_{PSCC\_CSIRS}=0</math>.</p> <p>Note 7: <math>N_{SCC\_CSIRS}</math>=Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured</p> <p>Note 8: <math>N_{SCC\_CSIRS\_FR2\_NCM}=1</math> if FR2 SCC, where neighbour cell measurement is required, is with either both SSB and CSI-RS configured or only CSI-RS measurement configured; otherwise, <math>N_{SCC\_CSIRS\_FR2\_NCM}=0</math>.</p> <p>Note 9: <math>N_{SCC\_SSB}</math>=Number of configured SCell(s) with only SSB based L3 measurement configured</p> <p>Note 10: <math>N_{PSCC\_CCA\_RSSI/CO}=1</math> if PSCC is configured with RSSI/CO measurements without MG when RMTc and SMTC are overlapping; <math>N_{SCC\_CCA\_RSSI/CO}</math> = Number of MOs for SCell(s) configured with RSSI/CO measurements without MG when RMTc and SMTC are overlapping.</p> |  |   |                                      |  |  |  |

### 9.1.5.1.2 SA mode: carrier-specific scaling factor for SSB-based, CSI-RS based L3 measurements and RSSI and channel occupancy measurements performed outside gaps

For UE in SA operation mode, the carrier-specific scaling factor  $CSSF_{outside\_gap,i}$  for intra-frequency SSB-based measurements, inter-frequency SSB-based measurements performed outside measurements gaps, intra-frequency CSI-RS L3 measurement and RSSI/channel occupancy measurement with no measurement gap on a carrier subject to CCA when SMTC and RMTc are overlapping will be as specified in Table 9.1.5.1.2-1, which shall also be applied for a UE configured with NE-DC operation.



Table 9.1.5.1.2-1:  $CSSF_{outside\_gap,i}$  scaling factor for SA mode

| Scenario   | $CSSF_{outside\_gap,i}$ for FR1 PCC        | $CSSF_{outside\_gap,i}$ for FR1 SCC  | $CSSF_{outside\_gap,i}$ for FR2 PCC | $CSSF_{outside\_gap,i}$ for FR2 SCC where neighbour cell measurement is required | $CSSF_{outside\_gap,i}$ for FR2 SCC where neighbour cell measurement is not required | $CSSF_{outside\_gap,i}$ for inter-frequency MO with no measurement gap         |
|--|--|--|-------------------------------------|--|--|--|
| FR1 only CA  | $1+N_{PCC\_CSIRS} + N_{PCC\_CCA\_RSSI/CO}$ | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS} + N_{SCC\_CCA\_RSSI/CO}$            | N/A                                 | N/A  | N/A  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$                                    |
| FR2 only intra band CA   | N/A  | N/A  | $1+N_{PCC\_CSIRS}$                  | N/A  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$                                    |
| FR2 only inter band CA   | N/A  | N/A  | 1                                   | $2 \cdot (1 + N_{SCC\_CSIRS\_FR2\_NCM})$ Note 3,5                                | $2x(N_{SCC\_SSB} + Y + 2X)$<br>$N_{SCC\_CSIRS} - 1 - N_{SCC\_CSIRS\_FR2\_NCM}$       | $2x(N_{SCC\_SSB} + Y + 2X)$<br>$N_{SCC\_CSIRS} - 1 - N_{SCC\_CSIRS\_FR2\_NCM}$ |
| FR1 +FR2 CA (FR1 PCell) Note 1   | $1+N_{PCC\_CSIRS}$                         | $2x(N_{SCC\_SSB} + Y + 2X)$<br>$N_{SCC\_CSIRS} - 1 - N_{SCC\_CSIRS\_FR2\_NCM}$ | N/A                                 | $2x(1 + N_{SCC\_CSIRS\_FR2\_NCM})$ Note 3,5                                      | $2x(N_{SCC\_SSB} + Y + 2X)$<br>$N_{SCC\_CSIRS} - 1 - N_{SCC\_CSIRS\_FR2\_NCM}$       | $2x(N_{SCC\_SSB} + Y + 2X)$<br>$N_{SCC\_CSIRS} - 1 - N_{SCC\_CSIRS\_FR2\_NCM}$ |
| FR1 +FR2 CA (FR2 PCell) Note 1   | N/A  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$                                    | $1+N_{PCC\_CSIRS}$                  | N/A  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$                                    |
| <p>Note 1: Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA.</p> <p>Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.</p> <p>Note 3: <math>CSSF_{outside\_gap,i} = 1</math> if only one SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on SCC; <math>CSSF_{outside\_gap,i} = 2</math> if only one SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on SCC.</p> <p>Note 4: Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG; otherwise, it is 0.</p> <p>Note 5: Only two NR FR2 operating bands are included for FR2 inter-band CA.</p> <p>Note 6: <math>N_{PCC\_CSIRS} = 1</math> if PCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, <math>N_{PCC\_CSIRS} = 0</math>.</p> <p>Note 7: <math>N_{SCC\_CSIRS}</math> = Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured</p> <p>Note 8: <math>N_{SCC\_CSIRS\_FR2\_NCM} = 1</math> if FR2 SCC, where neighbour cell measurement is required, is with either both SSB and CSI-RS configured or only CSI-RS measurement configured; otherwise, <math>N_{SCC\_CSIRS\_FR2\_NCM} = 0</math>.</p> <p>Note 9: <math>N_{SCC\_SSB}</math> = Number of configured SCell(s) with only SSB based L3 measurement configured</p> <p>Note 10: <math>N_{PCC\_CCA\_RSSI/CO} = 1</math> if PCC is configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping; <math>N_{SCC\_CCA\_RSSI/CO}</math> = Number of MOs for SCell(s) configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping..</p> |  |  |                                     |  |  |  |

9.1.5.1.3 NR-DC mode: carrier-specific scaling factor for SSB-based and CSI-RS based L3 measurements performed outside gaps

For UE configured with NR-DC operation, the carrier-specific scaling factor  $CSSF_{outside\_gap,i}$  for intra-frequency SSB-based measurement, inter-frequency SSB-based measurements performed outside measurements gaps and intra-frequency CSI-RS based L3 measurement will be as specified in Table 9.1.5.1.3-1.

Table 9.1.5.1.3-1:  $CSSF_{outside\_gap,i}$  scaling factor for NR-DC mode

| Scenario  | $CSSF_{outside\_gap,i}$ for FR1 PCC  | $CSSF_{outside\_gap,i}$ for FR1 SCC                     | $CSSF_{outside\_gap,i}$ for FR2 PSCC             | $CSSF_{outside\_gap,i}$ for FR2 SCC where neighbour cell measurement is not required | $CSSF_{outside\_gap,i}$ for inter-frequency MO with no measurement gap |
|---|--|---|--|--|--|
| <b>FR1 + FR2 NR-DC (FR1 PCell and FR2 PScell)</b><br>Note 1 | $1+N_{PCC\_CSIRS}$   | $2 \times (N_{SCC\_SSB} + Y + 2 \times N_{SCC\_CSIRS})$ | $2 \times (1 + N_{PSCC\_CSIRS})$ <sup>Note</sup> | $2 \times (N_{SCC\_SSB} + Y + 2 \times N_{SCC\_CSIRS})$                              | $2 \times (N_{SCC\_SSB} + Y + 2 \times N_{SCC\_CSIRS})$                |
| Note 1:   | NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.   |   |  |  |  |
| Note 2:   | $CSSF_{outside\_gap,i} = 1$ if no SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on PSCC; $CSSF_{outside\_gap,i} = 2$ if no SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on PSCC. |   |  |  |  |
| Note 3:   | Y is the number of configured inter-frequency SSB based frequency layers without MG that are being measured outside of MG; otherwise, it is 0.   |   |  |  |  |
| Note 4:   | $N_{PCC\_CSIRS} = 1$ if PCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, $N_{PCC\_CSIRS} = 0$ .   |   |  |  |  |
| Note 5:   | $N_{PSCC\_CSIRS} = 1$ if PSCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, $N_{PSCC\_CSIRS} = 0$ .  |   |  |  |  |
| Note 6:   | $N_{SCC\_CSIRS} =$ Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured  |   |  |  |  |
| Note 7:   | Void   |   |  |  |  |
| Note 8:   | $N_{SCC\_SSB} =$ Number of configured SCell(s) with only SSB based L3 measurement configured   |   |  |  |  |

#### 9.1.5.1.4 NE-DC mode: carrier-specific scaling factor for SSB-based and CSI-RS based measurements performed outside gaps

For UE configured with NE-DC operation, the carrier-specific scaling factor  $CSSF_{outside\_gap,i}$  for intra-frequency SSB-based measurement and inter-frequency SSB-based measurements performed outside measurements gaps and intra-frequency CSI-RS based L3 measurement will be as specified in Table 9.1.5.1.4-1.

Table 9.1.5.1.4-1:  $CSSF_{outside\_gap,i}$  scaling factor for NE-DC mode

| Scenario   | $CSSF_{outside\_gap,i}$ for FR1 PCC  | $CSSF_{outside\_gap,i}$ for FR1 SCC                          | $CSSF_{outside\_gap,i}$ for FR2 PCC | $CSSF_{outside\_gap,i}$ for FR2 SCC where neighbour cell measurement is required | $CSSF_{outside\_gap,i}$ for FR2 SCC where neighbour cell measurement is not required | $CSSF_{outside\_gap,i}$ for inter-frequency MO with no measurement gap |
|--|--|--|-------------------------------------|--|--|--|
| NE-DC with FR1 only CA                                   | $1+N_{PCC\_CSIRS}$   | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$                  | N/A                                 | N/A  | N/A  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$                            |
| NE-DC with FR2 only intra band CA                        | N/A  | N/A  | $1+N_{PCC\_CSIRS}$                  | N/A  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$  | $N_{SCC\_SSB} + Y + 2X$<br>$N_{SCC\_CSIRS}$                            |
| NE-DC with FR2 only inter band CA                        | N/A  | N/A  | $1+N_{PCC\_CSIRS}$                  | $2 \cdot (1 + N_{SCC\_CSIRS\_FR2\_NCM})$ <small>Note 3,5</small>                 | $2 \cdot (N_{SCC\_SSB} + Y + 2X - N_{SCC\_CSIRS\_FR2\_NCM})$                         | $2 \cdot (N_{SCC\_SSB} + Y + 2X - N_{SCC\_CSIRS\_FR2\_NCM})$           |
| NE-DC with FR1 +FR2 CA (FR1 PCell) <small>Note 1</small> | $1+N_{PCC\_CSIRS}$   | $2 \cdot (N_{SCC\_SSB} + Y + 2X - N_{SCC\_CSIRS\_FR2\_NCM})$ | N/A                                 | $2 \cdot (1 + N_{SCC\_CSIRS\_FR2\_NCM})$ <small>Note 3,5</small>                 | $2 \cdot (N_{SCC\_SSB} + Y + 2X - N_{SCC\_CSIRS\_FR2\_NCM})$                         | $2 \cdot (N_{SCC\_SSB} + Y + 2X - N_{SCC\_CSIRS\_FR2\_NCM})$           |
| Note 1:  | Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA.   |  |                                     |  |  |  |
| Note 2:  | Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.  |  |                                     |  |  |  |
| Note 3:  | $CSSF_{outside\_gap,i} = 1$ if only one SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on SCC; $CSSF_{outside\_gap,i} = 2$ if only one SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on SCC. |  |                                     |  |  |  |
| Note 4:  | Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG.  |  |                                     |  |  |  |
| Note 5:  | Only two NR FR2 operating band are included for NE-DC with FR2 only inter-band CA.   |  |                                     |  |  |  |
| Note 6:  | $N_{PCC\_CSIRS} = 1$ if PCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, $N_{PCC\_CSIRS} = 0$ .   |  |                                     |  |  |  |
| Note 7:  | $N_{SCC\_CSIRS} =$ Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured  |  |                                     |  |  |  |
| Note 8:  | $N_{SCC\_CSIRS\_FR2\_NCM} = 1$ if FR2 SCC, where neighbour cell measurement is required, is with either both SSB and CSI-RS configured or only CSI-RS measurement configured; otherwise, $N_{SCC\_CSIRS\_FR2\_NCM} = 0$ .  |  |                                     |  |  |  |
| Note 9:  | $N_{SCC\_SSB} =$ Number of configured SCell(s) with only SSB based L3 measurement configured   |  |                                     |  |  |  |

### 9.1.5.2 Monitoring of multiple layers within gaps

The carrier-specific scaling factor  $CSSF_{within\_gap,i}$  for a measurement object  $i$  derived in this chapter is applied to following measurement types:

- SSB-based intra-frequency measurement object with no measurement gap in clause 9.2.5 and 9.2A.5, when all of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.
- SSB-based intra-frequency measurement object with measurement gap in clause 9.2.6 and 9.2A.6.
- CSI-RS based inter-frequency measurement in clause 9.10.3, when CSI-RS resources for L3 measurement of this inter-frequency measurement object are overlapped by the measurement gap.
- CSI-RS based inter-frequency measurement in clause 9.10.3, when CSI-RS resources for L3 measurement of this inter-frequency measurement object are partially overlapped by the measurement gap.
- SSB-based inter-frequency measurement object with measurement gap in clause 9.3.4.
- SSB-based inter-frequency measurement object without measurement gap for UE capable of *interFrequencyMeas-NoGap* in clause 9.3.9, when
  - all of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, or

- part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, but the flag *interFrequencyConfig-NoGap-r16* is not configured by the Network.
- Intra-frequency RSSI/CO measurement with measurement gap in clause 9.2A.7.
- Intra-frequency RSSI/CO measurement with no measurement gap in clause 9.2A.7 when all of the RMTTC occasions of this intra-frequency RSSI/CO measurement are overlapped by the measurement gap
- Inter-frequency RSSI/CO measurement in clause 9.3A.8 and 9.3A.9.
- E-UTRA Inter-RAT measurement object in clauses 9.4.2 and 9.4.3.
- For a UE in E-UTRA-NR dual connectivity operation, NR SSB-based Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.4) on an NR serving carrier
  - the SSB is not completely contained in the active BWP of the UE, or
  - all of the SMTC occasions of this inter-RAT measurement object are overlapped by the measurement gap;
- NR SSB-based Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.4) on an NR non-serving carrier.
- E-UTRAN Inter-frequency measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.3) and by the E-UTRAN PSCell (TS 36.133 [15] clause 8.19.3).
- E-UTRAN Inter-frequency RSTD measurement configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.15).
- UTRA Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.5 to 8.17.12).
- GSM Inter-RAT measurements configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.13 and 8.17.14).

UE is expected to conduct the measurement of this measurement object *i* only within the measurement gaps.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps,  $CSSF_{\text{within\_gap},i}$  and requirements derived from  $CSSF_{\text{outside\_gap},i}$  are not specified.

Number of SSB layers should include SSB for mobility and that as associated SSB for CSI-RS mobility. The *ssbfrequency* is counted only once if the *ssbfrequency* for mobility and associated SSB are the same, or *ssbfrequency* and *smtc* in multiple MOs are the same.

SSB-based measurement and CSI-RS based measurement for mobility configured in the same measurement object are considered as different layers.

#### 9.1.5.2.1 EN-DC mode: carrier-specific scaling factor for SSB, CSI-RS-based L3 measurements and RSSI and channel occupancy measurements performed within gaps

The scaling value  $CSSF_{\text{within\_gap},i}$  below has been derived without considering GSM inter-RAT carriers.

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index *i* is designated as  $CSSF_{\text{within\_gap},i}$  and is derived as described in this clause.

For a UE in E-UTRA-NR dual connectivity operation, if a SSB-based measurement object configured by PSCell and an NR SSB-based inter-RAT measurement object configured by E-UTRAN PCell are on the same carrier, they shall be counted as one measurement object in  $M_{\text{tot},i,j}$ , provided that they meet the measurement object merging conditions [in clause 9.1.3.2].

If measurement object *i* refers to an RSTD measurement with periodicity  $T_{\text{prs}} > 160\text{ms}$  or with periodicity  $T_{\text{prs}} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured,  $CSSF_{\text{within\_gap},i} = 1$ . Otherwise, the  $CSSF_{\text{within\_gap},i}$  for other measurement objects (including RSTD measurement with periodicity  $T_{\text{prs}} = 160\text{ms}$ ) participate in the gap competition are derived as below.

For each measurement gap  $j$  not used for an RSTD measurement with periodicity  $T_{prs} > 160\text{ms}$  or with periodicity  $T_{prs} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intra-frequency measurement objects and inter-frequency/inter-RAT measurement objects which are candidates to be measured within the gap  $j$ .

- An NR measurement object with SSB measurement configured is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR carriers, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An NR measurement object with CSI-RS measurement configured is a candidate to be measured in a gap if the window confining all CSI-RS resources are fully covered by the MGL excluding RF switching time. -
- An NR measurement object with RSSI and channel occupancy measurement is a candidate to be measurement in a gap if the RMTC duration is fully covered by MGL excluding RF switching time.
- An inter-RAT UTRA measurement object configured by E-UTRA PCell [15] is a candidate to be measured in all measurement gaps.
- An inter-frequency E-UTRA measurement object configured by E-UTRA PCell [15] is a candidate to be measured in all measurement gaps.
- For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.
- $M_{\text{intra},i,j}$ : Number of intra-frequency measurement objects, including both SSB, CSI-RS based and RSSI/CO measurement, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{intra},i,j}$  equals 0.
- $M_{\text{inter},i,j}$ : Number of NR inter-frequency layers including both SSB and CSI-RS based, NR inter-RAT frequency layer and RSSI/CO measurement, configured by E-UTRA PCell, EUTRA inter-frequency measurement objects configured by E-UTRA PCell, or UTRA inter-RAT measurement objects configured by E-UTRA PCell which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{inter},i,j}$  equals 0.
- A measurement object  $i$  in  $M_{\text{intra},i,j}$  and in  $M_{\text{inter},i,j}$  is counted twice if the measurement object is configured with both RMTC and SMTC which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate
- $M_{\text{tot},i,j} = M_{\text{intra},i,j} + M_{\text{inter},i,j}$ : Total number of intra-frequency, inter-frequency and inter-RAT frequency layers which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{tot},i,j}$  equals 0.

For each measurement gap  $j$  used for an RSTD measurement with periodicity  $T_{prs} > 160\text{ms}$  or with periodicity  $T_{prs} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period,  $M_{\text{intra},i,j} = M_{\text{inter},i,j} = M_{\text{tot},i,j} = 0$ .

The carrier specific scaling factor  $\text{CSSF}_{\text{within\_gap},i}$  is given by:

If *measGapSharingScheme* is equal sharing,  $\text{CSSF}_{\text{within\_gap},i} = \max(\text{ceil}(R_i \times M_{\text{tot},i,j}))$ , where  $j = 0 \dots (160/\text{MGRP}) - 1$

If *measGapSharingScheme* is not equal sharing and

- measurement object  $i$  is an intra-frequency measurement object,  $\text{CSSF}_{\text{within\_gap},i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{\text{intra}} \times M_{\text{intra},i,j})$  in gaps where  $M_{\text{inter},i,j} \neq 0$ , where  $j = 0 \dots (160/\text{MGRP}) - 1$
  - $\text{ceil}(R_i \times M_{\text{intra},i,j})$  in gaps where  $M_{\text{inter},i,j} = 0$ , where  $j = 0 \dots (160/\text{MGRP}) - 1$
- measurement object  $i$  is an inter-frequency or inter-RAT measurement object,  $\text{CSSF}_{\text{within\_gap},i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{\text{inter}} \times M_{\text{inter},i,j})$  in gaps where  $M_{\text{intra},i,j} \neq 0$ , where  $j = 0 \dots (160/\text{MGRP}) - 1$
  - $\text{ceil}(R_i \times M_{\text{inter},i,j})$  in gaps where  $M_{\text{intra},i,j} = 0$ , where  $j = 0 \dots (160/\text{MGRP}) - 1$

Where  $R_i$  is the maximal ratio of the number of measurement gap where measurement object  $i$  is a candidate to be measured over the number of measurement gap where measurement object  $i$  is a candidate and not used for RSTD measurement with periodicity  $T_{prs} > 160\text{ms}$  or with periodicity  $T_{prs} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured within an arbitrary 1280ms period.

#### 9.1.5.2.2 SA mode: carrier-specific scaling factor for SSB, CSI-RS-based L3 measurements and RSSI and channel occupancy measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index  $i$  is designated as  $CSSF_{\text{within\_gap},i}$  and is derived as described in this clause.

If measurement object  $i$  refers to a long-periodicity measurement which is any of:

- an E-UTRA RSTD measurement with periodicity  $T_{prs} > 160\text{ms}$  or with periodicity  $T_{prs} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured, or
- an NR measurement for positioning frequency layer  $i$  with  $T_{\text{available\_PRS},i} > 160\text{ms}$ , where  $T_{\text{available\_PRS},i}$  is defined in clauses 9.9.2.5, 9.9.3.5 and 9.9.4.5 for RSTD, PRS-RSRP and UE Rx-Tx time difference measurements, respectively.

then  $CSSF_{\text{within\_gap},i} = 1$ . Otherwise, the  $CSSF_{\text{within\_gap},i}$  for other measurement objects (including E-UTRA RSTD measurement with periodicity  $T_{prs} = 160\text{ms}$ ) participate in the gap competition and the  $CSSF_{\text{within\_gap},i}$  are derived as below.

**Table 9.1.5.2.2-1: void**

When multiple positioning frequency layers are configured,

- for each positioning frequency layer  $i$ ,  $CSSF_{\text{within\_gap},i}$  is derived with the following steps assuming no other positioning frequency layer is configured.
- for each RRM frequency layer  $i$ ,  $CSSF_{\text{within\_gap},i}$  is derived as follows:
  - o an intermediate  $CSSF_{\text{within\_gap},i,k}$  is derived with the following steps assuming only positioning frequency layer  $k$  is configured, and
  - o  $CSSF_{\text{within\_gap},i} = \max(CSSF_{\text{within\_gap},i,k})$ , where  $k = 0 \dots K-1$ , and  $K$  is the number of configured positioning frequency layers.

For each measurement gap  $j$  not used for a long-periodicity measurement defined above, count the total number of intra-frequency measurement objects and inter-frequency/inter-RAT measurement objects and NR PRS measurements on all positioning frequency layers which are candidates to be measured within the gap  $j$ .

- An NR measurement object with SSB measurement configured is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR measurement objects, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An NR measurement object with CSI-RS measurement configured is a candidate to be measured in a gap if the window confining all CSI-RS resources are fully covered by the MGL excluding RF switching time.
- An NR measurement object with RSSI and channel occupancy measurement is a candidate to be measurement in a gap if the RMTC duration is fully covered by MGL excluding RF switching time.
- An inter-frequency SFTD measurement object, if to be measured with measurement gaps, is a candidate to be measured in all measurement gaps.
- A positioning frequency layer is counted as candidate for a MG occasion if at least one PRS resource on that positioning frequency layer is fully covered by the MGL excluding RF switching time.
- For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis. For UEs which support and are

configured with per FR gaps, the CSSF requirements do not apply when NR PRS measurement in one FR gap collides with SSB/CSI-RS/PRS measurements in the other FR gap in time domain.

- $M_{intra,i,j}$ : Number of intra-frequency measurement objects, including both SSB, CSI-RS based and RSSI/CO measurements, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{intra,i,j}$  equals 0.
- $M_{inter,i,j}$ : Number of NR inter-frequency layers including both SSB and CSI-RS based, EUTRA inter-RAT and UTRA inter-RAT frequency layers, up to one positioning frequency layer, RSSI/CO measurements, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{inter,i,j}$  equals 0.
- A measurement object  $i$  in  $M_{intra,i,j}$  and in  $M_{inter,i,j}$  is counted twice if the measurement object is configured with both RMTC and SMTC which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate
- $M_{tot,i,j} = M_{intra,i,j} + M_{inter,i,j}$ : Total number of intra-frequency, inter-frequency and inter-RAT frequency layers and up to one NR PRS measurement on any one positioning frequency layer, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{tot,i,j}$  equals 0.

For each measurement gap  $j$  used for a long-periodicity measurement defined above,  $M_{intra,i,j} = M_{inter,i,j} = M_{tot,i,j} = 0$ . The carrier specific scaling factor  $CSSF_{within\_gap,i}$  is given by:

If *measGapSharingScheme* is equal sharing,  $CSSF_{within\_gap,i} = \max(\text{ceil}(R_i \times M_{tot,i,j}))$ , where  $j=0 \dots (160/MGRP)-1$

If *measGapSharingScheme* is not equal sharing and

- measurement object  $i$  is an intra-frequency measurement object,  $CSSF_{within\_gap,i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{intra} \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j} \neq 0$ , where  $j=0 \dots (160/MGRP)-1$
  - $\text{ceil}(R_i \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j} = 0$ , where  $j=0 \dots (160/MGRP)-1$
- measurement object  $i$  is an inter-frequency or inter-RAT measurement object or NR PRS measurement on any one positioning frequency layer,  $CSSF_{within\_gap,i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{inter} \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j} \neq 0$ , where  $j=0 \dots (160/MGRP)-1$
  - $\text{ceil}(R_i \times M_{inter,i,j})$  in gaps where  $M_{intra,i,j} = 0$ , where  $j=0 \dots (160/MGRP)-1$

Where  $R_i$  is the maximal ratio of the number of measurement gap where measurement object  $i$  is a candidate to be measured over the number of measurement gap where measurement object  $i$  is a candidate and not used for a long-periodicity measurement defined above.

$CSSF_{within\_gap,k} = 1$  during  $T_{\text{Detect, E-UTRAN FDD}}$  specified in clause 9.4.4.1.2.2 and  $T_{\text{Detect, E-UTRAN TDD}}$  specified in clause 9.4.4.2.2.2, where  $k$  is the carrier frequency where the UE is performing cell detection of the inter-RAT E-UTRA OTDOA assistance data reference cell when acquiring the subframe and slot timing of the cell according to clause 9.4.4. In this case, the UE cell identification and measurement periods derived based on  $CSSF_{within\_gap,i}$  in clauses 9.2.5.1, 9.2.5.2, 9.2.6.2, 9.2.6.3, 9.3.4, 9.3.5, 9.4.2.2, 9.4.2.3 and 9.10.2 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with  $T_{\text{Detect, E-UTRAN FDD}}$  and  $T_{\text{Detect, E-UTRAN TDD}}$ .

### 9.1.5.2.3 NE-DC: carrier-specific scaling factor for SSB-based and CSI-RS based L3 measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index  $i$  is designated as  $CSSF_{within\_gap,i}$  and is derived as described in this clause.

If measurement object  $i$  refers to a long-periodicity measurement which is any of:

- an E-UTRA RSTD measurement with periodicity  $T_{\text{prs}} > 160\text{ms}$  or with periodicity  $T_{\text{prs}} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured, or
- an NR measurement for positioning frequency layer  $i$  with  $T_{\text{available\_PRS},i} > 160\text{ms}$ , where  $T_{\text{available\_PRS},i}$  is defined in clauses 9.9.2.5, 9.9.3.5 and 9.9.4.5 for RSTD, PRS-RSRP and UE Rx-Tx time difference measurements, respectively.

then  $CSSF_{\text{within\_gap},i}=1$ . Otherwise, the  $CSSF_{\text{within\_gap},i}$  for other measurement objects (including E-UTRA RSTD measurement with periodicity  $T_{\text{prs}}=160\text{ms}$ ) participate in the gap competition are derived as below.

When multiple positioning frequency layers are configured,

- for each positioning frequency layer  $i$ ,  $CSSF_{\text{within\_gap},i}$  is derived with the following steps assuming no other positioning frequency layer is configured.
- for each RRM frequency layer  $i$ ,  $CSSF_{\text{within\_gap},i}$  is derived as follows:
  - o an intermediate  $CSSF_{\text{within\_gap},i,k}$  is derived with the following steps assuming only positioning frequency layer  $k$  is configured, and
  - o  $CSSF_{\text{within\_gap},i} = \max(CSSF_{\text{within\_gap},i,k})$ , where  $k=0\dots K-1$ , and  $K$  is the number of configured positioning frequency layers.

For each measurement gap  $j$  not used for a long-periodicity measurement defined above, count the total number of intra-frequency measurement objects and inter-frequency/inter-RAT measurement objects and NR PRS measurements on all positioning frequency layers which are candidates to be measured within the gap  $j$ .

- An NR measurement object with SSB measurement configured is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR measurement objects, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An NR measurement object with CSI-RS measurement configured is a candidate to be measured in a gap if the window confining all CSI-RS resources are fully covered by the MGL excluding RF switching time.
- An inter-RAT measurement object is a candidate to be measured in all measurement gaps.
- An inter-frequency E-UTRA measurement object is a candidate to be measured in all measurement gaps.
- A positioning frequency layer is counted as candidate for a MG occasion if at least one PRS resource on that positioning frequency layer is fully covered by the MGL excluding RF switching time.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis. For UEs which support and are configured with per FR gaps, the CSSF requirements do not apply when NR PRS measurement in one FR gap collides with SSB/CSI-RS/PRS measurements in the other FR gap in time domain.

If the number of configured interfrequency and interRAT measurement objects and NR PRS measurements on all positioning frequency layers is non-zero and the UE is configured with per UE gaps, or if the UE is configured with per FR gaps:

FR1 and FR2 intrafrequency measurement objects belong to group A

Interfrequency and interRAT measurement objects belong to group B

$M_{\text{groupA},i,j}$ : Sum of the number of FR1 intra-frequency measurement objects  $M_{\text{intra-FR1},i,j}$  and the number of FR2 intra-frequency measurement objects  $M_{\text{intra-FR2},i,j}$ , including both SSB and CSI-RS based, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupA},i,j}$  equals 0.

$M_{\text{groupB},i,j}$ : Number of NR inter-frequency layers including both SSB and CSI-RS based, EUTRA inter-RAT and UTRA inter-RAT measurement objects, up to one positioning frequency layer, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupB},i,j}$  equals 0.

If the number of configured inter-frequency and inter-RAT measurement objects and NR PRS measurements on all positioning frequency layers is zero and the UE is configured with per UE gaps:

FR1 intrafrequency measurement objects belong to group A

FR2 intrafrequency measurement objects belong to group B



$M_{\text{groupA},i,j}$ : The number of FR1 intrafrequency measurement objects  $M_{\text{intra-FR1},i,j}$ , including both SSB and CSI-RS based, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupA},i,j}$  equals 0.

$M_{\text{groupB},i,j}$ : The number of FR2 intrafrequency measurement objects  $M_{\text{intra-FR2},i,j}$ , including both SSB and CSI-RS based, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupB},i,j}$  equals 0.

$M_{\text{tot},i,j} = M_{\text{groupA},i,j} + M_{\text{groupB},i,j}$ : Total number of group A and group B measurement objects which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{tot},i,j}$  equals 0.

For each measurement gap  $j$  used for a long-periodicity measurement defined above,  $M_{\text{intra},i,j} = M_{\text{inter},i,j} = M_{\text{tot},i,j} = 0$ . The carrier specific scaling factor  $\text{CSSF}_{\text{within\_gap},i}$  is given by:

If *measGapSharingScheme* is equal sharing,  $\text{CSSF}_{\text{within\_gap},i} = \max(\text{ceil}(R_i \times M_{\text{tot},i,j}))$ , where  $j=0 \dots (160/\text{MGRP})-1$

If *measGapSharingScheme* is not equal sharing and

- measurement object  $i$  is a group A measurement object,  $\text{CSSF}_{\text{within\_gap},i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{\text{intra}} \times M_{\text{groupA},i,j})$  in gaps where  $M_{\text{groupB},i,j} \neq 0$ , where  $j=0 \dots (160/\text{MGRP})-1$
  - $\text{ceil}(R_i \times M_{\text{groupA},i,j})$  in gaps where  $M_{\text{groupB},i,j} = 0$ , where  $j=0 \dots (160/\text{MGRP})-1$
- measurement object  $i$  is a group B measurement object,  $\text{CSSF}_{\text{within\_gap},i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{\text{inter}} \times M_{\text{groupB},i,j})$  in gaps where  $M_{\text{groupA},i,j} \neq 0$ , where  $j=0 \dots (160/\text{MGRP})-1$
  - $\text{ceil}(R_i \times M_{\text{groupB},i,j})$  in gaps where  $M_{\text{groupA},i,j} = 0$ , where  $j=0 \dots (160/\text{MGRP})-1$

Where  $R_i$  is the maximal ratio of the number of measurement gap where measurement object  $i$  is a candidate to be measured over the number of measurement gap where measurement object  $i$  is a candidate and not used for a long-periodicity measurement defined above.

#### 9.1.5.2.4 NR-DC: carrier-specific scaling factor for SSB-based and CSI-RS-based L3 measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index  $i$  is designated as  $\text{CSSF}_{\text{within\_gap},i}$  and is derived as described in this clause.

If measurement object  $i$  refers to a long-periodicity measurement which is any of:

- an E-UTRA RSTD measurement with periodicity  $T_{\text{prs}} > 160\text{ms}$  or with periodicity  $T_{\text{prs}} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured, or
- an NR measurement for positioning frequency layer  $i$  with  $T_{\text{available\_PRS},i} > 160\text{ms}$ , where  $T_{\text{available\_PRS},i}$  is defined in clauses 9.9.2.5, 9.9.3.5 and 9.9.4.5 for RSTD, PRS-RSRP and UE Rx-Tx time difference measurements, respectively.

then  $\text{CSSF}_{\text{within\_gap},i} = 1$ . Otherwise, the  $\text{CSSF}_{\text{within\_gap},i}$  for other measurement objects (including E-UTRA RSTD measurement with periodicity  $T_{\text{prs}} = 160\text{ms}$ ) participate in the gap competition and the  $\text{CSSF}_{\text{within\_gap},i}$  are derived as below.

When multiple positioning frequency layers are configured,

- for each positioning frequency layer  $i$ ,  $\text{CSSF}_{\text{within\_gap},i}$  is derived with the following steps assuming no other positioning frequency layer is configured.
- for each RRM frequency layer  $i$ ,  $\text{CSSF}_{\text{within\_gap},i}$  is derived as follows:
  - an intermediate  $\text{CSSF}_{\text{within\_gap},i,k}$  is derived with the following steps assuming only positioning frequency layer  $k$  is configured, and
  - $\text{CSSF}_{\text{within\_gap},i} = \max(\text{CSSF}_{\text{within\_gap},i,k})$ , where  $k=0 \dots K-1$ , and  $K$  is the number of configured positioning frequency layers.

For each measurement gap  $j$  not used for an RSTD measurement with periodicity  $T_{\text{prs}} > 160\text{ms}$  or with periodicity  $T_{\text{prs}} = 160\text{ms}$  but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intra-frequency measurement objects and inter-frequency/inter-RAT measurement objects and NR PRS measurements on all positioning frequency layers which are candidates to be measured within the gap  $j$ .

- An NR measurement object with SSB measurement configured is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR measurement objects, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An NR measurement object with CSI-RS measurement configured is a candidate to be measured in a gap if the window confining all CSI-RS resources are fully covered by the MGL excluding RF switching time.
- A positioning frequency layer is counted as candidate for a MG occasion if at least one PRS resource on that positioning frequency layer is fully covered by the MGL excluding RF switching time.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis. For UEs which support and are configured with per FR gaps, the CSSF requirements do not apply when NR PRS measurement in one FR gap collides with SSB/CSI-RS/PRS measurements in the other FR gap in time domain.

If the number of configured interfrequency and interRAT measurement objects and NR PRS measurements on all positioning frequency layers is non-zero and the UE is configured with per UE gaps, or if the UE is configured with per FR gaps:

FR1 and FR2 intrafrequency measurement objects belong to group A

Interfrequency and interRAT measurement objects and up to one NR PRS measurement on any one positioning frequency layer belong to group B

$M_{\text{groupA},i,j}$ : Sum of the number of FR1 intra-frequency measurement objects  $M_{\text{intra-FR1},i,j}$  and the number of FR2 intra-frequency measurement objects  $M_{\text{intra-FR2},i,j}$ , including both SSB and CSI-RS based, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupA},i,j}$  equals 0.

$M_{\text{groupB},i,j}$ : Number of NR inter-frequency layers including both SSB and CSI-RS based, EUTRA inter-RAT and UTRA inter-RAT measurement objects and up to one positioning frequency layer, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupB},i,j}$  equals 0.

If the number of configured interfrequency and interRAT measurement objects and NR PRS measurements on all positioning frequency layers is zero and the UE is configured with per UE gaps:

FR1 intrafrequency measurement objects belong to group A

FR2 intrafrequency measurement objects belong to group B

$M_{\text{groupA},i,j}$ : The number of FR1 intrafrequency measurement objects  $M_{\text{intra-FR1},i,j}$ , including both SSB and CSI-RS based, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupA},i,j}$  equals 0.

$M_{\text{groupB},i,j}$ : The number of FR2 intrafrequency measurement objects  $M_{\text{intra-FR2},i,j}$ , including both SSB and CSI-RS based, which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{groupB},i,j}$  equals 0.

$M_{\text{tot},i,j} = M_{\text{groupA},i,j} + M_{\text{groupB},i,j}$ : Total number of group A and group B measurement objects which are candidates to be measured in gap  $j$  where the measurement object  $i$  is also a candidate. Otherwise  $M_{\text{tot},i,j}$  equals 0.

For each measurement gap  $j$  used for a long-periodicity measurement defined above,  $M_{\text{intra},i,j} = M_{\text{inter},i,j} = M_{\text{tot},i,j} = 0$ . The carrier specific scaling factor  $\text{CSSF}_{\text{within\_gap},i}$  is given by:

If *measGapSharingScheme* is equal sharing,  $\text{CSSF}_{\text{within\_gap},i} = \max(\text{ceil}(R_i \times M_{\text{tot},i,j}))$ , where  $j = 0 \dots (160/\text{MGRP}) - 1$

If *measGapSharingScheme* is not equal sharing and

- measurement object  $i$  is a group A measurement object,  $CSSF_{\text{within\_gap},i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{\text{intra}} \times M_{\text{groupA},i,j})$  in gaps where  $M_{\text{groupB},i,j} \neq 0$ , where  $j=0 \dots (160/\text{MGRP})-1$
  - $\text{ceil}(R_i \times M_{\text{groupA},i,j})$  in gaps where  $M_{\text{groupB},i,j}=0$ , where  $j=0 \dots (160/\text{MGRP})-1$
- measurement object  $i$  is a group B measurement object,  $CSSF_{\text{within\_gap},i}$  is the maximum among
  - $\text{ceil}(R_i \times K_{\text{inter}} \times M_{\text{groupB},i,j})$  in gaps where  $M_{\text{groupA},i,j} \neq 0$ , where  $j=0 \dots (160/\text{MGRP})-1$
  - $\text{ceil}(R_i \times M_{\text{groupB},i,j})$  in gaps where  $M_{\text{groupA},i,j}=0$ , where  $j=0 \dots (160/\text{MGRP})-1$

$R_i$  is the maximal ratio of the number of measurement gap where measurement object  $i$  is a candidate to be measured over the number of measurement gap where measurement object  $i$  is a candidate and not used for a long-periodicity measurement defined above.

#### 9.1.5.2.5 SA mode: carrier-specific scaling factor for PRS-based measurements performed within gaps

The requirements in this clause apply for NR PRS-based measurements for positioning in clause 9.9.

When NR PRS-based measurements for positioning are configured on one or more positioning frequency layers within measurement gaps, the carrier specific scaling factor for a target PRS-based positioning measurement on a positioning frequency layer with index  $i$  is designated as  $CSSF_{\text{within\_gap},i}$  and is derived as described in clause 9.1.5.2.2.

NR Positioning measurement requirements for long periodicity measurements apply in case all PRS resources in the PFL are configured with periodicity  $> 160$  ms.

#### 9.1.5.2.6 NE-DC: carrier-specific scaling factor for PRS-based measurements performed within gaps

The requirements in this clause apply for NR PRS-based measurements for positioning in clause 9.9.

When NR PRS-based measurements for positioning are configured on one or more positioning frequency layers within measurement gaps, the carrier specific scaling factor for a target measurement on a positioning frequency layer with index  $i$  is designated as  $CSSF_{\text{within\_gap},i}$  and is derived as described in clause 9.1.5.2.3.

NR Positioning measurement requirements for long periodicity measurements apply in case all PRS resources in the PFL are configured with periodicity  $> 160$  ms.

#### 9.1.5.2.7 NR-DC: carrier-specific scaling factor for PRS-based measurements performed within gaps

The requirements in this clause apply for NR PRS-based measurements for positioning in clause 9.9.

When NR PRS-based measurements for positioning are configured on one or more positioning frequency layers within measurement gaps, the carrier specific scaling factor for a target measurement on a positioning frequency layer with index  $i$  is designated as  $CSSF_{\text{within\_gap},i}$  and is derived as described in clause 9.1.5.2.4.

NR Positioning measurement requirements for long periodicity measurements apply in case all PRS resources in the PFL are configured with periodicity  $> 160$  ms.

### 9.1.6 Minimum requirement at transitions

When the measurement on one intra-frequency measurement object transitions from measurements performed outside gaps to measurements performed within gaps or vice versa during one measurement period, the cell identification and measurement period requirements with the longer delay apply.

The carrier-specific scaling factor specified in clause 9.1.5 that applies to the other impacted measurement objects will also apply based on the longer measurement or cell identification delay before or after the transition.

When the UE transitions between DRX and non-DRX or when DRX cycle periodicity changes, the cell identification and measurement period requirements apply based on the longer delay before or after the transition.

Subsequent to this measurement period, the cell identification and measurement period requirements on each measurement object are corresponding to the second mode after transition.

## 9.2 NR intra-frequency measurements

### 9.2.1 Introduction

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the SSB of the serving cell indicated for measurement and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell or the PSCell, even if no explicit neighbour list with physical layer cell identities is provided.

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the UE indicates 'no-gap' via *intraFreq-needForGap* for intra-frequency measurement, or
- the SSB is completely contained in the active BWP of the UE, or
- the active downlink BWP is initial BWP[3].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in clause 9.2.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC(s)) which provides periodicity, duration and offset information on a window of up to 5ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5ms for frequency range FR1 and 0.25ms for frequency range FR2.

The requirements in this clause shall also apply, when the UE is configured to perform SRS carrier based switching and using measurement gaps.

The measurement requirements defined for an activated SCell with a non-dormant active BWP defined in this clause shall also apply to an activated SCell with dormant BWP as active BWP.

### 9.2.2 Requirements applicability

The requirements in clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.2 for a corresponding Band.

## 9.2.3 Number of cells and number of SSB

### 9.2.3.1 Requirements for FR1

For each intra-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 8 identified cells, and
- 14 SSBs with different SSB index and/or PCI on the intra-frequency layer, where the number of SSBs in the serving cell (except for the SCell) is not smaller than the number of configured RLM-RS SSB resources.

### 9.2.3.2 Requirements for FR2

For one single intra-frequency layer in a band, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 6 identified cells, and
- 24 SSBs with different SSB index and/or PCI,

where this single intra-frequency layer shall be:

- PCC when UE is configured with SA NR operation mode with PCC in the band; or
- PSCC when UE is configured with EN-DC with PSCC in the band; or
- PSCC when UE is configured with NR-DC with PSCC in the band; or
- One of the SCCs on which UE is configured to report SSB based measurements when neither PCC nor PSCC is in the same band, so that the selected SCC shall be an SCC where the UE is configured with SS-RSRP measurement reporting if such SCC exists, otherwise the selected SCC is determined by UE implementation.

The UE shall also be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least 2 SSBs on serving cell for each of the other intra-frequency layer(s) in the same band.

## 9.2.4 Measurement Reporting Requirements

### 9.2.4.1 Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodic measurement reports shall meet the requirements in clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

### 9.2.4.2 Event-triggered Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.2.4.3.

### 9.2.4.3 Event Triggered Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times T_{TI_{DCCH}}$ . This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than  $T_{\text{identify\_intra\_with\_index}}$  OR  $T_{\text{identify\_intra\_without\_index}}$  defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period  $T_{\text{identify\_intra\_without\_index}}$  OR  $T_{\text{identify\_intra\_with\_index}}$  as defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period  $T_{\text{identify\_intra\_without\_index}}$  OR  $T_{\text{identify\_intra\_with\_index}}$  defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than  $T_{\text{SSB\_measurement\_period\_intra}}$  provided the timing to that cell has not changed more than  $\pm 3200/2^\mu T_c$  while the measurement gap has not been available and L3 filtering has not been used, where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

## 9.2.5 Intrafrequency measurements without measurement gaps

### 9.2.5.1 Intrafrequency cell identification

The UE shall be able to identify a new detectable intra-frequency cell within  $T_{\text{identify\_intra\_without\_index}}$  if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRSIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within  $T_{\text{identify\_intra\_with\_index}}$ . The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within  $T_{\text{identify\_intra\_without\_index}}$ . It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{\text{identify\_intra\_without\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}}) \text{ ms}$$

$$T_{\text{identify\_intra\_with\_index}} = (T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} + T_{\text{SSB\_time\_index\_intra}}) \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_intra}}$ : it is the time period used in PSS/SSS detection given in table 9.2.5.1-1, 9.2.5.1-2, 9.2.5.1-4 (deactivated SCell) or 9.2.5.1-5 (deactivated SCell)

$T_{\text{SSB\_time\_index\_intra}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2.5.1-3 or 9.2.5.1-6 (deactivated SCell)

$T_{\text{SSB\_measurement\_period\_intra}}$ : equal to a measurement period of SSB based measurement given in table 9.2.5.2-1, table 9.2.5.2-2 table 9.2.5.2-3 (deactivated SCell) or 9.2.5.2-4(deactivated SCell)

$\text{CSSF}_{\text{intra}}$ : it is a carrier specific scaling factor and is determined

according to  $\text{CSSF}_{\text{outside\_gap},i}$  in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to  $\text{CSSF}_{\text{within\_gap},i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

if the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

$M_{\text{pss/sss\_sync\_w/o\_gaps}}$  : For a UE supporting FR2 power class 1,  $M_{\text{pss/sss\_sync\_w/o\_gaps}}=40$ . For a UE supporting power class 2,  $M_{\text{pss/sss\_sync\_w/o\_gaps}}=24$ . For a UE supporting FR2 power class 3,  $M_{\text{pss/sss\_sync\_w/o\_gaps}}=24$ . For a UE supporting FR2 power class 4,  $M_{\text{pss/sss\_sync\_w/o\_gaps}}=24$

$M_{\text{meas\_period\_w/o\_gaps}}$  : For a UE supporting power class 1,  $M_{\text{meas\_period\_w/o\_gaps}}=40$ . For a UE supporting FR2 power class 2,  $M_{\text{meas\_period\_w/o\_gaps}}=24$ . For a UE supporting power class 3,  $M_{\text{meas\_period\_w/o\_gaps}}=24$ . For a UE supporting power class 4,  $M_{\text{meas\_period\_w/o\_gaps}}=24$ .

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs,  $K_p=1$

When intra-frequency SMTC is partially overlapping with measurement gaps,  $K_p = 1/(1 - (\text{SMTC period} / \text{MGRP}))$ , where  $\text{SMTC period} < \text{MGRP}$ . For calculation of  $K_p$ , if the high layer signalling (TS 38.331 [2]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

If the higher layer signaling in TS38.331 [2] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for  $T_{\text{identify\_intra\_without\_index}}$  or  $T_{\text{identify\_intra\_with\_index}}$

For FR2,

$K_{\text{layer1\_measurement}}=1$ ,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{\text{layer1\_measurement}}=1.5$ , otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5 and Table 9.2.5.1-6 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5 and Table 9.2.5.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)**

| DRX cycle   | $T_{PSS/SSS\_sync\_intra}$   |
|---|--|
| No DRX  | $\max(600\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{intra}$                                   |
| DRX cycle $\leq$ 320ms  | $\max(600\text{ms}, \text{ceil}(M2^{\text{Note 2}} \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle > 320ms   | $\text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{intra}$   |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified   |  |
| NOTE 2: When <i>highSpeedMeasFlag-r16</i> is not configured, $M2 = 1.5$ ; When <i>highSpeedMeasFlag-r16</i> is configured, $M2 = 1.5$ if SMTC periodicity > 40 ms; otherwise $M2=1$ .   |  |
| NOTE 3: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. |  |

**Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)**

| DRX cycle   | $T_{PSS/SSS\_sync\_intra}$  |
|---|---|
| No DRX  | $\max(600\text{ms}, \text{ceil}(M_{pss/sss\_sync\_w/o\_gaps} \times K_p \times K_{layer1\_measurement})^{\text{Note 1}} \times \text{SMTC period}) \times \text{CSSF}_{intra}$                    |
| DRX cycle $\leq$ 320ms  | $\max(600\text{ms}, \text{ceil}(1.5 \times M_{pss/sss\_sync\_w/o\_gaps} \times K_p \times K_{layer1\_measurement}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle > 320ms   | $\text{Ceil}(M_{pss/sss\_sync\_w/o\_gaps} \times K_p \times K_{layer1\_measurement}) \times \text{DRX cycle} \times \text{CSSF}_{intra}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

**Table 9.2.5.1-3: Time period for time index detection (FR1)**

| DRX cycle  | $T_{SSB\_time\_index\_intra}$  |
|--|--|
| No DRX   | $\max(120\text{ms}, \text{ceil}(3 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{intra}$                                   |
| DRX cycle $\leq$ 320ms   | $\max(120\text{ms}, \text{ceil}(M2^{\text{Note 2}} \times 3 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle > 320ms  | $\text{Ceil}(3 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{intra}$   |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified  |  |
| NOTE 2: When <i>highSpeedMeasFlag-r16</i> is not configured, $M2 = 1.5$ ; When <i>highSpeedMeasFlag-r16</i> is configured, $M2 = 1.5$ if SMTC periodicity > 40 ms; otherwise $M2=1$  |  |
| NOTE 3: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell |  |

**Table 9.2.5.1-4: Time period for PSS/SSS detection, deactivated SCell (FR1)**

| DRX cycle              | $T_{PSS/SSS\_sync\_intra}$   |
|------------------------|--|
| No DRX                 | $\text{Ceil}(5 \times K_p) \times \text{measCycleSCell} \times \text{CSSF}_{intra}$                                    |
| DRX cycle $\leq$ 320ms | $\text{Ceil}(5 \times K_p) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{intra}$ |
| DRX cycle > 320ms      | $\text{Ceil}(5 \times K_p) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{intra}$            |



**Table 9.2.5.1-5: Time period for PSS/SSS detection, deactivated SCell (FR2)**

| DRX cycle              | $T_{PSS/SSS\_sync\_intra}$  |
|------------------------|---|
| No DRX                 | $\text{Ceil}(M_{pss/sss\_sync\_w/o\_gaps} \times K_p) \times \text{measCycleSCell} \times \text{CSSF}_{intra}$                                    |
| DRX cycle $\leq$ 320ms | $\text{Ceil}(M_{pss/sss\_sync\_w/o\_gaps} \times K_p) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{intra}$ |
| DRX cycle $>$ 320ms    | $\text{Ceil}(M_{pss/sss\_sync\_w/o\_gaps} \times K_p) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{intra}$            |

**Table 9.2.5.1-6: Time period for time index detection, deactivated SCell (FR1)**

| DRX cycle              | $T_{SSB\_time\_index\_intra}$  |
|------------------------|--|
| No DRX                 | $\text{Ceil}(3 \times K_p) \times \text{measCycleSCell} \times \text{CSSF}_{intra}$                                    |
| DRX cycle $\leq$ 320ms | $\text{Ceil}(3 \times K_p) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{intra}$ |
| DRX cycle $>$ 320ms    | $\text{Ceil}(3 \times K_p) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{intra}$            |

**Table 9.2.5.1-7: Void****Table 9.2.5.1-8: Void**

## 9.2.5.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 9.2.5.2-1, 9.2.5.2-2, 9.2.5.2-3 (deactivated SCell) or 9.2.5.2-4 (deactivated SCell). When *highSpeedMeasFlag-r16* is configured,  $T_{SSB\_measurement\_period\_intra}$  is specified in Table 9.2.5.2-5.

If the higher layer signaling in TS38.331 [2] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for  $T_{SSB\_measurement\_period\_intra}$

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3 and Table 9.2.5.2-4 shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3 and Table 9.2.5.2-4 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

**Table 9.2.5.2-1: Measurement period for intra-frequency measurements without gaps (FR1)**

| DRX cycle   | $T_{SSB\_measurement\_period\_intra}$   |
|---|---|
| No DRX  | $\max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{intra}$                    |
| DRX cycle $\leq$ 320ms  | $\max(200\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle $>$ 320ms   | $\text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{intra}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

**Table 9.2.5.2-2: Measurement period for intra-frequency measurements without gaps(FR2)**

| DRX cycle              | $T_{SSB\_measurement\_period\_intra}$   |
|------------------------|---|
| No DRX                 | $\max(400\text{ms}, \text{ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$                    |
| DRX cycle $\leq$ 320ms | $\max(400\text{ms}, \text{ceil}(1.5 \times M_{\text{meas\_period\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle > 320ms      | $\text{ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_p \times K_{\text{layer1\_measurement}}) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$  |

NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

**Table 9.2.5.2-3: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1)**

| DRX cycle              | $T_{SSB\_measurement\_period\_intra}$   |
|------------------------|---|
| No DRX                 | $\text{Ceil}(5 \times K_p) \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$                                    |
| DRX cycle $\leq$ 320ms | $\text{Ceil}(5 \times K_p) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle > 320ms      | $\text{Ceil}(5 \times K_p) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$            |

**Table 9.2.5.2-4: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR2)**

| DRX cycle              | $T_{SSB\_measurement\_period\_intra}$  |
|------------------------|--|
| No DRX                 | $\text{Ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_p) \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$                                    |
| DRX cycle $\leq$ 320ms | $\text{Ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_p) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle > 320ms      | $\text{Ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_p) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$            |

**Table 9.2.5.2-5:  $T_{SSB\_measurement\_period\_intra}$  When *highSpeedMeasFlag-r16* is configured (Frequency range FR1)**

| DRX cycle                      | $T_{SSB\_measurement\_period\_intra}$   |
|--------------------------------|---|
| No DRX <sup>Note 2</sup>       | $\max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$                                   |
| DRX cycle $\leq$ 160ms         | $\max(200\text{ms}, \text{ceil}(5 \times M2^{\text{Note 2}} \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| 160ms < DRX cycle $\leq$ 320ms | $\text{ceil}(4 \times M2^{\text{Note 2}} \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$   |
| DRX cycle > 320ms              | $\text{ceil}(Y^{\text{Note 3}} \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$   |

NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

NOTE 2:  $M2 = 1.5$  if SMTC period > 40 ms, otherwise  $M2=1$

NOTE 3:  $Y=3$  when SMTC period  $\leq$  40ms,  $Y=5$  when SMTC period > 40ms

NOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.

### 9.2.5.3 Scheduling availability of UE during intra-frequency measurements

UE shall be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged [2], if it is configured; otherwise, all  $L$  SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

### 9.2.5.3.1 Scheduling availability of UE performing measurements in TDD bands on FR1

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

When TDD inter-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to another serving cell in a different band on the symbols that fully or partially overlap with the aforementioned restricted symbols, if UE does not have the capability of supporting *simultaneousRxTxInterBandCA* for this band pair.

### 9.2.5.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If *deriveSSB\_IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2* is configured (in TS 38.331 [2]), the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.
- If *deriveSSB\_IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

### 9.2.5.3.3 Scheduling availability of UE performing measurements on FR2

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 intra-frequency cell

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration (The signaling *deriveSSB\_IndexFromCell* is always enabled for FR2). If the high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 intra-frequency cell

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols

within SMTC window duration (The signaling *deriveSSB\_IndexFromCellc* is always enabled for FR2). If the high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to SS-RSRP, SS-RSRQ or SS-SINR measurement on an FR2 intra-frequency cell in different bands, provided that UE is capable of independent beam management on this FR2 band pair. Additionally, there is no scheduling restriction if the UE is configured with different numerology between SSB on one FR2 band and data on the other FR2 band provided the UE is configured for IBM operation for the band pair.

Note: When inter-band carrier aggregation in FR2 is performed, the scheduling restrictions as defined in clause 9.2.5.3.1 due to a given serving cell should also apply to another serving cell in a different FR2 band on the symbols that fully or partially overlap with the aforementioned restricted symbols, if UE does not have the capability of supporting *simultaneousRxTxInterBandCA* for this FR2 band pair.

If following conditions are met:

- The UE has been notified about system information update through paging,
- The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

#### 9.2.5.3.4 Scheduling availability of UE performing measurements on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to measurements performed on FR2 serving cell frequency layer. However, the scheduling restrictions as defined in clause 9.2.5.3.1 due to a given serving cell in FR2 should also apply to another serving cell in an FR1 band on the symbols that fully or partially overlap with the aforementioned restricted symbols, if UE does not have the capability of supporting *simultaneousRxTxInterBandCA* for this FR1-FR2 band pair.

There are no scheduling restrictions on FR2 serving cell(s) due to measurements performed on FR1 serving cell frequency layer. However, the scheduling restrictions as defined in clause 9.2.5.3.1 due to a given serving cell in FR1 should also apply to another serving cell in an FR2 band on the symbols that fully or partially overlap with the aforementioned restricted symbols, if UE does not have the capability of supporting *simultaneousRxTxInterBandCA* for this FR1-FR2 band pair.

### 9.2.5.4 SFTD Measurements between PCell and PSCell

#### 9.2.5.4.1 Introduction

This clause contains SFTD measurement requirements for UE which supports NR-DC and is configured with a PSCell in RRC\_CONNECTED state. The UE shall perform SFTD measurement between PCell and PSCell, and report the SFTD result with/without SS-RSRP after the network requests with *reportType* for the associated *reportConfig* set to *reportSFTD*. The overall delay includes RRC procedure delay defined in clause 12 in TS 38.331 [2], and SFTD measurement reporting delay in clause 9.2.5.4.3..

### 9.2.5.4.2 SFTD Measurement delay

When no DRX is used in either of PCell and PSCell, the physical layer measurement period of the SFTD measurement shall be  $T_{\text{measure\_SFTD1}} = \max(200, 5 \times \text{SMTC period})$  ms, where the SMTC period refers to the maximum between the configured SMTC period in PCell and PSCell.

When DRX is used in either of the PCell or the PSCell, or in both PCell and PSCell, the physical layer measurement period ( $T_{\text{measure\_SFTD1}}$ ) of the SFTD measurement shall be as specified in Table 9.2.5.4.2-1.

**Table 9.2.5.4.2-1: SFTD measurement requirement when DRX is used**

| DRX cycle length (s) <sup>Note 3</sup>   | $T_{\text{measure\_SFTD1}}$ (s)                       |
|--|---|
| $\leq 0.04$  | $\max(0.2, 5 \times \text{SMTC period})$ (Note2)      |
| $0.04 < \text{DRX cycle} \leq 0.32$  | $8 \times \max(\text{DRX cycle}, \text{SMTC period})$ |
| $0.32 < \text{DRX cycle} \leq 10.24$   | $5 \times \text{DRX cycle}$                           |
| Note 1: SMTC period in this table refers to the maximum between the configured SMTC period in PCell and PSCell.<br>Note 2: Number of DRX cycles depends upon the DRX cycle in use<br>Note 3: DRX cycle length in this table refers to the DRX cycle length configured for PCell or PSCell. When DRX is used in both PCell and PSCell, DRX cycle length in this table refers to the longer of the DRX cycle lengths for PCell and PSCell. |   |

If PSCell is changed without changing carrier frequency of PSCell, while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed  $T_{\text{measure\_SFTD2}}$  as defined by the following expression:

$$T_{\text{measure\_SFTD2}} = (M+1) \cdot (T_{\text{measure\_SFTD1}}) + M \cdot T_{\text{PSCell\_change\_NRDC}}$$

where:

M is the number of times the NR PSCell is changed over the measurement period ( $T_{\text{measure\_SFTD2}}$ ), and

$T_{\text{PSCell\_change\_NRDC}}$  is the time necessary to change the PSCell; it can be up to 25ms.

If PCell is changed, or if PSCell is changed with different carrier frequency from PSCell, the UE shall terminate SFTD measurements.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in the clause 10.1.21.

### 9.2.5.4.3 SFTD Measurement Reporting Delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times \text{TTI}_{\text{DCCH}}$ . This measurement reporting delay excludes any delay caused by no UL resources available for UE to send the measurement report.

The SFTD measurement reporting delay shall be less than measurement period defined in clause 9.2.5.4.2 plus the RRC procedure delay defined in TS 38.331 [2].

## 9.2.6 Intra-frequency measurements with measurement gaps

### 9.2.6.1 Void

### 9.2.6.2 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within  $T_{\text{identify\_intra\_without\_index}}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or

*maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within  $T_{\text{identify\_intra\_with\_index}}$ . The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within  $T_{\text{identify\_intra\_without\_index}}$ . It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{\text{identify\_intra\_without\_index}} = T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} \text{ ms}$$

$$T_{\text{identify\_intra\_with\_index}} = T_{\text{PSS/SSS\_sync\_ntra}} + T_{\text{SSB\_measurement\_period\_intra}} + T_{\text{SSB\_time\_index\_intra}} \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_intra}}$ : it is the time period used in PSS/SSS detection given in table 9.2.6.2-1 or 9.2.6.2-2.

$T_{\text{SSB\_time\_index\_intra}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2.6.2-3.

$T_{\text{SSB\_measurement\_period\_intra}}$ : equal to a measurement period of SSB based measurement given in table 9.2.6.3-1 or 9.2.6.3-2.

$\text{CSSF}_{\text{intra}}$ : it is a carrier specific scaling factor and is determined according to  $\text{CSSF}_{\text{within\_gap},i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{\text{pss/sss\_sync\_with\_gaps}}$ : For a UE supporting FR2 power class 1,  $M_{\text{pss/sss\_sync\_with\_gaps}}=40$ . For a UE supporting FR2 power class 2,  $M_{\text{pss/sss\_sync\_with\_gaps}}=24$ . For a UE supporting FR2 power class 3,  $M_{\text{pss/sss\_sync\_with\_gaps}}=24$ . For a UE supporting power class 4,  $M_{\text{pss/sss\_sync\_with\_gaps}}=24$

$M_{\text{meas\_period\_with\_gaps}}$ : For a UE supporting power class 1,  $M_{\text{meas\_period\_with\_gaps}}=40$ . For a UE supporting power class 2,  $M_{\text{meas\_period\_with\_gaps}}=24$ . For a UE supporting power class 3,  $M_{\text{meas\_period\_with\_gaps}}=24$ . For a UE supporting power class 4,  $M_{\text{meas\_period\_with\_gaps}}=24$ .

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for  $T_{\text{identify\_intra\_without\_index}}$  OR  $T_{\text{identify\_intra\_with\_index}}$ .

If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in Table 9.2.6.2-1, Table 9.2.6.2-2, and Table 9.2.6.2-3 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in Table 9.2.6.2-1, Table 9.2.6.2-2, and Table 9.2.6.2-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 9.2.6.2-1: Time period for PSS/SSS detection (FR1)**

| DRX cycle  | $T_{\text{PSS/SSS\_sync\_intra}}$   |
|--|---|
| No DRX   | $\max(600\text{ms}, 5 \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$  |
| $\text{DRX cycle} \leq 320\text{ms}$   | $\max(600\text{ms}, \text{ceil}(M2^{\text{Note 1}} \times 5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| $\text{DRX cycle} > 320\text{ms}$  | $5 \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$  |
| NOTE 1: When <i>highSpeedMeasFlag-r16</i> is not configured, $M2 = 1.5$ ; When <i>highSpeedMeasFlag-r16</i> is configured, $M2 = 1.5$ if SMTC periodicity > 40 ms, otherwise $M2=1$ .<br>NOTE 2: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. |   |

**Table 9.2.6.2-2: Time period for PSS/SSS detection (FR2)**

| DRX cycle                            | $T_{\text{PSS/SSS\_sync\_intra}}$   |
|--------------------------------------|---|
| No DRX                               | $\max(600\text{ms}, M_{\text{pss/sss\_sync\_with\_gaps}} \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$   |
| $\text{DRX cycle} \leq 320\text{ms}$ | $\max(600\text{ms}, \text{ceil}(1.5 \times M_{\text{pss/sss\_sync\_with\_gaps}}) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| $\text{DRX cycle} > 320\text{ms}$    | $M_{\text{pss/sss\_sync\_with\_gaps}} \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$   |

**Table 9.2.6.2-3: Time period for time index detection (Frequency range FR1)**

| DRX cycle   | $T_{\text{SSB\_time\_index\_intra}}$  |
|---|---|
| No DRX  | $\max(120\text{ms}, 3 \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$  |
| $\text{DRX cycle} \leq 320\text{ms}$  | $\max(120\text{ms}, \text{ceil}(M2^{\text{Note 1}} \times 3) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| $\text{DRX cycle} > 320\text{ms}$   | $3 \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$  |
| NOTE 1: When <i>highSpeedMeasFlag-r16</i> is not configured, $M2 = 1.5$ ; When <i>highSpeedMeasFlag-r16</i> is configured, $M2 = 1.5$ if SMTC periodicity > 40 ms, otherwise $M2=1$ .   |   |
| NOTE 2: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. |   |

**Table 9.2.6.2-7: Void****Table 9.2.6.2-8: Void**

### 9.2.6.3 Intrafrequency Measurement Period

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 9.2.6.3-1.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in table 9.2.6.3-2.

When *highSpeedMeasFlag-r16* is configured,  $T_{\text{SSB\_measurement\_period\_intra}}$  is specified in Table 9.2.6.3-3.

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified in Table 9.2.6.3-1 and Table 9.2.6.3-2, shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in Table 9.2.6.3-1 and Table 9.2.6.3-2, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

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

**Table 9.2.6.3-1: Measurement period for intra-frequency measurements with gaps(FR1)**

| DRX cycle                            | $T_{\text{SSB\_measurement\_period\_intra}}$   |
|--------------------------------------|--|
| No DRX                               | $\max(200\text{ms}, 5 \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$   |
| $\text{DRX cycle} \leq 320\text{ms}$ | $\max(200\text{ms}, \text{ceil}(1.5 \times 5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| $\text{DRX cycle} > 320\text{ms}$    | $5 \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$   |

**Table 9.2.6.3-2: Measurement period for intra-frequency measurements with gaps(FR2)**

| DRX cycle              | T <sub>SSB_measurement_period_intra</sub>   |
|------------------------|---|
| No DRX                 | $\max(400\text{ms}, M_{\text{meas\_period with\_gaps}} \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$   |
| DRX cycle $\leq$ 320ms | $\max(400\text{ms}, \text{ceil}(1.5 \times M_{\text{meas\_period with\_gaps}}) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle}))^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle > 320ms      | $M_{\text{meas\_period with\_gaps}} \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$   |

**Table 9.2.6.3-3: Measurement period When *highSpeedMeasFlag-r16* is configured (Frequency Range FR1)**

| DRX cycle   | T <sub>SSB_measurement_period_intra</sub>   |
|---|---|
| No DRX  | $\max(200\text{ms}, 5 \times \max(\text{MGRP}, \text{SMTC period}))^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$  |
| DRX cycle $\leq$ 160ms  | $\max(200\text{ms}, \text{ceil}(M2^{\text{Note 2}} \times 5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| 160ms < DRX cycle $\leq$ 320ms  | $\max(200\text{ms}, \text{ceil}(M2^{\text{Note 2}} \times 4) \times \max(\text{MGRP}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$                     |
| DRX cycle > 320ms   | $Y^{\text{Note 3}} \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$  |
| <p>NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified</p> <p>NOTE 2: M2 = 1.5 if SMTC periodicity &gt; 40 ms, otherwise M2=1</p> <p>NOTE 3: Y=3 when SMTC <math>\leq</math> 40ms, Y=5 when SMTC &gt; 40ms</p> <p>NOTE 4: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.</p> |   |

## 9.2A NR intra-frequency measurements with CCA

### 9.2A.1 Introduction

The requirements in clause 9.2.A apply for intra-frequency measurements on carrier frequency with CCA.

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the SSB of the serving cell indicated for measurement and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell or the PSCell, even if no explicit neighbour list with physical layer cell identities is provided.

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE, or
- the active downlink BWP is initial BWP[3].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in clause 9.2A.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC(s)) which provides periodicity, duration and offset information on a window of up to 5ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5ms.



In the requirements of clause 9.2A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but  $N$  candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period, where:

- For the cell detection procedure:  $N$  is at least one candidate SSB position (NOTE: the one candidate SSB position for the cell detection shall not be impacted by the set of candidate SSB positions which are already being measured by the UE within the current measurement period of the on-going measurements), and
- For other procedures in clause 9.2A:  $N$  are the first two successive candidate SSB positions when two or more candidate SSB positions are configured for this SSB index in one discovery burst transmission window, otherwise  $N$  is one candidate SSB position;

otherwise the SMTC occasion is considered as available at the UE.

## 9.2A.2 Requirements applicability

The requirements in clause 9.2A apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.27, for a corresponding Band,
- SS-RSRQ related side conditions given in clause 10.1.29, for a corresponding Band,
- SS-SINR related side conditions given in clause 10.1.31, for a corresponding Band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.8 for a corresponding Band.

## 9.2A.3 Number of cells and number of SSB

For each intra-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 8 identified cells, and
- 14 SSBs with different SSB index and/or PCI on the intra-frequency layer, where the number of SSBs in the serving cell (except for the SCell) is not smaller than the number of configured RLM-RS SSB resources.

## 9.2A.4 Measurement Reporting Requirements

### 9.2A.4.1 Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.27, 20.1.29, and 10.1.31, respectively.

### 9.2A.4.2 Event-triggered Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.27, 20.1.29, and 10.1.31, respectively.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.2A.4.3.

### 9.2A.4.3 Event Triggered Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.27, 20.1.29, and 10.1.31, respectively.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on, and all delays due to UL CCA failures until the successful transmission of the report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than  $T_{\text{identify\_intra\_with\_index\_CCA}}$  or  $T_{\text{identify\_intra\_without\_index\_CCA}}$  defined in clause 9.2A.5.1 or clause 9.2A.6.2. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period  $T_{\text{identify\_intra\_without\_index\_CCA}}$  or  $T_{\text{identify\_intra\_with\_index\_CCA}}$  as defined in clause 9.2A.5.1 or clause 9.2A.6.2. If a cell which has been detectable at least for the time period  $T_{\text{identify\_intra\_without\_index\_CCA}}$  or  $T_{\text{identify\_intra\_with\_index\_CCA}}$  defined in clause 9.2A.5.1 or clause 9.2A.6.2 becomes undetectable for a period  $\leq 8$  seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than  $T_{\text{SSB\_measurement\_period\_intra\_CCA}}$  provided the timing to that cell has not changed more than  $\pm 3200/2^\mu T_c$  while the measurement gap has not been available and the L3 filter has not been used, where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

## 9.2A.5 Intra-frequency measurements without measurement gaps

### 9.2A.5.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within  $T_{\text{identify\_intra\_without\_index\_CCA}}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within  $T_{\text{identify\_intra\_with\_index\_CCA}}$ . The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within  $T_{\text{identify\_intra\_without\_index\_CCA}}$ .

$$T_{\text{identify\_intra\_without\_index\_CCA}} = (T_{\text{PSS/SSS\_sync\_intra\_CCA}} + T_{\text{SSB\_measurement\_period\_intra\_CCA}}) \text{ ms}$$

$$T_{\text{identify\_intra\_with\_index\_CCA}} = (T_{\text{PSS/SSS\_sync\_intra\_CCA}} + T_{\text{SSB\_measurement\_period\_intra\_CCA}} + T_{\text{SSB\_time\_index\_intra\_CCA}}) \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_intra\_CCA}}$ : it is the time period used in PSS/SSS detection given in table 9.2A.5.1-1, 9.2A.5.1-3 (deactivated Scell).

$T_{\text{SSB\_time\_index\_intra\_CCA}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2A.5.1-2 or 9.2A.5.1-4 (deactivated SCell).

$T_{\text{SSB\_measurement\_period\_intra\_CCA}}$ : equal to a measurement period of SSB based measurement given in table 9.2A.5.2-1, 9.2A.5.2-2 (deactivated Scell).  $CSSF_{\text{intra}}$ : it is a carrier specific scaling factor and is determined

- according to  $CSSF_{\text{outside\_gap},i}$  in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to  $CSSF_{\text{within\_gap},i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs,  $K_p=1$

When intra-frequency SMTC is partially overlapping with measurement gaps,  $K_p = 1/(1 - (\text{SMTC period} / \text{MGRP}))$ , where  $\text{SMTC period} < \text{MGRP}$ .

If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 9.2A.5.1-1, Table 9.2A.5.1-2, Table 9.2A.5.1-3, and Table 9.2A.5.1-4 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in clause 9.2A.4.3.

**Table 9.2A.5.1-1: Time period for PSS/SSS detection**

| Condition   | $T_{PSS/SSS\_sync\_intra\_CCA}$   |
|---|---|
| No DRX  | $\max(600\text{ms}, \text{ceil}((5+L_{PSS/SSS}) \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{intra}$                    |
| DRX cycle $\leq 320\text{ms}$   | $\max(600\text{ms}, \text{ceil}(1.5 \times (5+L_{PSS/SSS}) \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle $> 320\text{ms}$  | $\text{ceil}((5+L_{PSS/SSS}) \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{intra}$  |
| <p>NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified</p> <p>NOTE 2: When DRX is not configured, <math>L_{PSS/SSS}</math> is the number of SMTC occasions not available at the UE during <math>T_{PSS/SSS\_sync\_intra\_CCA}</math> for PSS/SSS detection, where <math>L_{PSS/SSS} &lt; L_{PSS/SSS,max}</math>. When DRX is configured, <math>L_{PSS/SSS}</math> is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during <math>T_{PSS/SSS\_sync\_intra\_CCA}</math> for PSS/SSS detection, where <math>L_{PSS/SSS} &lt; L_{PSS/SSS,max}</math>. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by <math>\text{CSSF}_{intra}</math>.</p> <p>NOTE 3: <math>L_{PSS/SSS,max} = 7</math> for <math>\text{Max}(\text{DRX cycle}, \text{SMTC period}) \leq 40\text{ms}</math> where DRX cycle is 0 for non-DRX, <math>L_{PSS/SSS,max} = 5</math> for <math>40\text{ms} &lt; \text{Max}(\text{DRX cycle}, \text{SMTC period}) \leq 320\text{ms}</math>, <math>L_{PSS/SSS,max} = 3</math> for DRX cycle <math>&gt; 320\text{ms}</math>.</p> <p>NOTE 4: Upon exceeding <math>L_{PSS/SSS,max}</math>, the UE is not required to meet the requirements for PSS/SSS detection.</p> |   |

**Table 9.2A.5.1-2: Time period for time index detection**

| Condition  | $T_{SSB\_time\_index\_intra\_CCA}$  |
|--|---|
| No DRX   | $\max(120\text{ms}, \text{ceil}((3+L_{ind}) \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{intra}$                    |
| DRX cycle $\leq 320\text{ms}$  | $\max(120\text{ms}, \text{ceil}(1.5 \times (3+L_{ind}) \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle $> 320\text{ms}$   | $\text{Ceil}((3+L_{ind}) \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{intra}$  |
| <p>NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified</p> <p>NOTE 2: When DRX is not configured, <math>L_{ind}</math> is the number of SMTC occasions not available at the UE during <math>T_{SSB\_time\_index\_intra\_CCA}</math> for index detection, where <math>L_{ind} \leq L_{ind,max}</math>. When DRX is configured, <math>L_{ind}</math> is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during <math>T_{SSB\_time\_index\_intra\_CCA}</math> for index detection, where <math>L_{ind} \leq L_{ind,max}</math>. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by <math>\text{CSSF}_{intra}</math>.</p> <p>NOTE 3: <math>L_{ind,max} = 5</math> for <math>\text{Max}(\text{DRX cycle}, \text{SMTC period}) \leq 40\text{ms}</math> where DRX cycle is 0 for non-DRX, <math>L_{ind,max} = 3</math> for <math>40\text{ms} &lt; \text{Max}(\text{DRX cycle}, \text{SMTC period}) \leq 320\text{ms}</math>, <math>L_{ind,max} = 2</math> for DRX cycle <math>&gt; 320\text{ms}</math>.</p> <p>NOTE 4: Upon exceeding <math>L_{ind,max}</math> over the period of time <math>T_{SSB\_time\_index\_intra\_CCA}</math>, the UE has to restart the time index detection procedure.</p> |   |

**Table 9.2A.5.1-3: Time period for PSS/SSS detection, deactivated SCell**

| Condition                     | $T_{\text{PSS/SSS\_sync\_intra\_CCA}}$   |
|-------------------------------|--|
| No DRX                        | $(5 + L_{\text{PSS/SSS,deact}}) \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$                                    |
| DRX cycle $\leq 320\text{ms}$ | $(5 + L_{\text{PSS/SSS,deact}}) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle $> 320\text{ms}$    | $(5 + L_{\text{PSS/SSS,deact}}) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$            |

NOTE 1: When DRX is not configured,  $L_{\text{PSS/SSS,deact}}$  is the number of SMTC occasions not available at the UE during  $T_{\text{PSS/SSS\_sync\_intra\_CCA}}$  for PSS/SSS detection, where  $L_{\text{PSS/SSS,deact}} < L_{\text{PSS/SSS,deact,max}}$ . When DRX is configured,  $L_{\text{PSS/SSS,deact}}$  is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during  $T_{\text{PSS/SSS\_sync\_intra\_CCA}}$  for PSS/SSS detection, where  $L_{\text{PSS/SSS,deact}} < L_{\text{PSS/SSS,deact,max}}$ . When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by  $\text{CSSF}_{\text{intra}}$ .

NOTE 2:  $L_{\text{PSS/SSS,deact,max}} = 7$  for  $\text{Max}(\text{DRX cycle}, \text{measCycleSCell}) \leq 40\text{ms}$  where DRX cycle is 0 for non-DRX,  $L_{\text{PSS/SSS,deact,max}} = 5$  for  $40\text{ms} < \text{Max}(\text{DRX cycle}, \text{measCycleSCell}) \leq 320\text{ms}$ ,  $L_{\text{PSS/SSS,deact,max}} = 3$  for DRX cycle  $> 320\text{ms}$ .

NOTE 3: Upon exceeding  $L_{\text{PSS/SSS,deact,max}}$ , the UE is not required to meet the requirements for PSS/SSS detection.

**Table 9.2A.5.1-4: Time period for time index detection, deactivated SCell**

| Condition                     | $T_{\text{SSB\_time\_index\_intra\_CCA}}$  |
|-------------------------------|--|
| No DRX                        | $(3 + L_{\text{ind,deact}}) \times \text{measCycleSCell} \times \text{CSSF}_{\text{intra}}$                                    |
| DRX cycle $\leq 320\text{ms}$ | $(3 + L_{\text{ind,deact}}) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle $> 320\text{ms}$    | $(3 + L_{\text{ind,deact}}) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$            |

NOTE 1: When DRX is not configured,  $L_{\text{ind,deact}}$  is the number of SMTC occasions not available at the UE during  $T_{\text{SSB\_time\_index\_intra\_CCA}}$  for index detection, where  $L_{\text{ind,deact}} < L_{\text{ind,deact,max}}$ . When DRX is configured,  $L_{\text{ind,deact}}$  is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during  $T_{\text{SSB\_time\_index\_intra\_CCA}}$  for index detection, where  $L_{\text{ind,deact}} < L_{\text{ind,deact,max}}$ . When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by  $\text{CSSF}_{\text{intra}}$ .

NOTE 2:  $L_{\text{ind,deact,max}} = 5$  for  $\text{Max}(\text{DRX cycle}, \text{measCycleSCell}) \leq 40\text{ms}$  where DRX cycle is 0 for non-DRX,  $L_{\text{ind,deact,max}} = 3$  for  $40\text{ms} < \text{Max}(\text{DRX cycle}, \text{measCycleSCell}) \leq 320\text{ms}$ ,  $L_{\text{ind,deact,max}} = 2$  for DRX cycle  $> 320\text{ms}$ .

NOTE 3: Upon exceeding  $L_{\text{ind,deact,max}}$  over the period of time  $T_{\text{SSB\_time\_index\_intra\_CCA}}$ , the UE has to restart the time index detection procedure.

### 9.2A.5.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 9.2A.5.2-1, 9.2A.5.2-2 (deactivated SCell).

If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 9.2A.5.2-1, Table 9.2A.5.2-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in clause 9.2A.4.3.

When the time period of unsuccessful measurement attempts due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in clause 9.2A.4.3, UE shall stop the measurement attempts on this SSB and perform the detection procedure again like for any other SSB.

**Table 9.2A.5.2-1: Measurement period for intra-frequency measurements without gaps**

| Condition   | $T_{SSB\_measurement\_period\_intra\_CCA}$   |
|---|--|
| No DRX  | $\max(200\text{ms}, \text{ceil}((5+L_{meas}) \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{intra}$                    |
| DRX cycle $\leq$ 320ms  | $\max(200\text{ms}, \text{ceil}(1.5 \times (5+L_{meas}) \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle $>$ 320ms   | $\text{ceil}((5+L_{meas}) \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{intra}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified   |  |
| NOTE 2: When DRX is not configured, $L_{meas}$ is the number of SMTC occasions not available at the UE during $T_{SSB\_measurement\_period\_intra\_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$ . When DRX is configured, $L_{meas}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB\_measurement\_period\_intra\_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$ . When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $\text{CSSF}_{intra}$ . |  |
| NOTE 3: $L_{meas,max} = 7$ for $\text{Max}(\text{DRX cycle}, \text{SMTC period}) \leq 40\text{ms}$ where DRX cycle is 0 for non-DRX, $L_{meas,max} = 5$ for $40\text{ms} < \text{Max}(\text{DRX cycle}, \text{SMTC period}) \leq 320\text{ms}$ , $L_{meas,max} = 3$ for DRX cycle $>$ 320ms.  |  |
| NOTE 4: Upon exceeding $L_{meas,max}$ over the period of time $T_{SSB\_measurement\_period\_intra\_CCA}$ , the UE has to restart the measurement procedure.   |  |

**Table 9.2A.5.2-2: Measurement period for intra-frequency measurements without gaps (deactivated SCell)**

| Condition  | $T_{SSB\_measurement\_period\_intra\_CCA}$  |
|--|---|
| No DRX   | $(5+L_{meas,deact}) \times \text{measCycleSCell} \times \text{CSSF}_{intra}$                                    |
| DRX cycle $\leq$ 320ms   | $(5+L_{meas,deact}) \times \max(\text{measCycleSCell}, 1.5 \times \text{DRX cycle}) \times \text{CSSF}_{intra}$ |
| DRX cycle $>$ 320ms  | $(5+L_{meas,deact}) \times \max(\text{measCycleSCell}, \text{DRX cycle}) \times \text{CSSF}_{intra}$            |
| NOTE 1: When DRX is not configured, $L_{meas,deact}$ is the number of SMTC occasions not available at the UE during $T_{SSB\_measurement\_period\_intra\_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,deact,max}$ . When DRX is configured, $L_{meas,deact}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB\_measurement\_period\_intra\_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,deact,max}$ . When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $\text{CSSF}_{intra}$ . |   |
| NOTE 2: $L_{meas,deact,max} = 7$ for $\text{Max}(\text{DRX cycle}, \text{measCycleSCell}) \leq 40\text{ms}$ where DRX cycle is 0 for non-DRX, $L_{meas,deact,max} = 5$ for $40\text{ms} < \text{Max}(\text{DRX cycle}, \text{measCycleSCell}) \leq 320\text{ms}$ , $L_{meas,deact,max} = 3$ for DRX cycle $>$ 320ms.   |   |
| NOTE 3: Upon exceeding $L_{meas,deact,max}$ over the period of time $T_{SSB\_measurement\_period\_intra\_CCA}$ , the UE has to restart the measurement procedure.  |   |

### 9.2A.5.3 Scheduling availability of UE during intra-frequency measurements

UE shall be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged [2], if it is configured; otherwise, all  $L$  SSB symbols within SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

#### 9.2A.5.3.1 Scheduling availability of UE performing measurements in TDD bands

When UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols configured to be measured, and on 1 data symbol before each consecutive SSB symbols configured to be measured and 1 data symbol after each consecutive SSB symbols configured to be measured within SMTC window duration if

*deriveSSB\_IndexFromCell* is enabled. If the high layer in TS 38.331[2] signaling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

- The UE is not expected to transmit PUCCH/PUSCH/SRS on all symbols within SMTC window duration if *deriveSSB\_IndexFromCell* is not enabled. If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols configured to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB configured to be measured/RSSI symbols and 1 data symbol after each consecutive SSB configured to be measured/RSSI symbols within SMTC window duration if *deriveSSB\_IndexFromCell* is enabled. If the high layer signaling of *smtc2* is configured (in TS 38.331), the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.
- The UE is not expected to transmit PUCCH/PUSCH/SRS on all symbols within SMTC window duration if *deriveSSB\_IndexFromCell* is not enabled. If the high layer in TS 38.331 signaling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When intra-band carrier aggregation in unlicensed spectrum is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

#### 9.2A.5.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If *deriveSSB\_IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.
- If *deriveSSB\_IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

### 9.2A.6 Intra-frequency measurements with measurement gaps

#### 9.2A.6.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within  $T_{\text{identify\_intra\_without\_index\_CCA}}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within  $T_{\text{identify\_intra\_with\_index\_CCA}}$ . The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within  $T_{\text{identify\_intra\_without\_index\_CCA}}$ .

$$T_{\text{identify\_intra\_without\_index\_CCA}} = T_{\text{PSS/SSS\_sync\_intra\_CCA}} + T_{\text{SSB\_measurement\_period\_intra\_CCA}} \text{ ms}$$

$$T_{\text{identify\_intra\_with\_index\_CCA}} = T_{\text{PSS/SSS\_sync\_intra\_CCA}} + T_{\text{SSB\_measurement\_period\_intra\_CCA}} + T_{\text{SSB\_time\_index\_intra\_CCA}}$$

Where:

$T_{\text{PSS/SSS\_sync\_intra\_CCA}}$ : it is the time period used in PSS/SSS detection given in table 9.2A.6.1-1.

$T_{\text{SSB\_time\_index\_intra\_CCA}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2A.6.1-2.

$T_{SSB\_measurement\_period\_intra\_CCA}$ : equal to a measurement period of SSB based measurement given in table 9.2A.6.2-1 or 9.2A.6.1-3.  $CSSF_{intra}$ : it is a carrier specific scaling factor and is determined according to  $CSSF_{within\_gap,i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 9.2A.6.1-1 and Table 9.2A.6.1-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in clause 9.2A.4.3.

**Table 9.2A.6.1-1: Time period for PSS/SSS detection**

| Condition   | $T_{PSS/SSS\_sync\_intra\_CCA}$   |
|---|---|
| No DRX  | $\max(600\text{ms}, (5+L_{PSS/SSS,gaps}) \times \max(\text{MGRP}, \text{SMTC period})) \times CSSF_{intra}$   |
| DRX cycle $\leq$ 320ms  | $\max(600\text{ms}, \text{ceil}(1.5 \times (5+L_{PSS/SSS,gaps})) \times \max(\text{DRX cycle}, \text{MGRP}, \text{SMTC period})) \times CSSF_{intra}$ |
| DRX cycle $>$ 320ms   | $(5+L_{PSS/SSS,gaps}) \times (\text{MGRP}, \text{DRX cycle}) \times CSSF_{intra}$   |
| <p>NOTE 1: When DRX is not configured, <math>L_{PSS/SSS,gaps}</math> is the number of SMTC occasions not available at the UE during <math>T_{PSS/SSS\_sync\_intra\_CCA}</math> for PSS/SSS detection, where <math>L_{PSS/SSS,gaps} &lt; L_{PSS/SSS,gaps,max}</math>. When DRX is configured, <math>L_{PSS/SSS,gaps}</math> is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during <math>T_{PSS/SSS\_sync\_intra\_CCA}</math> for PSS/SSS detection, where <math>L_{PSS/SSS,gaps} &lt; L_{PSS/SSS,gaps,max}</math>. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by <math>CSSF_{intra}</math>.</p> <p>NOTE 2: <math>L_{PSS/SSS,gaps,max} = 7</math> for <math>\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 40\text{ms}</math> where DRX cycle is 0 for non-DRX, <math>L_{PSS/SSS,gaps,max} = 5</math> for <math>40\text{ms} &lt; \max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 320\text{ms}</math>, <math>L_{PSS/SSS,gaps,max} = 3</math> for DRX cycle <math>&gt;</math> 320ms.</p> <p>NOTE 3: Upon exceeding <math>L_{PSS/SSS,gaps,max}</math>, the UE is not required to meet the requirements for PSS/SSS detection.</p> |   |

**Table 9.2A.6.1-2: Time period for time index detection**

| Condition  | $T_{SSB\_time\_index\_intra\_CCA}$  |
|--|---|
| No DRX   | $\max(120\text{ms}, (3+L_{ind,gaps}) \times \max(\text{MGRP}, \text{SMTC period})) \times CSSF_{intra}$   |
| DRX cycle $\leq$ 320ms   | $\max(120\text{ms}, \text{ceil}(1.5 \times (3+L_{ind,gaps})) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times CSSF_{intra}$ |
| DRX cycle $>$ 320ms  | $(3+L_{ind,gaps}) \times (\text{MGRP}, \text{DRX cycle}) \times CSSF_{intra}$   |
| <p>NOTE 1: When DRX is not configured, <math>L_{ind,gaps}</math> is the number of SMTC occasions not available at the UE during <math>T_{SSB\_time\_index\_intra\_CCA}</math> for index detection where <math>L_{ind,gaps} &lt; L_{ind,gaps,max}</math>. When DRX is configured, <math>L_{ind,gaps}</math> is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during <math>T_{SSB\_time\_index\_intra\_CCA}</math> for index detection where <math>L_{ind,gaps} &lt; L_{ind,gaps,max}</math>. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by <math>CSSF_{intra}</math>.</p> <p>NOTE 2: <math>L_{ind,gaps,max} = 5</math> for <math>\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 40\text{ms}</math> where DRX cycle is 0 for non-DRX, <math>L_{ind,gaps,max} = 3</math> for <math>40\text{ms} &lt; \max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 320\text{ms}</math>, <math>L_{ind,gaps,max} = 2</math> for DRX cycle <math>&gt;</math> 320ms.</p> <p>NOTE 3: Upon exceeding <math>L_{ind,gaps,max}</math> over the <math>T_{SSB\_time\_index\_intra\_CCA}</math> period of time, the UE has to restart the time index detection procedure.</p> |   |

## 9.2A.6.2 Intra-frequency Measurement Period

The measurement period for intra-frequency measurements with gaps is as shown in table 9.2A.6.2-1.

If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 9.2A.6.2-1 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in clause 9.2A.4.3.

When the time period of unsuccessful measurement attempts due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in clause 9.2A.4.3, UE shall stop the measurement attempts on this SSB and perform the detection procedure again like for any other SSB.

**Table 9.2A.6.2-1: Measurement period for intra-frequency measurements with gaps**

| Condition   | $T_{SSB\_measurement\_period\_intra\_CCA}$  |
|---|---|
| No DRX  | $\max(200\text{ms}, (5+L_{meas,gaps}) \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{intra}$   |
| DRX cycle $\leq 320\text{ms}$   | $\max(200\text{ms}, \text{ceil}(1.5 \times (5+L_{meas,gaps})) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{intra}$ |
| DRX cycle $> 320\text{ms}$  | $(5+L_{meas,gaps}) \times (\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{intra}$   |
| <p>NOTE 1: When DRX is not configured, <math>L_{meas,gaps}</math> is the number of SMTC occasions not available at the UE during <math>T_{SSB\_time\_index\_intra\_CCA}</math> for measurement where <math>L_{meas,gaps} &lt; L_{meas,gaps,max}</math>. When DRX is configured, <math>L_{meas,gaps}</math> is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during <math>T_{SSB\_time\_index\_intra\_CCA}</math> for measurement where <math>L_{meas,gaps} &lt; L_{meas,gaps,max}</math>. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by <math>\text{CSSF}_{intra}</math>.</p> <p>NOTE 2: <math>L_{meas,gaps,max} = 7</math> for <math>\text{Max}(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 40\text{ms}</math> where DRX cycle is 0 for non-DRX, <math>L_{meas,gaps,max} = 5</math> for <math>40\text{ms} &lt; \text{Max}(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 320\text{ms}</math>, <math>L_{meas,gaps,max} = 3</math> for DRX cycle <math>&gt; 320\text{ms}</math>.</p> <p>NOTE 3: Upon exceeding <math>L_{meas,gaps,max}</math> over the <math>T_{SSB\_measurement\_period\_intra\_CCA}</math> period of time, the UE has to restart the measurement procedure.</p> |   |

## 9.2A.7 Intra-frequency RSSI and Channel occupancy measurements

### 9.2A.7.1 Intra-frequency RSSI measurements

An RSSI measurement is defined as an intra-frequency measurement provided that the RSSI measurement bandwidth is fully contained within the current carrier bandwidth of the UE.

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [4] on one or more serving carriers operating with CCA, TS 37.213 [33], if the carrier(s) are indicated by higher layers [2], and report the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [2] occurring with a configured RSSI measurement timing configuration periodicity [2], *rmtc-Periodicity*.

The UE can perform RSSI measurements without measurement gaps if RSSI measurement bandwidth is fully within the active DL BWP of the UE.

The measurement period for intra-frequency RSSI measurements without measurement gaps is as shown in Table 9.2A.7.1-1 and Table 9.2A.7.1-2. The measurement period for intra-frequency RSSI measurements with measurement gaps is as shown in Table 9.2A.7.1-3.

**Table 9.2A.7.1-1: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTc are overlapping**

| Condition <sup>NOTE1,2</sup>   | $T_{RSSI\_measurement\_period\_intra\_cca}$  |
|--|--|
| No DRX   | $\max(\text{reportInterval}, \text{rmtc-Periodicity} \times \text{CSSF}_{outside\_gap,i})$                         |
| DRX  | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{DRX cycle}) \times \text{CSSF}_{outside\_gap,i})$ |
| <p>NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1</p> <p>NOTE 2: <math>\text{CSSF}_{outside\_gap,i}</math> is a carrier specific scaling factor and is determined according to <math>\text{CSSF}_{outside\_gap,i}</math> in clause 9.1.5.1 for measurement conducted outside measurement gap.</p> |  |



**Table 9.2A.7.1-2: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are not overlapping**

| Condition <sup>NOTE1,2</sup>  | T <sub>RSSI_measurement_period_intra_cca</sub>   |
|---|--|
| No DRX  | $\max(\text{reportInterval}, N_{\text{intra-MO}} \cdot \text{rmtc-Periodicity})$                               |
| DRX   | $\max(\text{reportInterval}, N_{\text{intra-MO}} \cdot \max(\text{rmtc-Periodicity}, \text{DRXcycle length}))$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1                 |  |
| NOTE 2: $N_{\text{intra-MO}}$ is defined as the number of measurement objects that can be measured without gaps |  |

**Table 9.2A.7.1-3: Measurement period for intra-frequency RSSI measurements with measurement gaps**

| Condition <sup>NOTE1,2</sup>   | T <sub>RSSI_measurement_period_intra_cca</sub>   |
|--|--|
| No DRX   | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}) \times \text{CSSF}_{\text{intra}})$                          |
| DRX  | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}, \text{DRX cycle length}) \times \text{CSSF}_{\text{intra}})$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |  |
| NOTE 2: $\text{CSSF}_{\text{intra}}$ is a carrier specific scaling factor and is determined according to $\text{CSSF}_{\text{within\_gap},i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps. |  |

If the UE requires measurement gaps to perform intra-frequency measurements, a single measurement gap pattern is used for all concurrent intra-frequency measurements, including intra-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The RSSI measurement performed and reported according to this clause shall meet the RSSI measurement accuracy requirement in Clause 10.1.34.1. The reported RSSI measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in Clause 10.1.34.3.

## 9.2A.7.2 Intra-frequency Channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more serving carrier frequencies indicated by higher layers [2], based on RSSI samples provided by the physical layer.

The UE can perform channel occupancy measurements without measurement gaps if RSSI measurement bandwidth is fully within the active DL BWP of the UE.

The measurement period for intra-frequency channel occupancy measurements without measurement gap is as shown in Table 9.2A.7.2-1 and Table 9.2A.7.1-2. The measurement period for intra-frequency RSSI measurements with measurement gaps is as shown in Table 9.2A.7.2-3.

**Table 9.2A.7.2-1: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are overlapping**

| Condition <sup>NOTE1,2</sup>  | T <sub>RSSI_measurement_period_intra_cca</sub>   |
|---|--|
| No DRX  | $\max(\text{reportInterval}, \text{rmtc-Periodicity} \cdot \text{CSSF}_{\text{outside\_gap},i})$                         |
| DRX   | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{DRX cycle}) \cdot \text{CSSF}_{\text{outside\_gap},i})$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1   |  |
| NOTE 2: $\text{CSSF}_{\text{outside\_gap},i}$ is a carrier specific scaling factor and is determined according to $\text{CSSF}_{\text{within\_gap},i}$ in clause 9.1.5.1 for measurement conducted outside measurement gap. |  |

**Table 9.2A.7.2-2: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are not overlapping**

| Condition <sup>NOTE1,2</sup>  | T <sub>RSSI_measurement_period_intra_cca</sub>   |
|---|--|
| No DRX  | $\max(\text{reportInterval}, N_{\text{intra-MO}} \cdot \text{rmtc-Periodicity})$                               |
| DRX   | $\max(\text{reportInterval}, N_{\text{intra-MO}} \cdot \max(\text{rmtc-Periodicity}, \text{DRXcycle length}))$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1                 |  |
| NOTE 2: $N_{\text{intra-MO}}$ is defined as the number of measurement objects that can be measured without gaps |  |

**Table 9.2A.7.2-3: Measurement period for intra-frequency Channel Occupancy measurements with measurement gaps**

| Condition <sup>NOTE1,2</sup>   | $T_{\text{RSSI\_measurement\_period\_intra\_cca}}$   |
|--|--|
| No DRX   | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}) \times \text{CSSF}_{\text{intra}})$                          |
| DRX  | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}, \text{DRX cycle length}) \times \text{CSSF}_{\text{intra}})$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |  |
| NOTE 2: $\text{CSSF}_{\text{intra}}$ is a carrier specific scaling factor and is determined according to $\text{CSSF}_{\text{within\_gap},i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps. |  |

If the UE requires measurement gaps to perform intra-frequency measurements, a single measurement gap pattern is used for all concurrent intra-frequency measurements, including intra-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The channel occupancy measurement performed and reported according to this clause shall meet the channel occupancy measurement accuracy requirements in Clause 10.1.35.1. The reported channel occupancy measurement values contained in measurement reports shall be based on the measurement reporting range specified in TS 38.331 [2].

### 9.2A.7.3 Scheduling restriction during RSSI and Channel Occupancy measurements

When the UE performs intra-frequency RSSI/CO measurements in unlicensed spectrum, the following restrictions apply due to RSSI/CO measurements:

- The UE is not expected to transmit PUCCH/PUSCH/SRS on UL symbols which are overlapping in time with the RSSI measurement symbols configured by RMTTC.

When intra-band carrier aggregation in unlicensed spectrum is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

## 9.3 NR inter-frequency measurements

### 9.3.1 Introduction

A measurement is defined as an SSB based inter-frequency measurement provided it is not defined as an intra-frequency measurement according to clause 9.2.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-frequency cells if carrier frequency information is provided by PCell or PSCell, even if no explicit neighbour list with physical layer cell identities is provided.

A measurement is defined as an inter-frequency SSB based measurements without measurement gaps for UE capable of *interFrequencyMeas-NoGap* provided

- the UE supports *interFrequencyMeas-Nogap-r16* [15], and
- the SSB is completely contained in the active BWP of the UE.

For inter-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in clause 9.3.5.3.

Note: Non-CA capable UE is not expected to indicate support of *interFrequencyMeas-Nogap-r16* [15].

SSB based measurements are configured along with a measurement timing configuration (SMTC) per carrier, which provides periodicity, duration and offset information on a window of up to 5ms where the measurements on the configured inter-frequency carrier are to be performed. For inter-frequency connected mode measurements, one measurement window periodicity may be configured per inter-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB on an inter-frequency measurement object which start earlier than the gap starting time + switching time, nor detect SSB which ends later than the gap end – switching time. When the inter-frequency cells are in FR2 and the per-FR gap is configured to the UE in EN-DC, SA NR, NE-DC and NR-DC, or the serving cells are in FR2, the inter-frequency cells are in FR2 and the per-UE gap is configured to the UE in SA NR and NR-DC, the switching time is 0.25ms. Otherwise the switching time is 0.5ms.

The requirements in this clause shall also apply, when the UE is configured to perform SRS carrier based switching and using measurement gaps.

Longer measurement period would be expected during the period  $T_{\text{identify\_CGI}}$  when the UE is requested to decode an NR CGI.

### 9.3.2 Requirements applicability

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.3 for a corresponding Band.

#### 9.3.2.1 Void

#### 9.3.2.2 Void

### 9.3.3 Number of cells and number of SSB

#### 9.3.3.1 Requirements for FR1

For each inter-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 4 identified cells, and
- 7 SSBs with different SSB index and/or PCI on the inter-frequency layer.

#### 9.3.3.2 Requirements for FR2

For each inter-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 4 identified cells, and
- 10 SSBs with different SSB index and/or PCI on the inter-frequency layer, and
- 1 SSB per identified cell.

### 9.3.4 Inter-frequency measurement with measurement gaps

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within  $T_{\text{identify\_inter\_without\_index}}$  if UE is not indicated

to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within  $T_{\text{identify\_inter\_with\_index}}$ . The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within  $T_{\text{identify\_inter\_without\_index}}$ .

$$T_{\text{identify\_inter\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter}} + T_{\text{SSB\_measurement\_period\_inter}}) \text{ ms}$$

$$T_{\text{identify\_inter\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter}} + T_{\text{SSB\_measurement\_period\_inter}} + T_{\text{SSB\_time\_index\_inter}}) \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_inter}}$ : it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2.

$T_{\text{SSB\_time\_index\_inter}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and table 9.3.4-4.

$T_{\text{SSB\_measurement\_period\_inter}}$ : equal to a measurement period of SSB based measurement given in table 9.3.5-1 and table 9.3.5-2.

$M_{\text{pss/sss\_sync\_inter}}$ : For a UE supporting FR2 power class 1,  $M_{\text{pss/sss\_sync\_inter}} = 64$  samples. For a UE supporting FR2 power class 2,  $M_{\text{pss/sss\_sync\_inter}} = 40$  samples. For a UE supporting FR2 power class 3,  $M_{\text{pss/sss\_sync\_inter}} = 40$  samples. For a UE supporting FR2 power class 4,  $M_{\text{pss/sss\_sync\_inter}} = 40$  samples.

$M_{\text{SSB\_index\_inter}}$ : For a UE supporting FR2 power class 1,  $M_{\text{SSB\_index\_inter}} = 40$  samples. For a UE supporting FR2 power class 2,  $M_{\text{SSB\_index\_inter}} = 24$  samples. For a UE supporting FR2 power class 3,  $M_{\text{SSB\_index\_inter}} = 24$  samples. For a UE supporting FR2 power class 4,  $M_{\text{SSB\_index\_inter}} = 24$  samples.

$M_{\text{meas\_period\_inter}}$ : For a UE supporting FR2 power class 1,  $M_{\text{meas\_period\_inter}} = 64$  samples. For a UE supporting FR2 power class 2,  $M_{\text{meas\_period\_inter}} = 40$  samples. For a UE supporting FR2 power class 3,  $M_{\text{meas\_period\_inter}} = 40$  samples. For a UE supporting FR2 power class 4,  $M_{\text{meas\_period\_inter}} = 40$  samples.

$\text{CSSF}_{\text{inter}}$ : it is a carrier specific scaling factor and is determined according to  $\text{CSSF}_{\text{within\_gap},i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

**Table 9.3.4-1: Time period for PSS/SSS detection (Frequency range FR1)**

| Condition <sup>NOTE1,2</sup>   | $T_{\text{PSS/SSS\_sync\_inter}}$  |
|--|--|
| No DRX   | $\text{Max}(600\text{ms}, 8 \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{inter}}$   |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(600\text{ms}, \text{Ceil}(8 \times 1.5) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{inter}}$ |
| DRX cycle $> 320\text{ms}$   | $8 \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$  |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |  |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |  |

**Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)**

| Condition <sup>NOTE1,2</sup>   | $T_{\text{PSS/SSS\_sync\_inter}}$   |
|--|---|
| No DRX   | $\text{Max}(600\text{ms}, M_{\text{pss/sss\_sync\_inter}} \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{inter}}$                                |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(600\text{ms}, (1.5 \times M_{\text{pss/sss\_sync\_inter}}) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{inter}}$ |
| DRX cycle $> 320\text{ms}$   | $M_{\text{pss/sss\_sync\_inter}} \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$   |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |   |

**Table 9.3.4-3: Time period for time index detection (Frequency range FR1)**

| Condition <sup>NOTE1,2</sup>   | $T_{SSB\_time\_index\_inter}$   |
|--|---|
| No DRX   | $\text{Max}(120\text{ms}, 3 \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{inter}$   |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(120\text{ms}, \text{Ceil}(3 \times 1.5) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$   | $3 \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |   |

**Table 9.3.4-4: Time period for time index detection (Frequency range FR2)**

| Condition <sup>NOTE1,2</sup>   | $T_{SSB\_time\_index\_inter}$  |
|--|--|
| No DRX   | $\text{Max}(200\text{ms}, M_{SSB\_index\_inter} \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{inter}$                                |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(200\text{ms}, (1.5 \times M_{SSB\_index\_inter}) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$   | $M_{SSB\_index\_inter} \times \text{DRX cycle} \times \text{CSSF}_{inter}$   |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |  |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |  |

9.3.4.1 Void

9.3.4.2 Void

### 9.3.5 Inter-frequency measurements

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

**Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)**

| Condition <sup>NOTE1,2</sup>   | $T_{SSB\_measurement\_period\_inter}$   |
|--|---|
| No DRX   | $\text{Max}(200\text{ms}, 8 \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{inter}$   |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(200\text{ms}, \text{Ceil}(8 \times 1.5) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$   | $8 \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |   |

**Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)**

| Condition <sup>NOTE1,2</sup>   | $T_{SSB\_measurement\_period\_inter}$  |
|--|--|
| No DRX   | $\text{Max}(400\text{ms}, M_{meas\_period\_inter} \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{inter}$                                |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(400\text{ms}, (1.5 \times M_{meas\_period\_inter}) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$   | $M_{meas\_period\_inter} \times \text{DRX cycle} \times \text{CSSF}_{inter}$   |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |  |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |  |

9.3.5.1 Void

9.3.5.2 Void

9.3.5.3 Void

## 9.3.6 Inter-frequency measurements reporting requirements

### 9.3.6.1 Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

### 9.3.6.2 Event-triggered Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered periodic measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.3.6.3.

### 9.3.6.3 Event-triggered Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within  $T_{\text{identify\_inter\_without\_index}}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within  $T_{\text{identify\_inter\_with\_index}}$ . Both  $T_{\text{identify\_inter\_without\_index}}$  and  $T_{\text{identify\_inter\_with\_index}}$  are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or in both FR1 and FR2 if the UE is not capable of per-FR gap.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period  $T_{\text{identify\_inter\_without\_index}}$  or  $T_{\text{identify\_inter\_with\_index}}$  defined in clause 9.3.4. If a cell which has been detectable at least for the time period  $T_{\text{identify\_inter\_without\_index}}$  or  $T_{\text{identify\_inter\_with\_index}}$  defined in clause 9.3.4 becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again with the same spatial reception parameter and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{\text{SSB\_measurement\_period\_inter}}$  defined in clause 9.3.5 provided the timing to that cell has not changed more than  $\pm 3200/2^{\mu}$  Tc while measurement gap has not been available and the L3 filtering has not been used, where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or in both FR1 and FR2 if the UE is not capable of per-FR gap.

## 9.3.7 Void

## 9.3.8 Inter-frequency SFTD measurement requirements

### 9.3.8.1 Introduction

This clause contains requirements for a UE supporting NR inter-frequency SFTD measurement and is applicable in RRC\_CONNECTED state. The UE shall, depending on network request, perform inter-frequency SFTD measurement and report SFTD result with or without SS-RSRP. The overall delay includes RRC procedure delay defined in clause 12 in TS 38.331 [2] and SFTD measurement reporting delay in clause 9.3.8.3.

UE which fulfils the requirements in clause 9.3.8 is not supposed to fulfil the requirements defined in clause 9.2.5.4.

### 9.3.8.2 SFTD Measurement delay

The requirements on SFTD measurement delay defined in this clause are applicable under the side condition  $\hat{E}_s/I_{ot} \geq -3$  dB for the inter-frequency neighbour cell. Depending on configuration, the SFTD measurement may be carried out with or without the support of configured measurement gaps. In the current release, indication on whether to carry out the SFTD measurement with or without measurement gaps is implicit and depending on whether measurement gaps are configured.

The UE shall be able to detect, identify and measure SFTD of up to 3 of the strongest applicable inter-frequency neighbour cells on the carrier frequency provided in the SFTD measurement configuration. Further depending on the SFTD measurement configuration, the UE shall additionally report SS-RSRP for the one or more strongest cells. The UE may or may not be configured with *cellsForWhichToReportSFTD*. The UE does not expect *cellsForWhichToReportSFTD* to change during an ongoing SFTD measurement.

When no measurement gaps are provided, the UE shall be capable of finding the inter-frequency neighbour cell regardless of its SSB position in the SMTC period, provided that the carrier frequency where SFTD measurement is configured and the serving carrier(s) form a supported CA or NR-DC band combination of the UE. The SFTD measurement shall be conducted with sustained connection to the PCell and activated SCell(s) in MCG. Depending on capability, the UE may be allowed to cause a certain amount of interruptions for reconfiguration of the radio receiver, as specified in clause 8.2.2.2.6.

When measurement gaps are provided, the UE shall be capable of finding the inter-frequency neighbour cell under the additional condition that the SSB at least occasionally falls within the measurement gap.

When no DRX is used, the UE shall be capable of determining SFTD within a physical layer measurement period of  $T_{\text{measure\_SFTD1}}$  as follows:

- For SFTD measurements without measurement gaps, and without additional SS-RSRP reporting:
  - For carrier frequency in FR1:  $T_{\text{measure\_SFTD1}} = 14$  SMTC periods
  - For carrier frequency in FR2:  $T_{\text{measure\_SFTD1}} = 112$  SMTC periods
- For SFTD measurements in measurement gaps, and without additional SS-RSRP reporting:
  - For carrier frequency in FR1:  $T_{\text{measure\_SFTD1}} = \text{CSSF}_{\text{inter}} \times 8 \times \text{Max}(\text{MGRP}, \text{SMTC period})$
  - For carrier frequency in FR2:  $T_{\text{measure\_SFTD1}} = \text{CSSF}_{\text{inter}} \times 64 \times \text{Max}(\text{MGRP}, \text{SMTC period})$
- For SFTD measurements without measurement gaps, and with additional SS-RSRP reporting:
  - For carrier frequency in FR1:  $T_{\text{measure\_SFTD1}} = 19$  SMTC periods
  - For carrier frequency in FR2:  $T_{\text{measure\_SFTD1}} = 152$  SMTC periods
- For SFTD measurements in measurement gaps, and with additional SS-RSRP reporting:
  - For carrier frequency in FR1:  $T_{\text{measure\_SFTD1}} = \text{CSSF}_{\text{inter}} \times 13 \times \text{Max}(\text{MGRP}, \text{SMTC period})$
  - For carrier frequency in FR2:  $T_{\text{measure\_SFTD1}} = \text{CSSF}_{\text{inter}} \times 104 \times \text{Max}(\text{MGRP}, \text{SMTC period})$

where  $CSSF_{inter}$  is a carrier specific scaling factor and is determined according to  $CSSF_{within\_gap,i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

When DRX is used, the same  $T_{measure\_SFTD1}$  as for non-DRX applies, but the reporting delay depends on the DRX cycle length in use.

In case PCell is changed due to handover, the UE shall terminate the inter-frequency SFTD measurement.

The measurement accuracy for the SFTD measurement shall fulfil the requirement in clause 10.1.21.3. The measurement accuracy for additionally reported SS-RSRP shall fulfil the requirement in clauses 10.1.4.1 and 10.1.5.1 for neighbour cell in FR1 and FR2, respectively.

### 9.3.8.3 SFTD Measurement reporting delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of  $2 \times TTI_{DCCH}$  resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The SFTD measurement reporting delay shall be less than  $T_{measure\_SFTD1}$  defined in clause 9.3.8.2 plus the RRC procedure delay defined in TS 38.331 [2].

## 9.3.9 Inter frequency measurements without measurement gaps

### 9.3.9.1 Inter frequency Cell identification

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter frequency cell within  $T_{identify\_inter\_without\_index}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within  $T_{identify\_inter\_with\_index}$ . The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within  $T_{identify\_inter\_without\_index}$ . It is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, the following conditions are met:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned, and
- the timing of SSBs across serving cell and inter-frequency neighbor cells are aligned  $T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter})$  ms

$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter})$$
 ms

Where:

$T_{PSS/SSS\_sync\_inter}$ : it is the time period used in PSS/SSS detection given in table 9.3.9.1-1 and table 9.3.9.1-2.

$T_{SSB\_time\_index\_inter}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3.9.1-3.

$T_{SSB\_measurement\_period\_inter}$ : equal to a measurement period of SSB based measurement given in table 9.3.9.2-1 and table 9.3.9.2-2.

$CSSF_{inter}$ : it is a carrier specific scaling factor and is determined according to  $CSSF_{outside\_gap,i}$  in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when interfrequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to  $CSSF_{within\_gap,i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when interfrequency SMTC is fully overlapping with measurement gaps.

$M_{pss/sss\_sync\_inter}$ : For a UE supporting FR2 power class 1,  $M_{pss/sss\_sync\_inter} = 40$  samples. For a UE supporting FR2 power class 2,  $M_{pss/sss\_sync\_inter} = 24$  samples. For a UE supporting FR2 power class 3,  $M_{pss/sss\_sync\_inter} = 24$  samples. For a UE supporting FR2 power class 4,  $M_{pss/sss\_sync\_inter} = 24$  samples.



$M_{SSB\_index\_inter}$ : For a UE supporting power class 1,  $M_{SSB\_index\_inter} = 40$  samples. For a vehicle mounted UE supporting power class 2,  $M_{pss/sss\_sync\_inter} = 24$  samples. For a UE supporting power class 3,  $M_{SSB\_index\_inter} = 24$  samples. For a UE supporting power class 4,  $M_{meas\_period\_inter} = 24$  samples.

$M_{meas\_period\_inter}$ : For a UE supporting FR2 power class 1,  $M_{meas\_period\_inter} = 40$  samples. For a vehicle mounted UE supporting FR2 power class 2,  $M_{pss/sss\_sync\_inter} = 24$  samples. For a UE supporting FR2 power class 3,  $M_{meas\_period\_inter} = 24$  samples. For a UE supporting FR2 power class 4,  $M_{meas\_period\_inter} = 24$  samples.

When interfrequency SMTC is fully non overlapping with measurement gaps or interfrequency SMTC is fully overlapping with MGs,  $K_p = 1$ .

When interfrequency SMTC is partially overlapping with measurement gaps,  $K_p = 1 / (1 - (\text{SMTC period} / \text{MGRP}))$ , where  $\text{SMTC period} < \text{MGRP}$ .

For FR2,

$K_{layer1\_measurement} = 1$ ,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1\_measurement} = 1.5$ , otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

**Table 9.3.9.1-1: Time period for PSS/SSS detection, (FR1)**

| DRX cycle   | $T_{PSS/SSS\_sync\_inter}$  |
|---|---|
| No DRX  | $\max(600\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{inter}$                    |
| $\text{DRX cycle} \leq 320\text{ms}$  | $\max(600\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| $\text{DRX cycle} > 320\text{ms}$   | $\text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

**Table 9.3.9.1-2: Time period for PSS/SSS detection, (FR2)**

| DRX cycle   | $T_{PSS/SSS\_sync\_inter}$  |
|---|---|
| No DRX  | $\max(600\text{ms}, \text{ceil}(M_{pss/sss\_sync\_inter} \times K_p \times K_{layer1\_measurement}) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{inter}$                    |
| $\text{DRX cycle} \leq 320\text{ms}$  | $\max(600\text{ms}, \text{ceil}(1.5 \times M_{pss/sss\_sync\_inter} \times K_p \times K_{layer1\_measurement}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| $\text{DRX cycle} > 320\text{ms}$   | $\text{ceil}(M_{pss/sss\_sync\_inter} \times K_p \times K_{layer1\_measurement}) \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

**Table 9.3.9.1-3: Time period for time index detection (FR1)**

| DRX cycle   | $T_{SSB\_time\_index\_inter}$   |
|---|---|
| No DRX  | $\max(120\text{ms}, \text{ceil}(3 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{inter}$                    |
| DRX cycle $\leq 320\text{ms}$   | $\max(120\text{ms}, \text{ceil}(1.5 \times 3 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$  | $\text{Ceil}(3 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

### 9.3.9.2 Measurement period

The UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.9.2-1 and 9.3.9.2-2, if UE supports inter-frequency measurement without measurement gaps:

**Table 9.3.9.2-1: Measurement period for inter-frequency measurements without gaps ((FR1)**

| DRX cycle   | $T_{SSB\_measurement\_period\_inter}$   |
|---|---|
| No DRX  | $\max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{inter}$                    |
| DRX cycle $\leq 320\text{ms}$   | $\max(200\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$  | $\text{ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

**Table 9.3.9.2-2: Measurement period for inter-frequency measurements without gaps (FR2)**

| DRX cycle   | $T_{SSB\_measurement\_period\_inter}$  |
|---|--|
| No DRX  | $\max(400\text{ms}, \text{ceil}(M_{meas\_period\_inter} \times K_p \times K_{layer1\_measurement}) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{inter}$                    |
| DRX cycle $\leq 320\text{ms}$   | $\max(400\text{ms}, \text{ceil}(1.5 \times M_{meas\_period\_inter} \times K_p \times K_{layer1\_measurement}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$  | $\text{ceil}(M_{meas\_period\_inter} \times K_p \times K_{layer1\_measurement}) \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |  |

### 9.3.9.3 Scheduling availability of UE during inter-frequency measurements

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE is required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by SSB-ToMeasure [2], if it is configured; otherwise, all L SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

The scheduling availability requirements when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2 in clause 9.3.9.3.1~9.3.9.3.3 are valid under the following conditions:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned, and
- the timing of SSBs across serving cell and inter-frequency neighbor cells are aligned

#### 9.3.9.3.1 Scheduling availability of UE performing measurements in TDD bands on FR1

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

### 9.3.9.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology-Inter-r16* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If UE performs inter-frequency measurements without measurement gaps in a TDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.
- If UE performs inter-frequency measurements without measurement gaps in a FDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

### 9.3.9.3.3 Scheduling availability of UE performing measurements on FR2

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 inter-frequency cell

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 inter-frequency cell

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

If following conditions are met:

- The UE has been notified about system information update through paging,
- The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

#### 9.3.9.3.4 Scheduling availability of UE performing measurements on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to measurements performed on FR2 serving cell frequency layer.

There are no scheduling restrictions on FR2 serving cell(s) due to measurements performed on FR1 serving cell frequency layer.

## 9.3A NR inter-frequency measurements in carrier frequencies with CCA

### 9.3A.1 Introduction

The requirements in clause 9.3A apply for inter-frequency measurements on a carrier frequency with CCA. A measurement is defined as an SSB based inter-frequency measurement provided it is not defined as an intra-frequency measurement according to clause 9.2A. The UE shall be able to identify new inter-frequency cells in carrier frequencies with CCA and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-frequency cells if carrier frequency information is provided by PCell or PSCell, even if no explicit neighbour list with physical layer cell identities is provided.

SSB based measurements are configured along with a measurement timing configuration (SMTC) per carrier, which provides periodicity, duration and offset information on a window of up to 5ms where the measurements on the configured inter-frequency carrier are to be performed. For inter-frequency connected mode measurements, one measurement window periodicity may be configured per inter-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB on an inter-frequency measurement object which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time.

In the requirements of clause 9.3A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but  $N$  candidate SSB positions for the same SS/PBCH block index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation or measurement period, where:

- For the cell detection procedure:  $N$  is at least one candidate SSB position (NOTE: the one candidate SSB position for the cell detection shall not be impacted by the set of candidate SSB positions which are already being measured by the UE within the current measurement period of the on-going measurements), and
- For other procedures in clause 9.3A:  $N$  are the first two successive candidate SSB positions when two or more candidate SSB positions are configured for this SSB index in one discovery burst transmission window, otherwise  $N$  is one candidate SSB position;

otherwise the SMTC occasion is considered as available at the UE.

### 9.3A.2 Requirements applicability

The requirements in clause 9.3A apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency CCA cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.28,
- SS-RSRQ related side conditions given in clause 10.1.30,
- SS-SINR related side conditions given in clause 10.1.32,

- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.9.

### 9.3A.3 Number of cells and number of SSB

#### 9.3A.3.1 Requirements

For each inter-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 4 identified cells, and
- 7 SSBs with different SSB indexes and/or PCI on the inter-frequency layer.

### 9.3A.4 Inter-frequency cell identification

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-frequency cell within  $T_{\text{identify\_inter\_cca\_without\_index}}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRSIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell, in carrier frequencies with CCA, within  $T_{\text{identify\_inter\_cca\_with\_index}}$ . The UE shall be able to identify a new detectable inter-frequency SS block, in carrier frequencies with CCA, of an already detected cell within  $T_{\text{identify\_inter\_cca\_without\_index}}$ .

$$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}}) \text{ ms}$$

$$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}}) \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

$\text{CSSF}_{\text{inter}}$ : it is a carrier specific scaling factor and is determined according to  $\text{CSSF}_{\text{within\_gap},i}$  in clause 9.1.5.2 for measurement conducted within measurement gaps.

**Table 9.3A.4-1: Time period for PSS/SSS detection**

| Condition <sup>NOTE1,2,3,4</sup>  | $T_{\text{PSS/SSS\_sync\_inter\_cca}}$   |
|---|--|
| No DRX  | $\max(600\text{ms}, (8+L_{\text{PSS/SSS,gaps}}) \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{inter}}$   |
| DRX cycle $\leq$ 320ms  | $\max(600\text{ms}, \text{ceil}((8+L_{\text{PSS/SSS,gaps}}) \times 1.5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{inter}}$ |
| DRX cycle > 320ms   | $(8+L_{\text{PSS/SSS,gaps}}) \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$  |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1   |  |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.  |  |
| NOTE 3: When DRX is not configured, $L_{\text{PSS/SSS,gaps}}$ is the number of SMTC occasions not available at the UE during $T_{\text{PSS/SSS\_sync\_inter\_cca}}$ , for PSS/SSS detection, where $L_{\text{PSS/SSS,gaps}} \leq L_{\text{PSS/SSS,gaps,max}}$ . When DRX is configured, $L_{\text{PSS/SSS,gaps}}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{\text{PSS/SSS\_sync\_inter\_cca}}$ , for PSS/SSS detection, where $L_{\text{PSS/SSS,gaps}} \leq L_{\text{PSS/SSS,gaps,max}}$ . When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $\text{CSSF}_{\text{inter}}$ . |  |
| NOTE 4: $L_{\text{PSS/SSS,gaps,max}} = 12$ for $\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 40$ ms $L_{\text{PSS/SSS,gaps,max}} = 8$ for $40$ ms < $\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 320$ ms, and $L_{\text{PSS/SSS,gaps,max}} = 5$ for DRX cycle > 320 ms.  |  |

Upon exceeding  $L_{\text{PSS/SSS,gaps,max}}$ , the UE is not required to meet the corresponding PSS/SSS detection requirement. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

**Table 9.3A.4-2: Time period for time index detection**

| Condition <sup>NOTE1,2,3,4</sup>   | $T_{SSB\_time\_index\_inter\_cca}$  |
|--|---|
| No DRX   | $\max(120\text{ms}, (3+ L_{ind,gaps}) \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{inter}$   |
| DRX cycle $\leq$ 320ms   | $\max(120\text{ms}, \text{ceil}((3+ L_{ind,gaps}) \times 1.5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle > 320ms  | $(3 + L_{ind,gaps}) \times \text{DRX cycle} \times \text{CSSF}_{inter}$   |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.   |   |
| NOTE 3: When DRX is not configured, $L_{ind,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB\_time\_index\_inter\_cca}$ for time index identification, where $L_{ind,gaps} \leq L_{ind,gaps,max}$ . When DRX is configured, $L_{ind,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB\_time\_index\_inter\_cca}$ for time index identification, where $L_{ind,gaps} \leq L_{ind,gaps,max}$ . When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $\text{CSSF}_{inter}$ . |   |
| NOTE 4: $L_{ind,gaps,max} = 5$ for $\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 40$ ms, $L_{ind,gaps,max} = 3$ for $40$ ms < $\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 320$ ms, and $L_{ind,gaps,max} = 2$ for DRX cycle > 320 ms.  |   |

The UE shall restart the time index detection upon exceeding  $L_{ind,gaps,max}$ . The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

### 9.3A.5 Inter-frequency measurements

When measurement gaps are provided for inter-frequency measurements in carrier frequencies with CCA, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.28, 10.1.30, 10.1.32, respectively, as shown in table 9.3A.5-1:

**Table 9.3A.5-1: Measurement period for inter-frequency measurements with gaps**

| Condition <sup>NOTE1,2,3,4</sup>   | $T_{SSB\_measurement\_period\_inter\_cca}$  |
|--|---|
| No DRX   | $\max(200\text{ms}, (8+ L_{meas}) \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{inter}$   |
| DRX cycle $\leq$ 320ms   | $\max(200\text{ms}, \text{ceil}((8+ L_{meas}) \times 1.5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle > 320ms  | $(8+ L_{meas}) \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.   |   |
| NOTE 3: When DRX is not configured, $L_{meas}$ is the number of SMTC occasions not available at the UE during $T_{SSB\_measurement\_period\_NR\_cca}$ , for inter-frequency measurements with gaps, where $L_{meas} \leq L_{meas,max}$ . When DRX is configured, $L_{meas}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB\_measurement\_period\_NR\_cca}$ , for inter-frequency measurements with gaps, where $L_{meas} \leq L_{meas,max}$ . When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $\text{CSSF}_{inter}$ . |   |
| NOTE 4: $L_{meas,max} = 12$ for $\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 40$ ms, $L_{meas,max} = 8$ for $40$ ms < $\max(\text{DRX cycle}, \text{SMTC period}, \text{MGRP}) \leq 320$ ms, and $L_{meas,max} = 5$ for DRX cycle > 320 ms.   |   |

The UE shall restart the measurement upon exceeding  $L_{meas,max}$ . The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

The UE shall stop the measurement attempts on the SSB of a cell and perform the detection procedure again, like for any other SSB, when the following conditions are met:

- $L_{meas} > L_{meas,max}$ , and

- The time period of unsuccessful measurement attempts exceeds the maximum time required for the cell to remain known as defined in clause 9.3A.6.3.

## 9.3A.6 NR Inter-frequency measurements reporting requirements

### 9.3A.6.1 Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.28, 10.1.30, and 10.1.32, respectively.

### 9.3A.6.2 Event-triggered Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered periodic measurement reports shall meet the requirements in clauses 10.1.28, 10.1.30, and 10.1.32, respectively.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.3A.6.3.

### 9.3A.6.3 Event-triggered Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.28, 10.1.30, and 10.1.32, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report, and all delays due to UL CCA failures until the successful transmission of the report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within  $T_{\text{identify\_inter\_cca\_without\_index}}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter-frequency cell within  $T_{\text{identify\_inter\_cca\_with\_index}}$ . Both  $T_{\text{identify\_inter\_cca\_without\_index}}$  and  $T_{\text{identify\_inter\_cca\_with\_index}}$  are defined in clause 9.3A.4. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period  $T_{\text{identify\_inter\_cca\_without\_index}}$  OR  $T_{\text{identify\_inter\_cca\_with\_index}}$  defined in clause 9.3A.4. If a cell which has been detectable at least for the time period  $T_{\text{identify\_inter\_cca\_without\_index}}$  OR  $T_{\text{identify\_inter\_cca\_with\_index}}$  defined in clause 9.3A.4 becomes undetectable for a period  $\leq 8$  seconds and then the cell becomes detectable again with the same spatial reception parameter and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{\text{SSB\_measurement\_period\_inter\_cca}}$  defined in clause 9.3A.5 provided the timing to that cell has not changed more than  $\pm 3200/2^\mu T_c$  while measurement gap has not been available and the L3 filtering has not been used, where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used an additional delay can be expected.

## 9.3A.8 Inter-frequency RSSI measurements

An RSSI measurement is defined as an inter-frequency measurement provided that the RSSI measurement bandwidth is not contained within the current carrier bandwidth of the UE.

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [4] on one or more inter-frequency carriers operating with CCA, TS 37.213 [33], if the carrier(s) are indicated by higher layers [2], and report the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [2] occurring with a configured RSSI measurement timing configuration periodicity [2], *rmtc-Periodicity*. The requirements apply if *rmtc-SubframeOffset* [2] is configured.

**Table 9.3A.8-1: Measurement period for inter-frequency RSSI measurements with gaps**

| Condition <sup>NOTE1,2,3,4</sup>   | $T_{\text{RSSI\_measurement\_period\_inter\_cca}}$  |
|--|---|
| No DRX   | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}) \times \text{CSSF}_{\text{inter}})$                   |
| DRX  | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{inter}})$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: $\text{CSSF}_{\text{inter}}$ is a carrier specific scaling factor and is determined according to $\text{CSSF}_{\text{within\_gap},i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps. |   |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The RSSI measurement performed and reported according to this clause shall meet the RSSI measurement accuracy requirement in Clause 10.1.34.2. The reported RSSI measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in Clause 10.1.34.3.

## 9.3A.9 Inter-frequency channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more carrier frequencies indicated by higher layers [2], based on RSSI samples provided by the physical layer. The requirements apply if *rmtc-SubframeOffset* [2] is configured.

**Table 9.3A.9-1: Measurement period for inter-frequency Channel Occupancy measurements with gaps**

| Condition <sup>NOTE1,2,3,4</sup>   | $T_{\text{CO\_measurement\_period\_inter\_cca}}$  |
|--|---|
| No DRX   | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}) \times \text{CSSF}_{\text{inter}})$                   |
| DRX  | $\max(\text{reportInterval}, \max(\text{rmtc-Periodicity}, \text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{inter}})$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: $\text{CSSF}_{\text{inter}}$ is a carrier specific scaling factor and is determined according to $\text{CSSF}_{\text{within\_gap},i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps. |   |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency channel occupancy measurements. The RSSI measurement duration used for channel occupancy measurement and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The channel occupancy measurement performed and reported according to this clause shall meet the channel occupancy measurement accuracy requirements in Clause 10.1.35.2. The reported channel occupancy measurement values contained in measurement reports shall be based on the measurement reporting range specified in TS 38.331 [2].

## 9.4 Inter-RAT measurements

### 9.4.1 Introduction

The requirements in this clause are specified for NR–E-UTRAN FDD and NR–E-UTRAN TDD measurements and are applicable without an explicit E-UTRAN neighbour cell list containing physical layer cell identities, for a UE:

- in RRC\_CONNECTED state, and
- configured
  - with SA or NR-DC operation mode or configured in NE-DC operation mode by PCell with NR–E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, RSTD, or E-CID RSRP and RSRQ) on E-UTRA non-serving frequency carrier, or



- with SA operation mode on NR carrier frequencies with CCA by PCell with NR–E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR) on E-UTRA non-serving frequency carrier, and
- configured with an appropriate measurement gap pattern according to Table 9.1.2-3.

When the UE is in NE-DC operation mode and an NR–E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, or E-CID RSRP and RSRQ) configured by NR PCell is on a E-UTRA serving frequency carrier, then the corresponding E-UTRA intra-frequency measurements requirements specified in clause 8.19 of TS 36.133 [15] shall apply.

When *highSpeedMeasFlag-r16* is configured but UE does not support either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 9.4.2.3-2 and Table 9.4.3.3-2.

*Editor's note: the exact signalling names in the above brackets and in Table 9.4.2.3-2 and Table 9.4.3.3-2 are subject to RAN2 definitions and the brackets shall be replaced by the correct signalling names according to RAN2 specification.*

Parameter  $T_{\text{inter1}}$  used in inter-RAT requirements in clause 9.4 is specified in Table 9.4.1-1.

**Table 9.4.1-1: Minimum available time for inter-RAT measurements**

| Gap Pattern Id | MeasurementGap Length (MGL, ms) | Measurement Gap Repetition Period (MGRP, ms) | Minimum available time for inter-frequency and inter-RAT measurements during 480 ms period ( $T_{\text{inter1}}$ , ms) |
|----------------|---------------------------------|--|--|
| 0              | 6                               | 40   | 60   |
| 1              | 6                               | 80   | 30   |
| 2              | 3                               | 40   | 24 <sup>Note 1</sup>   |
| 3              | 3                               | 80   | 12 <sup>Note 1</sup>   |
| 4              | 6                               | 20   | 120 <sup>Note 1</sup>  |
| 6              | 4                               | 20   | 72 <sup>Note 1,3,6</sup>   |
| 7              | 4                               | 40   | 36 <sup>Note 1,4,6</sup>   |
| 8              | 4                               | 80   | 18 <sup>Note 1,5,6</sup>   |
| 10             | 3                               | 20   | 48 <sup>Note 1</sup>   |

NOTE 1: When determining UE requirements using  $T_{\text{inter1}}$  for gap pattern IDs 2, 3, 4, 6, 7, 8, 10,  $T_{\text{inter1}} = 60$  for gap pattern IDs 2, 4, 6, 7, 10, and  $T_{\text{inter1}} = 30$  for gap pattern IDs 3 and 8 shall be used.

NOTE 2: Measurement gaps pattern configurations applicability is as specified in Table 9.1.2-1.

NOTE 3: When this gap pattern is used, the  $T_{\text{inter}}$  for E-UTRA inter-frequency measurements is 48 ms corresponding to the first 3 ms of the 4 ms gap.

NOTE 4: When this gap pattern is used, the  $T_{\text{inter}}$  for E-UTRA inter-frequency measurements is 24 ms corresponding to the first 3 ms of the 4 ms gap.

NOTE 5: When this gap pattern is used, the  $T_{\text{inter}}$  for E-UTRA inter-frequency measurements is 12 ms corresponding to the first 3 ms of the 4 ms gap.

NOTE 6: This gap pattern is applicable for E-UTRA inter-frequency measurements only if gap based NR measurements are also configured.

A UE configured with gap pattern ID 2, 3 or 10 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than 500  $\mu\text{s}$  from the start of the measurement gap, and
- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends not later than 500  $\mu\text{s}$  before the end of the measurement gap in case of FDD and not later than 750  $\mu\text{s}$  before the end of measurement gap in case of TDD.

A UE configured with gap pattern ID 6, 7 or 8 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than 500  $\mu\text{s}$  from the start of the measurement gap, and

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends no later than 1500  $\mu$ s before the end of the measurement gap in case of FDD and no later than 1750  $\mu$ s before the end of measurement gap in case of TDD.

## 9.4.2 NR – E-UTRAN FDD measurements

### 9.4.2.1 Introduction

The requirements are applicable for NR–E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

### 9.4.2.2 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD cell within  $T_{\text{Identify, E-UTRAN FDD}}$  according to the following expression:

$$T_{\text{Identify, E-UTRAN FDD}} = T_{\text{BasicIdentify}} \cdot \frac{480}{T_{\text{Inter1}}} \cdot \text{CSSF}_{\text{interRAT}} \quad \text{ms},$$

where:

$$T_{\text{BasicIdentify}} = 480 \text{ ms},$$

$T_{\text{Inter1}}$  is defined in clause 9.4.1,

$\text{CSSF}_{\text{interRAT}} = \text{CSSF}_{\text{within\_gap}, i}$  is the scaling factor for the measured inter-RAT E-UTRA carrier  $i$  which is calculated as specified in clause 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of  $T_{\text{Measure, E-UTRAN FDD}}$  defined in Table 9.4.2.2-1.

**Table 9.4.2.2-1: Measurement period and measurement bandwidth**

| Configuration                           | Physical Layer Measurement period:<br>$T_{\text{Measure, E-UTRAN FDD}}$ [ms] | Measurement bandwidth [RB] |
|---|--|----------------------------|
| 0                                       | $480 \times \text{CSSF}_{\text{interRAT}}$                                   | 6                          |
| 1 (Note 1)                              | $240 \times \text{CSSF}_{\text{interRAT}}$                                   | 50                         |
| NOTE 1: This configuration is optional. |  |                            |

When measurement gaps are scheduled for E-UTRAN FDD inter-RAT measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting RSRP, RSRQ, and RS-SINR measurements to higher layers with measurement period  $T_{\text{Measure, E-UTRAN FDD}}$  given by table 9.4.2.2-1.

The UE shall be capable of identifying and performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

### 9.4.2.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN FDD cell within  $T_{\text{Identify, E-UTRAN FDD}}$  specified in Table 9.4.2.3-1. When *highSpeedMeasFlag-r16* is configured and UE supports the enhanced inter-RAT E-UTRAN measurement requirements, the UE shall be able to identify a new detectable E-UTRAN FDD cell within  $T_{\text{Identify, E-UTRAN FDD}}$  specified in Table 9.4.2.3-2.

**Table 9.4.2.3-1: Requirement to identify a newly detectable E-UTRAN FDD cell**

| DRX cycle length (s)  | $T_{\text{Identify, E-UTRAN FDD}}$ (s) (DRX cycles)                                |  |
|---|--|--|
|   | Gap period = 40 ms, 20 ms  | Gap period = 80 ms   |
| $\leq 0.16$   | Non-DRX requirements in clause 9.4.2.2 apply                                       | Non-DRX requirements in clause 9.4.2.2 apply                                       |
| 0.256   | $5.12^* \text{CSSF}_{\text{interRAT}}$<br>( $20^* \text{CSSF}_{\text{interRAT}}$ ) | $7.68^* \text{CSSF}_{\text{interRAT}}$<br>( $30^* \text{CSSF}_{\text{interRAT}}$ ) |
| 0.32  | $6.4^* \text{CSSF}_{\text{interRAT}}$<br>( $20^* \text{CSSF}_{\text{interRAT}}$ )  | $7.68^* \text{CSSF}_{\text{interRAT}}$<br>( $24^* \text{CSSF}_{\text{interRAT}}$ ) |
| $0.32 < \text{DRX-cycle} \leq 10.24$  | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )                                     | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )                                     |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.2.2. |  |  |

**Table 9.4.2.3-2: Requirement to identify a newly detectable E-UTRAN FDD cell when *highSpeedMeasFlag-r16* is configured**

| DRX cycle length (s)  | $T_{\text{Identify, E-UTRAN FDD}}$ (s) (DRX cycles) |   |
|---|---|---|
|   | Gap period = 40 ms, 20 ms                           | Gap period = 80 ms                              |
| $\leq 0.16$   | Non-DRX requirements in clause 9.4.2.2 apply        | Non-DRX requirements in clause 9.4.2.2 apply    |
| $0.16 < \text{DRx cycle} \leq 0.32$   | Note 1 ( $15^* \text{CSSF}_{\text{interRAT}}$ )     |   |
| $0.32 < \text{DRx cycle} \leq 0.64$   | Note 1 ( $10^* \text{CSSF}_{\text{interRAT}}$ )     |   |
| DRx cycle = 1.024   | Note 1 ( $10^* \text{CSSF}_{\text{interRAT}}$ )     | Note 1 ( $10^* \text{CSSF}_{\text{interRAT}}$ ) |
| DRx cycle = 1.28  | Note 1 ( $8^* \text{CSSF}_{\text{interRAT}}$ )      | Note 1 ( $8^* \text{CSSF}_{\text{interRAT}}$ )  |
| $1.28 < \text{DRX-cycle} \leq 10.24$  | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )      | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )  |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.2.2.<br>NOTE 3: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>interRAT-MeasurementEnhancement-r16</i> . |   |   |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period  $T_{\text{measure, E-UTRAN FDD}}$  specified in Table 9.4.2.3-2.

**Table 9.4.2.3-2: Requirement to measure E-UTRAN FDD cells**

| DRX cycle length (s)  | $T_{\text{measure, E-UTRAN FDD}}$ (s) (DRX cycles) |
|---|--|
| $\leq 0.08$   | Non-DRX requirements in clause 9.4.2.2 apply       |
| $0.08 < \text{DRX-cycle} \leq 10.24$  | Note1 ( $5^* \text{CSSF}_{\text{interRAT}}$ )      |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.2.2. |  |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

## 9.4.2.4 Measurement reporting requirements

### 9.4.2.4.1 Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

### 9.4.2.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.2.4.3.

### 9.4.2.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than  $T_{Identify, E-UTRAN FDD}$  defined in clauses 9.4.2.2 and 9.4.2.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{Identify, E-UTRAN FDD}$  becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{Measure, E-UTRAN FDD}$  provided the timing to that cell has not changed more than  $\pm 50 T_s$  while measurement gap has not been available and the L3 filter has not been used.

## 9.4.3 NR – E-UTRAN TDD measurements

### 9.4.3.1 Introduction

The requirements are applicable for NR–E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

### 9.4.3.2 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable TDD cell within  $T_{Identify, E-UTRAN TDD}$  according to the following expression:

- When configuration 0 or configuration 1 in Table 9.4.3.2-1 is applied,

$$T_{\text{Identify,E-UTRAN TDD}} = T_{\text{BasicIdentify}} \cdot \frac{480}{T_{\text{Inter1}}} \cdot \text{CSSF}_{\text{interRAT}} \quad \text{ms},$$

- When configuration 2 or configuration 3 in Table 9.4.3.2-1 is applied,

$$T_{\text{Identify,E-UTRAN TDD}} = T_{\text{BasicIdentify}} \cdot \frac{480}{T_{\text{Inter1}}} \cdot \text{CSSF}_{\text{interRAT}} + 240 \cdot \text{CSSF}_{\text{interRAT}} \quad \text{ms},$$

where:

$$T_{\text{BasicIdentify}} = 480 \text{ ms},$$

$T_{\text{Inter1}}$  is defined in clause 9.4.1,

$\text{CSSF}_{\text{interRAT}} = \text{CSSF}_{\text{within\_gap},i}$  is the scaling factor for the measured inter-RAT E-UTRA carrier  $i$  which is calculated as specified in clause 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of  $T_{\text{Measure,E-UTRAN TDD}}$  defined in Table 9.4.3.2-1.

**Table 9.4.3.2-1:  $T_{\text{Measure,E-UTRAN TDD}}$  for different configurations**

| Configuration | Measurement bandwidth (RB) | Number of UL/DL sub-frames per half frame (5 ms) |    | DwPTS             |                   | $T_{\text{Measure,E-UTRAN TDD}}$ (ms)      |
|---------------|----------------------------|--|----|-------------------|-------------------|--|
|               |                            | DL   | UL | Normal CP         | Extended CP       |  |
| 0             | 6                          | 2  | 2  | $19760 \cdot T_s$ | $20480 \cdot T_s$ | $480 \times \text{CSSF}_{\text{interRAT}}$ |
| 1 (Note 1)    | 50                         | 2  | 2  | $19760 \cdot T_s$ | $20480 \cdot T_s$ | $240 \times \text{CSSF}_{\text{interRAT}}$ |
| 2             | 6                          | 1  | 3  | $19760 \cdot T_s$ | $20480 \cdot T_s$ | $720 \times \text{CSSF}_{\text{interRAT}}$ |
| 3 (Note 1)    | 50                         | 1  | 3  | $19760 \cdot T_s$ | $20480 \cdot T_s$ | $480 \times \text{CSSF}_{\text{interRAT}}$ |

NOTE 1: This configuration is optional.  
NOTE 2: Void

When measurement gaps are scheduled for E-UTRAN TDD inter-RAT measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting RSRP, RSRQ, and RS-SINR measurements to higher layers with measurement period  $T_{\text{measure,E-UTRAN TDD}}$  given by table 9.4.3.2-1.

The UE shall be capable of identifying and performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.  
The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.  
The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

### 9.4.3.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN TDD cell within  $T_{\text{Identify,E-UTRAN TDD}}$  specified in Table 9.4.3.3-1. When *highSpeedMeasFlag-r16* is configured and UE supports the enhanced inter-RAT E-UTRAN measurement requirements, the UE shall be able to identify a new detectable E-UTRAN TDD cell within  $T_{\text{Identify,E-UTRAN TDD}}$  specified in Table 9.4.3.3-2.

**Table 9.4.3.3-1: Requirement to identify a newly detectable E-UTRAN TDD cell**

| DRX cycle length (s)   | $T_{\text{Identify, E-UTRAN TDD}}$ (s) (DRX cycles)                                |  |
|--|--|--|
|  | Gap period = 40 ms, 20 ms  | Gap period = 80 ms   |
| $\leq 0.16$  | Non-DRX requirements in clause 9.4.3.2 apply                                       | Non-DRX requirements in clause 9.4.3.2 apply                                       |
| 0.256  | $5.12^* \text{CSSF}_{\text{interRAT}}$<br>( $20^* \text{CSSF}_{\text{interRAT}}$ ) | $7.68^* \text{CSSF}_{\text{interRAT}}$<br>( $30^* \text{CSSF}_{\text{interRAT}}$ ) |
| 0.32   | $6.4^* \text{CSSF}_{\text{interRAT}}$<br>( $20^* \text{CSSF}_{\text{interRAT}}$ )  | $7.68^* \text{CSSF}_{\text{interRAT}}$<br>( $24^* \text{CSSF}_{\text{interRAT}}$ ) |
| $0.32 < \text{DRX-cycle} \leq 10.24$                                     | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )                                     | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )                                     |
| NOTE 1: The time depends on the DRX cycle length.                        |  |  |
| NOTE 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.3.2. |  |  |

**Table 9.4.3.3-2: Requirement to identify a newly detectable E-UTRAN TDD cell when *highSpeedMeasFlag-r16* is configured**

| DRX cycle length (s)   | $T_{\text{Identify, E-UTRAN TDD}}$ (s) (DRX cycles) |   |
|--|---|---|
|  | Gap period = 40 ms, 20 ms                           | Gap period = 80 ms                              |
| $\leq 0.16$  | Non-DRX requirements in clause 9.4.3.2 apply        | Non-DRX requirements in clause 9.4.3.2 apply    |
| $0.16 < \text{DRx cycle} \leq 0.32$  | Note 1 ( $15^* \text{CSSF}_{\text{interRAT}}$ )     |   |
| $0.32 < \text{DRx cycle} \leq 0.64$  | Note 1 ( $10^* \text{CSSF}_{\text{interRAT}}$ )     |   |
| DRx cycle = 1.024  | Note 1 ( $10^* \text{CSSF}_{\text{interRAT}}$ )     | Note 1 ( $10^* \text{CSSF}_{\text{interRAT}}$ ) |
| DRx cycle = 1.28   | Note 1 ( $8^* \text{CSSF}_{\text{interRAT}}$ )      | Note 1 ( $8^* \text{CSSF}_{\text{interRAT}}$ )  |
| $1.28 < \text{DRX-cycle} \leq 10.24$   | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )      | Note1 ( $20^* \text{CSSF}_{\text{interRAT}}$ )  |
| NOTE 1: The time depends on the DRX cycle length.  |   |   |
| NOTE 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.3.2.   |   |   |
| NOTE 3: When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>interRAT-MeasurementEnhancement-r16</i> . |   |   |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period  $T_{\text{measure, E-UTRAN TDD}}$  specified in Table 9.4.3.3-2.

**Table 9.4.3.3-2: Requirement to measure E-UTRAN TDD cells**

| DRX cycle length (s)   | $T_{\text{measure, E-UTRAN TDD}}$ (s) (DRX cycles)   |
|--|--|
| $\leq 0.08$  | Non-DRX Requirements in clause 9.4.3.2 apply   |
| 0.128  | For configuration 2 <sup>Note3</sup> , non-DRX requirements in clause 9.4.3.2 apply,<br>Otherwise: Note1 ( $5^* \text{CSSF}_{\text{interRAT}}$ ) |
| $0.128 < \text{DRX-cycle} \leq 10.24$                                    | Note1 ( $5^* \text{CSSF}_{\text{interRAT}}$ )  |
| NOTE 1: The time depends on the DRX cycle length.                        |  |
| NOTE 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.3.2. |  |
| NOTE 3: See Table 9.4.3.2-1.   |  |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.  
The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.  
The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.3.4 Measurement reporting requirements

##### 9.4.3.4.1 Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

##### 9.4.3.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.3.4.3.

##### 9.4.3.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than  $T_{Identify, E-UTRAN TDD}$  defined in clauses 9.4.3.2 and 9.4.3.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{Identify, E-UTRAN TDD}$  becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{Measure, E-UTRAN TDD}$  provided the timing to that cell has not changed more than  $\pm 50 T_s$  while measurement gap has not been available and the L3 filter has not been used.

#### 9.4.4 Inter-RAT RSTD measurements

##### 9.4.4.1 NR – E-UTRAN FDD RSTD measurements

###### 9.4.4.1.1 Introduction

The requirements are applicable for NR–E-UTRAN FDD RSTD measurements requested via LPP [22, 27].

When the UE is in NE-DC operation mode and an NR–E-UTRAN FDD RSTD measurement configured by NR PCell is on a E-UTRA serving frequency carrier, then the corresponding E-UTRA intra-frequency measurements requirements as follows shall apply.

- Measurements configured on E-UTRA PSCC shall meet E-UTRAN OTDOA intra-frequency measurements requirements in clause 8.1.2.5. The applicable measurement accuracy requirements are in clause 9.1.10.
- Measurements configured on E-UTRA SCC shall meet all applicable requirements in clause 8.4, except that the terms PCell and primary component carrier shall be deemed to be swapped with PSCell and PSCC. The applicable measurement accuracy requirements are in clause 9.1.12, except that the terms PCell and primary component carrier shall be deemed to be swapped with PSCell and PSCC.

The requirements in clause 9.4.4.1 apply when:

- the UE is provided with the LTE timing information via LPP [27], including both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset*, or
- the UE is not provided with *nr-LTE-SFN-Offset* or *nr-LTE-fineTiming-Offset*, or
- the UE is provided with *nr-LTE-SFN-Offset* but not with *nr-LTE-fineTiming-Offset*.

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE may be using autonomous gaps to acquire SFN of the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  time period starts while meeting all the requirements in clause 9.4.4.1.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to acquire the SFN before the  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  starts.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps to perform cell detection for the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  time period starts while meeting all the requirements in clause 9.4.4.1.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to detect the cell before the  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  starts.

#### 9.4.4.1.2 Requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-RAT E-UTRAN FDD RSTD, specified in TS 38.215 [4], for at least  $n=16$  cells, including the reference cell, within  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  ms as given below:

$$T_{\text{RSTD InterRAT, E-UTRAN FDD}} = T_{\text{PRS}} \cdot (M - 1) + \Delta \quad \text{ms},$$

where

$T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  is the total time for detecting and measuring at least  $n$  cells,

$T_{\text{PRS}}$  is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [23], among the measured  $n$  cells including the reference cell,

$M$  is the number of PRS positioning occasions as defined in Table 9.4.4.1.2-1, where each PRS positioning occasion comprises of  $N_{\text{PRS}}$  ( $1 \leq N_{\text{PRS}} \leq 6$ ) consecutive downlink positioning subframes defined in TS 36.211 [23],

$\text{CSSF}_{\text{interRAT}} = \text{CSSF}_{\text{within\_gap},i}$  is the scaling factor determined by the gap sharing scheme for the RSTD measurements on the carrier frequency  $i$  as defined in clause 9.1.5.2,

$\Delta = 160 \cdot \left\lceil \frac{n}{M} \right\rceil$  ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time, and

the  $n$  cells are distributed on up to two E-UTRAN FDD carrier frequencies.

**Table 9.4.4.1.2-1: Number of PRS positioning occasions within  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$**

| Positioning subframe configuration period, $T_{\text{PRS}}$   | Number of PRS positioning occasions, $M$  |   |
|---|---|---|
|   | f2 <sup>Note1</sup>                       | f1 and f2 <sup>Note2</sup>                |
| 160 ms  | $16 \times \text{CSSF}_{\text{interRAT}}$ | $32 \times \text{CSSF}_{\text{interRAT}}$ |
| >160 ms   | $8 \times \text{CSSF}_{\text{interRAT}}$  | $16 \times \text{CSSF}_{\text{interRAT}}$ |
| NOTE 1: When inter-RAT E-UTRAN FDD RSTD measurements are performed over the reference cell and neighbour cells, which belong to the E-UTRAN FDD carrier frequency f2.   |   |   |
| NOTE 2: When inter-RAT E-UTRAN FDD RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the E-UTRAN FDD carrier frequency f1 and the E-UTRAN FDD carrier frequency f2 respectively. |   |   |



The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells  $i$  out of at least  $(n-1)$  neighbor cells within  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  provided:

$(\text{PRS } \hat{E}_s / \text{Iot})_{\text{ref}} \geq -6$  dB for all Frequency Bands for the reference cell,  
 $(\text{PRS } \hat{E}_s / \text{Iot})_i \geq -13$  dB for all Frequency Bands for neighbour cell  $i$ ,  
 $(\text{PRS } \hat{E}_s / \text{Iot})_{\text{ref}}$  and  $(\text{PRS } \hat{E}_s / \text{Iot})_i$  conditions apply for all subframes of at least  $L = \frac{M}{2}$  PRS positioning occasions,  
 PRP 1,2<sub>dBm</sub> according to TS 36.133 [15, Annex B.2.6] for a corresponding Band,

$\text{PRS } \hat{E}_s / \text{Iot}$  is defined as the ratio of the average received energy per PRS resource element during the useful part of the symbol to the average received power spectral density of the total noise and interference for this resource element, where the ratio is measured over all resource elements which carry PRS.

The time  $T_{\text{RSTD InterRAT, E-UTRAN FDD}}$  starts from the first subframe of the PRS positioning occasion closest in time after both the *OTDOA-RequestLocationInformation* message and the OTDOA assistance data in the *OTDOA-ProvideAssistanceData* message via LPP as specified in TS 38.305 [22], are delivered to the physical layer of the UE.

The RSTD measurement accuracy for all measured neighbor cells  $i$  shall be fulfilled according to the accuracy as specified in clause 10.2.4.

#### 9.4.4.1.2.1 RSTD Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times \text{TTI}_{\text{DCCH}}$  where  $\text{TTI}_{\text{DCCH}}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

#### 9.4.4.1.2.2 Requirements for acquiring the timing of the E-UTRA OTDOA reference cell

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE supporting per-FR gaps may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells in FR1 for acquiring SFN of the reference cell in the E-UTRA OTDOA assistance data, while no autonomous gaps in downlink reception or uplink transmission are allowed in any of the UE serving cells in FR2. The UE, which are only supporting per-UE gaps, may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells for acquiring the SFN of the reference cell in the E-UTRA OTDOA assistance data.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps while indicating *eutra-FineTimingDetection* according to TS 38.331 [2] for detecting the reference cell in the E-UTRA OTDOA assistance data.

When the UE is performing one or both of SFN acquisition or cell detection as specified above, the UE shall be able to determine the timing of the E-UTRA OTDOA assistance data reference cell during the time period

$$T_{\text{RefCell,E-UTRAN}} = T_{\text{Detect, E-UTRAN FDD}} + T_{\text{MIB}} + T_{\text{ECGI}},$$

where

$T_{\text{Detect, E-UTRAN FDD}} = T_{\text{Identify, E-UTRAN FDD}} - T_{\text{measure, E-UTRAN FDD}}$  is according to clause 9.4.2 assuming  $\text{CSSF}_{\text{interRAT}}=1$  and it is the time needed to detect the E-UTRA OTDOA assistance data reference cell when the UE needs to acquire the subframe and slot timing of the cell, provided the UE is configured with measurement gaps ( $T_{\text{Detect, E-UTRAN FDD}}=0$  when both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset* are provided in the E-UTRA OTDOA assistance data or the E-UTRA OTDOA assistance data reference cell is known to the UE), and

$T_{\text{MIB}} = 50$  ms is the time required to acquire SFN and/or PHICH configuration of the E-UTRA OTDOA assistance data reference cell provided the OTDOA assistance data reference cell is decodable and at least all E-UTRA subframes #0

during  $T_{MIB}$  are available at the UE receiver ( $T_{MIB}=0$  when *nr-LTE-SFN-Offset* is provided in the E-UTRA OTDOA assistance data and ECGI acquisition is not needed), and

$T_{ECGI} = 100$  ms is the time required to acquire ECGI of the E-UTRA OTDOA assistance data reference cell when *cellGlobalId* is included in *OTDOA-ReferenceCellInfo* and the UE is not aware of the ECGI of this cell ( $T_{ECGI} = 0$  when *cellGlobalId* is not included in *OTDOA-ReferenceCellInfo* or the UE is aware of the ECGI of the E-UTRA OTDOA assistance data reference cell).

When detecting the E-UTRAN OTDOA reference cell, the requirements in this clause shall be met, provided the conditions for the detectable cell are fulfilled according to clause 9.4.2.1. In addition, the MIB of the E-UTRA OTDOA reference cell whose SFN is acquired shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [25].

The requirement for acquiring the timing of the E-UTRA OTDOA reference cell within  $T_{RefCell,E-UTRAN}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

When  $T_{MIB}>0$  and UE is using autonomous gaps during  $T_{MIB}$ , the UE shall transmit at least  $N_{ACK/NACK, MIB, FDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are created, specified in Table 9.4.4.1.2.2-1. When both  $T_{MIB}>0$  and  $T_{ECGI}>0$  and UE is using autonomous gaps during  $T_{MIB}+T_{ECGI}$ , the UE shall transmit on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created at least  $N_{ACK/NACK, MIB+ECGI, FDD}$  ACK/NACKs specified in Table 9.4.4.1.2.2-3, provided the OTDOA reference cell bandwidth is configured in the OTDOA assistance data [22, 27]. The requirements in Tables 9.4.4.1.2.2-1, 9.4.4.1.2.2-2, and 9.4.4.1.2.2-3 apply, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured,
- SSBs are transmitted in one slot within SMTC window.

**Table 9.4.4.1.2.2-2: Void**

**Table 9.4.4.1.2.2-2: Number of ACK/NACKs transmitted by the UE during  $T_{ECGI}$**

| $N_{ACK/NACK, ECGI, FDD}$ | Configuration of the serving cell in which the transmitted ACK/NACKs are counted |         |
|---------------------------|--|---------|
|                           | Duplex mode configuration  | SCS     |
| 66                        | FDD  | 15 kHz  |
| 145                       | FDD  | 30 kHz  |
| 298                       | FDD  | 60 kHz  |
| 28                        | TDD <sup>Note 1</sup>  | 15 kHz  |
| 67                        | TDD <sup>Note 1</sup>  | 30 kHz  |
| 144                       | TDD <sup>Note 1</sup>  | 60 kHz  |
| 175                       | TDD <sup>Note 2</sup>  | 60 kHz  |
| 363                       | TDD <sup>Note 2</sup>  | 120 kHz |

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  
NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

**Table 9.4.4.1.2.2-3: Number of ACK/NACKs transmitted by the UE during  $T_{MIB+T_{ECGI}}$** 

| NACK/NACK, MIB+ECGI, FDD | Configuration of the serving cell in which the transmitted ACK/NACKs are counted |         |
|--------------------------|--|---------|
|                          | Duplex mode configuration  | SCS     |
| 84                       | FDD  | 15 kHz  |
| 193                      | FDD  | 30 kHz  |
| 402                      | FDD  | 60 kHz  |
| 28                       | TDD <sup>Note 1</sup>  | 15 kHz  |
| 81                       | TDD <sup>Note 1</sup>  | 30 kHz  |
| 159                      | TDD <sup>Note 1</sup>  | 60 kHz  |
| 233                      | TDD <sup>Note 2</sup>  | 60 kHz  |
| 491                      | TDD <sup>Note 2</sup>  | 120 kHz |

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  
NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

## 9.4.4.2 NR – E-UTRAN TDD RSTD measurements

### 9.4.4.2.1 Introduction

The requirements are applicable for NR–E-UTRAN TDD RSTD measurements requested via LPP [22, 27].

When the UE is in NE-DC operation mode and an NR–E-UTRAN TDD RSTD measurement configured by NR PCell is on a E-UTRA serving frequency carrier, then the corresponding E-UTRA intra-frequency measurements requirements as follows shall apply.

- Measurements configured on E-UTRA PSCC shall meet E-UTRAN OTDOA intra-frequency measurements requirements in clause 8.1.2.5. The applicable measurement accuracy requirements are in clause 9.1.10.
- Measurements configured on E-UTRA SCC shall meet all applicable requirements in clause 8.4, except that the terms PCell and primary component carrier shall be deemed to be swapped with PSCell and PSCC. The applicable measurement accuracy requirements are in clause 9.1.12, except that the terms PCell and primary component carrier shall be deemed to be swapped with PSCell and PSCC.

The requirements in clause 9.4.4.1 apply when:

- the UE is provided with the LTE timing information via LPP [27], including both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset*, or
- the UE is not provided with *nr-LTE-SFN-Offset* or *nr-LTE-fineTiming-Offset*, or
- the UE is provided with *nr-LTE-SFN-Offset* but not with *nr-LTE-fineTiming-Offset*.

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE may be using autonomous gaps to acquire SFN of the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{RSTD\ InterRAT,E-UTRAN\ TDD}$  time period starts while meeting all the requirements in clause 9.4.4.2.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to acquire the SFN before the  $T_{RSTD\ InterRAT,E-UTRAN\ TDD}$  starts. When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps to perform cell detection for the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{RSTD\ InterRAT,E-UTRAN\ TDD}$  time period starts while meeting all the requirements in clause 9.4.4.2.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to detect the cell before the  $T_{RSTD\ InterRAT,E-UTRAN\ TDD}$  starts.

#### 9.4.4.2.2 Requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-RAT -UTRAN TDD RSTD, specified in TS 38.215 [4], for at least  $n=16$  cells, including the reference cell, within  $T_{\text{RSTD InterRAT,E-UTRAN TDD}}$  ms as given below:

$$T_{\text{RSTD InterRAT,E-UTRAN TDD}} = T_{\text{PRS}} \cdot (M - 1) + \Delta \quad \text{ms} \quad ,$$

where

$T_{\text{RSTD InterRAT,E-UTRAN TDD}}$  is the total time for detecting and measuring at least  $n$  cells,

$T_{\text{PRS}}$  is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [23], among the measured  $n$  cells including the reference cell,

$M$  is the number of PRS positioning occasions as defined in Table 9.4.4.2.2-1, where a PRS positioning occasion is as defined in clause 9.4.4.1.2,

$\text{CSSF}_{\text{interRAT}} = \text{CSSF}_{\text{within\_gap},i}$  is the scaling factor determined by the gap sharing scheme for the RSTD measurements on the carrier frequency  $i$  as defined in clause 9.1.5.2,

$\Delta = 160 \cdot \left\lceil \frac{n}{M} \right\rceil$  ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time, and

the  $n$  cells are distributed on up to two E-UTRAN TDD carrier frequencies.

**Table 9.4.4.2.2-1: Number of PRS positioning occasions within  $T_{\text{RSTD InterRAT,E-UTRAN TDD}}$**

| Positioning subframe $T_{\text{PRS}}$<br>configuration period,  | Number of PRS positioning occasions, $M$  |   |
|---|---|---|
|   | f2 <sup>Note1</sup>                       | f1 and f2 <sup>Note2</sup>                |
| 160 ms  | $16 \times \text{CSSF}_{\text{interRAT}}$ | $32 \times \text{CSSF}_{\text{interRAT}}$ |
| >160 ms   | $8 \times \text{CSSF}_{\text{interRAT}}$  | $16 \times \text{CSSF}_{\text{interRAT}}$ |
| NOTE 1: When inter-RAT E-UTRAN TDD RSTD measurements are performed over the reference cell and neighbour cells, which belong to the E-UTRAN TDD carrier frequency f2.   |   |   |
| NOTE 2: When inter-RAT E-UTRAN TDD RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the E-UTRAN TDD carrier frequency f1 and the E-UTRAN TDD carrier frequency f2 respectively. |   |   |

The requirements in this clause shall apply for all TDD special subframe configurations specified in TS 36.211 [23] and for the TDD uplink-downlink configurations as specified in Table 9.4.4.2.2-2 for UE requiring measurement gaps for these measurements. For UEs capable of performing inter-RAT RSTD measurements without measurement gaps, TDD uplink-downlink subframe configurations as specified in Table 9.4.4.2.2-3 shall apply.

**Table 9.4.4.2.2-2: TDD uplink-downlink subframe configurations applicable for inter-RAT RSTD requirements**

| PRS Transmission Bandwidth (RB)  | Applicable TDD uplink-downlink configurations |
|--|---|
| 6, 15  | 3, 4 and 5                                    |
| 25   | 1, 2, 3, 4, 5 and 6                           |
| 50, 75, 100  | 0, 1, 2, 3, 4, 5 and 6                        |
| NOTE 1: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [23]. |   |

**Table 9.4.4.2.2-3: TDD uplink-downlink subframe configurations applicable for inter-RAT RSTD requirements without gaps**

| PRS Transmission Bandwidth (RB)  | Applicable TDD uplink-downlink configurations |
|--|---|
| 6, 15  | 1, 2, 3, 4 and 5                              |
| 25, 50, 75, 100  | 0, 1, 2, 3, 4, 5 and 6                        |
| NOTE 1: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [23]. |   |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells  $i$  out of at least  $(n-1)$  neighbor cells within  $T_{\text{RSTD InterRAT,E-UTRAN TDD}}$  provided:

$$\left( \text{PRS } \hat{E}_s / \text{Iot} \right)_{ref} \geq -6 \text{ dB for all Frequency Bands for the reference cell,}$$

$$\left( \text{PRS } \hat{E}_s / \text{Iot} \right)_i \geq -13 \text{ dB for all Frequency Bands for neighbour cell } i,$$

$$\left( \text{PRS } \hat{E}_s / \text{Iot} \right)_{ref} \text{ and } \left( \text{PRS } \hat{E}_s / \text{Iot} \right)_i \text{ conditions apply for all subframes of at least } L = \frac{M}{2} \text{ PRS positioning}$$

occasions,

PRP 1,2|<sub>dBm</sub> according to TS 36.133 [15, Annex B.2.6] for a corresponding Band,

$\text{PRS } \hat{E}_s / \text{Iot}$  is as defined in clause 9.4.4.1.2.

The time  $T_{\text{RSTD InterRAT,E-UTRAN TDD}}$  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message via LPP as specified in TS 38.305 [22], are delivered to the physical layer of the UE.

The RSTD measurement accuracy for all measured neighbor cells  $i$  shall be fulfilled according to the accuracy as specified in clause 10.2.4.

#### 9.4.4.2.2.1 RSTD Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times \text{TTI}_{\text{DCCH}}$  where  $\text{TTI}_{\text{DCCH}}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

#### 9.4.4.2.2.2 Requirements for acquiring the timing of the E-UTRA OTDOA reference cell

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE supporting per-FR gaps may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells in FR1 for acquiring SFN of the reference cell in the E-UTRA OTDOA assistance data, while no autonomous gaps in downlink reception or uplink transmission are allowed in any of the UE serving cells in FR2. The UE, which are only supporting per-UE gaps, may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells for acquiring the SFN of the reference cell in the E-UTRA OTDOA assistance data.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps while indicating *eutra-FineTimingDetection* according to TS 38.331 [2] for detecting the reference cell in the E-UTRA OTDOA assistance data.

When the UE is performing one or both of SFN acquisition or cell detection as specified above, the UE shall be able to determine the timing of the E-UTRA OTDOA assistance data reference cell during the time period

$$T_{\text{RefCell,E-UTRAN}} = T_{\text{Detect, E-UTRAN TDD}} + T_{\text{MIB}} + T_{\text{ECGI}},$$

where

$T_{\text{Detect, E-UTRAN TDD}} = T_{\text{Identify, E-UTRAN TDD}} - T_{\text{measure, E-UTRAN TDD}}$  is according to clause 9.4.3 assuming  $\text{CSSF}_{\text{interRAT}}=1$  and it is the time needed to detect the E-UTRA OTDOA assistance data reference cell when the UE needs to acquire the

subframe and slot timing of the cell, provided the UE is configured with measurement gaps ( $T_{\text{Detect, E-UTRAN TDD}}=0$  when both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset* are provided in the E-UTRA OTDOA assistance data or the E-UTRA OTDOA assistance data reference cell is known to the UE), and

$T_{\text{MIB}} = 50$  ms is the time required to acquire SFN and/or PHICH configuration of the E-UTRA OTDOA assistance data reference cell provided the OTDOA assistance data reference cell is decodable and at least all E-UTRA subframes #0 during  $T_{\text{MIB}}$  are available at the UE receiver ( $T_{\text{MIB}}=0$  when *nr-LTE-SFN-Offset* is provided in the E-UTRA OTDOA assistance data and ECGI acquisition is not needed), and

$T_{\text{ECGI}} = 100$  ms is the time required to acquire ECGI of the E-UTRA OTDOA assistance data reference cell when *cellGlobalId* is included in *OTDOA-ReferenceCellInfo* and the UE is not aware of the ECGI of this cell ( $T_{\text{ECGI}} = 0$  when *cellGlobalId* is not included in *OTDOA-ReferenceCellInfo* or the UE is aware of the ECGI of the E-UTRA OTDOA assistance data reference cell).

When detecting the E-UTRAN OTDOA reference cell, the requirements in this clause shall be met, provided the conditions for the detectable cell are fulfilled according to clause 9.4.3.1. In addition, the MIB of the E-UTRA OTDOA reference cell whose SFN is acquired shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [25].

The requirement for acquiring the timing of the E-UTRA OTDOA reference cell within  $T_{\text{RefCell,E-UTRAN}}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

When  $T_{\text{MIB}} > 0$  and UE is using autonomous gaps during  $T_{\text{MIB}}$ , the UE shall transmit at least  $N_{\text{ACK/NACK, MIB, TDD}}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are created, specified in Table 9.4.4.2.2.2-1. When both  $T_{\text{MIB}} > 0$  and  $T_{\text{ECGI}} > 0$  and UE is using autonomous gaps during  $T_{\text{MIB}} + T_{\text{ECGI}}$ , the UE shall transmit on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created at least  $N_{\text{ACK/NACK, MIB+ECGI, TDD}}$  ACK/NACKs specified in Table 9.4.4.2.2.2-3, provided the OTDOA reference cell bandwidth is configured in the OTDOA assistance data [22, 27]. The requirements in Tables 9.4.4.2.2.2-1, 9.4.4.2.2.2-2 and 9.4.4.2.2.2-3 apply, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured,
- SSBs are transmitted in one slot within SMTC window.

**Table 9.4.4.2.2-1: Minimum number of ACK/NACKs transmitted by the UE during  $T_{\text{MIB}}$**

| NACK/NACK, MIB, TDD | Configuration of the serving cell in which the transmitted ACK/NACKs are counted |         |
|---------------------|--|---------|
|                     | Duplex mode configuration  | SCS     |
| 15                  | FDD  | 15 kHz  |
| 39                  | FDD  | 30 kHz  |
| 85                  | FDD  | 60 kHz  |
| 0                   | TDD <sup>Note 1</sup>  | 15 kHz  |
| 4                   | TDD <sup>Note 1</sup>  | 30 kHz  |
| 12                  | TDD <sup>Note 1</sup>  | 60 kHz  |
| 46                  | TDD <sup>Note 2</sup>  | 60 kHz  |
| 104                 | TDD <sup>Note 2</sup>  | 120 kHz |

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  
NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

Table 9.4.4.2.2-2: Void

Table 9.4.4.2.2-3: Minimum number of ACK/NACKs transmitted by the UE during  $T_{MIB}+T_{ECGI}$ 

| NACK/NACK, MIB+ECGI, TDD | Configuration of the serving cell in which the transmitted ACK/NACKs are counted |         |
|--------------------------|--|---------|
|                          | Duplex mode configuration  | SCS     |
| 84                       | FDD  | 15 kHz  |
| 193                      | FDD  | 30 kHz  |
| 402                      | FDD  | 60 kHz  |
| 28                       | TDD <sup>Note 1</sup>  | 15 kHz  |
| 81                       | TDD <sup>Note 1</sup>  | 30 kHz  |
| 159                      | TDD <sup>Note 1</sup>  | 60 kHz  |
| 233                      | TDD <sup>Note 2</sup>  | 60 kHz  |
| 491                      | TDD <sup>Note 2</sup>  | 120 kHz |

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  
NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

## 9.4.5 Inter-RAT E-CID measurements

### 9.4.5.1 NR–E-UTRAN FDD E-CID RSRP and RSRQ measurements

#### 9.4.5.1.1 Introduction

The requirements in clause 9.4.5.1. shall apply provided the UE has received *ECID-RequestLocationInformation* message from LMF via LPP requesting the UE to report inter-RAT E-UTRAN FDD E-CID RSRP and RSRQ measurements [22, 27].

#### 9.4.5.1.2 Requirements

The requirements in clause 9.4.2 also apply for this clause except the measurement reporting requirements. The measurement reporting requirements for E-CID RSRP and RSRQ are defined in clause 9.4.5.1.3.

#### 9.4.5.1.3 Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

Reported RSRP and RSRQ measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2 and 10.2.3, respectively.

### 9.4.5.2 NR–E-UTRAN TDD E-CID RSRP and RSRQ measurements

#### 9.4.5.2.1 Introduction

The requirements in clause 9.4.5.2. shall apply provided the UE has received *ECID-RequestLocationInformation* message from LMF via LPP requesting the UE to report inter-RAT E-UTRAN TDD E-CID RSRP and RSRQ measurements [22, 27].

#### 9.4.5.2.2 Requirements

The requirements in clause 9.4.3 also apply for this clause except the measurement reporting requirements. The measurement reporting requirements for E-CID RSRP and RSRQ are defined in clause 9.4.5.2.3.

### 9.4.5.2.3 Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

Reported RSRP and RSRQ measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2 and 10.2.3, respectively.

## 9.4.6 NR – UTRAN FDD measurements

### 9.4.6.1 Introduction

The requirements are applicable for NR– UTRAN FDD CPICH RSCP and CPICH Ec/No measurements for SRVCC.

### 9.4.6.2 Requirements when no DRX is used

#### 9.4.6.2.1 Identification of a new UTRA FDD cell

When explicit neighbour list is provided and no DRX is used, either measurement gaps are scheduled or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable cell belonging to the monitored set within

$$T_{\text{identify\_UTRA\_FDD}} = T_{\text{basic\_identify\_UTRA\_FDD}} \cdot \frac{480}{T_{\text{inter1}}} \cdot CSSF_{\text{interRAT}} \quad ms$$

A cell shall be considered detectable when

- CPICH Ec/Io  $\geq$  -20 dB,
- SCH\_Ec/Io  $\geq$  -17 dB for at least one channel tap and SCH\_Ec/Io is equally divided between primary synchronisation code and secondary synchronisation code. When L3 filtering is used an additional delay can be expected.

#### 9.4.6.2.2 UE UTRA FDD CPICH measurement capability

When measurement gaps are scheduled for UTRA FDD inter RAT measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting measurements to higher layers with measurement accuracy as specified in Clause 10 with measurement period given by

$$T_{\text{measurement\_UTRA\_FDD}} = \text{Max} \left\{ T_{\text{Measurement\_Period\_UTRA\_FDD}} \cdot CSSF_{\text{interRAT}}, T_{\text{basic\_measurement\_UTRA\_FDD}} \cdot \frac{480}{T_{\text{inter1}}} \cdot CSSF_{\text{interRAT}} \right\} ms$$

The UE shall be capable of performing UTRA FDD CPICH measurements for  $X_{\text{basic\_measurementUTRA\_FDD}}$  inter-frequency cells per FDD frequency and the UE physical layer shall be capable of reporting measurements to higher layers with the measurement period of  $T_{\text{Measurement\_UTRA\_FDD}}$ .

$$X_{\text{basic\_measurement\_UTRA\_FDD}} = 6$$

$T_{\text{Measurement\_Period\_UTRA\_FDD}} = 480$  ms. The period used for calculating the measurement period  $T_{\text{measurement\_UTRA\_FDD}}$  for UTRA FDD CPICH measurements.

$T_{\text{basic\_identify\_UTRA\_FDD}} = 300$  ms. This is the time period used in the inter RAT equation in clause 9.4.6.2.1 where the maximum allowed time for the UE to identify a new UTRA FDD cell is defined.

$T_{\text{basic\_measurement\_UTRA\_FDD}} = 50$  ms. This is the time period used in the equation for defining the measurement period for inter RAT CPICH measurements.



$CSSF_{\text{interRAT}} = CSSF_{\text{within\_gap},i}$  is the scaling factor for the measured inter-RAT UTRA carrier  $i$  which is calculated as specified in clause 9.1.5.2.

$T_{\text{inter1}}$  is defined in clause 9.4.1.

#### 9.4.6.2.3 Periodic Reporting

Reported measurements in periodically triggered measurement reports shall meet the requirements in clause 10.

#### 9.4.6.2.4 Event Triggered Reporting

Reported measurements in event triggered measurement reports shall meet the requirements in clause 10.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria is not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than  $T_{\text{identify, UTRA\_FDD}}$  defined in Clause 9.4.6.2.1 for the minimum requirements. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{\text{identify, UTRA\_FDD}}$  defined in clause 9.4.6.2.1 for the minimum requirements and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{\text{measurement\_UTRA\_FDD}}$  defined in clause 9.4.6.2.2 provided the timing to that cell has not changed more than  $\pm 32$  chips while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

#### 9.4.6.2.5 Event-triggered Periodic Reporting

Reported measurements contained in event triggered periodic measurement reports shall meet the requirements in clause 10.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.6.2.4 Event Triggered Reporting.

#### 9.4.6.3 Requirements when DRX is used

When explicit neighbour list is provided and DRX is used, either measurement gaps are scheduled or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable cell belonging to the neighbour cell list within  $T_{\text{identify,UTRA\_FDD}}$  as shown in table 9.4.6.3-1

**Table 9.4.6.3-1: Requirement to identify a newly detectable UTRA FDD cell**

| DRX cycle length (s)  | $T_{\text{identify\_UTRA\_FDD}}$ (s) (DRX cycles)                                  |   |
|---|--|---|
|   | Gap period = 40 ms   | Gap period = 80 ms  |
| $\leq 0.04$   | Non DRX Requirements in clause 9.4.6.2 are applicable                              | Non DRX Requirements in clause 9.4.6.2 are applicable                             |
| 0.064   | $2.56 * \text{CSSF}_{\text{interRAT}}$<br>( $40 * \text{CSSF}_{\text{interRAT}}$ ) | $4.8 * \text{CSSF}_{\text{interRAT}}$ (75<br>$* \text{CSSF}_{\text{interRAT}}$ )  |
| 0.08  | $3.2 * \text{CSSF}_{\text{interRAT}}$ (40<br>$* \text{CSSF}_{\text{interRAT}}$ )   | $4.8 * \text{CSSF}_{\text{interRAT}}$ (60*<br>$\text{CSSF}_{\text{interRAT}}$ )   |
| 0.128   | $3.2 * \text{CSSF}_{\text{interRAT}}$ (25*<br>$\text{CSSF}_{\text{interRAT}}$ )    | $4.8 * \text{CSSF}_{\text{interRAT}}$ (37.5*<br>$\text{CSSF}_{\text{interRAT}}$ ) |
| 0.16  | $3.2 * \text{CSSF}_{\text{interRAT}}$ (20<br>$* \text{CSSF}_{\text{interRAT}}$ )   | $4.8 * \text{CSSF}_{\text{interRAT}}$ (30<br>$* \text{CSSF}_{\text{interRAT}}$ )  |
| $0.16 < \text{DRX-cycle} \leq 2.56$   | Note1 (20<br>$* \text{CSSF}_{\text{interRAT}}$ )                                   | Note1<br>(20 $* \text{CSSF}_{\text{interRAT}}$ )                                  |
| Note 1: Time depends upon the DRX cycle in use.<br>Note 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.2.2. |  |   |

A cell shall be considered detectable provided following conditions are fulfilled: A cell shall be considered detectable when

- CPICH  $E_c/I_o \geq -20$  dB,
- SCH  $E_c/I_o \geq -17$  dB for at least one channel tap and SCH  $E_c/I_o$  is equally divided between primary synchronisation code and secondary synchronisation code. When L3 filtering is used an additional delay can be expected.

The UE shall be capable of performing RSCP and  $E_c/I_o$  measurements of at least 6 UTRA cells per UTRA FDD carrier for up to 3 UTRA FDD carriers and the UE physical layer shall be capable of reporting RSCP and  $E_c/I_o$  measurements to higher layers with the measurement period defined in table 9.4.6.3-2 when DRX is used, either measurement gaps are scheduled or the UE supports capability of conducting such measurements without gaps.

**Table 9.4.6.3-2: Requirement to measure UTRA FDD cells**

| DRX cycle length (s)  | $T_{\text{measure\_UTRA\_FDD}}$ (s) (DRX cycles)   |  |
|---|--|--|
|   | Gap period = 40 ms   | Gap period = 80 ms   |
| $\leq 0.04$   | Non DRX Requirements in clause 9.4.6.2 are applicable  | Non DRX Requirements in clause 9.4.6.2 are applicable                              |
| 0.064   | $0.48 * \text{CSSF}_{\text{interRAT}}$<br>(7.5*<br>$N_{\text{freq}} * \text{CSSF}_{\text{interRAT}}$ ) | $0.8 * \text{CSSF}_{\text{interRAT}}$<br>(12.5 $* \text{CSSF}_{\text{interRAT}}$ ) |
| 0.08  | $0.48 * \text{CSSF}_{\text{interRAT}}$<br>(6 $* \text{CSSF}_{\text{interRAT}}$ )                       | $0.8 * \text{CSSF}_{\text{interRAT}}$ (10<br>$* \text{CSSF}_{\text{interRAT}}$ )   |
| 0.128   | $0.64 * \text{CSSF}_{\text{interRAT}}$<br>(5 $* \text{CSSF}_{\text{interRAT}}$ )                       | $0.8 * \text{CSSF}_{\text{interRAT}}$ (6.25<br>$* \text{CSSF}_{\text{interRAT}}$ ) |
| $0.128 < \text{DRX-cycle} \leq 2.56$  | Note1 (5<br>$* \text{CSSF}_{\text{interRAT}}$ )  | Note1 (5 $* \text{CSSF}_{\text{interRAT}}$ )                                       |
| Note 1: Time depends upon the DRX cycle in use.<br>Note 2: $\text{CSSF}_{\text{interRAT}}$ is as defined in clause 9.4.2.2. |  |  |

The measurement accuracy for all measured cells shall be as specified in the clause 10.3.

#### 9.4.6.3.1 Periodic Reporting

Reported measurements in periodically triggered measurement reports shall meet the requirements in clause 10.

#### 9.4.6.3.2 Event Triggered Reporting

Reported measurements in event triggered measurement reports shall meet the requirements in clause 10.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria is not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than  $T_{\text{identify,UTRA\_FDD}}$  defined in Clause 9.4.6.3. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{\text{identify,UTRA\_FDD}}$  defined in clause 9.4.6.3 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{\text{measurement\_UTRA\_FDD}}$  defined in clause 9.4.6.3 provided the timing to that cell has not changed more than  $\pm 32$  chips while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

#### 9.4.6.3.3 Event-triggered Periodic Reporting

Reported measurements contained in event triggered periodic measurement reports shall meet the requirements in clause 10.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.6.3.2 Event Triggered Reporting.

### 9.4.7 NR – E-UTRAN measurements with autonomous gaps

#### 9.4.7.1 CGI identification of an E-UTRA cell with autonomous gaps

The requirements in this clause apply when the UE is configured with standalone NR, NE-DC or NR-DC. The UE shall identify and report the CGI when requested by an NR PCell for the purpose ‘reportCGI’. The UE may make autonomous gaps in downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3.1 in TS 38.331 [2]. If autonomous gaps are used for measurement with the purpose of ‘reportCGI’, regardless of whether DRX is used or not, or regardless of whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of E-UTRA cell within  $T_{\text{identify\_CGI, E-UTAN}} = 150$  ms. This is the maximum allowed time for the UE to identify a new CGI of an E-UTRA cell, provided that the E-UTRA cell has been already identified by the UE.

A cell shall be considered identifiable following conditions are fulfilled:

- RSRP related side conditions given in Clause 9.1 in [15] are fulfilled for a corresponding Band,
- SCH<sub>RP</sub> and SCH<sub>Es</sub>/tot according to Annex B.2.2 in [15] for a corresponding Band

The MIB of an E-UTRA cell whose CGI is identified shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to [25].

The requirement for identifying a new CGI of an E-UTRA cell within  $T_{\text{identify\_CGI, E-UTRAN}}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

#### 9.4.7.2 CGI reporting delay

The E-UTRA CGI reporting delay is defined as the time between a command that will trigger an E-UTRA CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of  $2 \times TTI_{\text{DCCH}}$  resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than  $T_{\text{identify\_CGI, E-UTAN}}$  plus RRC procedure delay defined in clause 12 in TS 38.331 [2], and an additional 30ms margin.

## 9.5 L1-RSRP measurements for Reporting

### 9.5.1 Introduction

When configured by the network, the UE shall be able to perform L1-RSRP measurements of configured CSI-RS, SSB or CSI-RS and SSB resources for L1-RSRP. The measurements shall be performed for a serving cell, including PCell, PSCell, or SCell, on the resources configured for L1-RSRP measurements within the active BWP.

The UE shall be able to measure all CSI-RS resources and/or SSB resources of the *nzp-CSI-RS-ResourceSet* and/or *csi-SSB-ResourceSet* within the *CSI-ResourceConfig* settings configured for L1-RSRP for the active BWP, provided that the number of resources does not exceed the UE capability indicated by *beamManagementSSB-CSI-RS*.

The UE shall report the measurement quantity (*reportQuantity*) and send periodic, semi-persistent or aperiodic reports, according to the *reportConfigType* according to the CSI reporting configuration(s) (*CSI-ReportConfig*) for the active BWP.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

### 9.5.2 Requirements applicability

The requirements in clause 9.5 apply, provided:

- The CSI-RS or SSB or CSI-RS and SSB resources configured for L1-RSRP measurements are measurable.

An SSB resource configured for L1-RSRP shall be considered measurable when for each relevant SSB the following conditions are met:

- L1-RSRP related side conditions given in clauses 10.1.19.1 and 10.1.20.1 for FR1 and FR2, respectively, for a corresponding band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.4.1 for a corresponding band.

A CSI-RS resource configured for L1-RSRP shall be considered measurable when for each relevant CSI-RS the following conditions are met:

- L1-RSRP related side conditions given in clauses 10.1.19.2 and 10.1.20.2 for FR1 and FR2, respectively, for a corresponding band,
- CSI-RS<sub>RP</sub> and CSI-RS  $\hat{E}_s/I_{ot}$  according to Annex B.2.4.2 for a corresponding band.

A CSI-RS and SSB resource configured for L1-RSRP shall be considered measurable when the measurable resource conditions are met for both CSI-RS resource and SSB resource.

Requirements are defined for periodic, semi-persistent and aperiodic resources.

### 9.5.3 Measurement Reporting Requirements

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

### 9.5.3.1 Periodic Reporting

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

### 9.5.3.2 Semi-Persistent Reporting

Reported L1-RSRP measurements contained in a Semi-Persistent L1-RSRP measurement report shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively. This requirement applies for semi-persistent L1-RSRP reports send on PUSCH or PUCCH.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUSCH, if a DCI request has been received.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUCCH, if an activation command [7] has been received.

The UE shall transmit the semi-persistent L1-RSRP reporting on PUSCH or PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

### 9.5.3.3 Aperiodic Reporting

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.1.2.1 in TS 38.214 [26].

## 9.5.4 L1-RSRP measurement requirements

### 9.5.4.1 SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of  $T_{L1-RSRP\_Measurement\_Period\_SSB}$ .

The value of  $T_{L1-RSRP\_Measurement\_Period\_SSB}$  is defined in Table 9.5.4.1-1 for FR1 and Table 9.5.4.1-2 for FR2, where

- $M=1$  if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and  $M=3$  otherwise
- $N=8$ .

For FR1,

- $P = \frac{1}{1 - \frac{T_{SSB}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- $P=1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

- $P = \frac{1}{1 - \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ).
- $P$  is  $P_{sharing\ factor}$ , when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period ( $T_{SSB} = T_{SMTCperiod}$ ).
- $P = \frac{1}{1 - \frac{T_{SSB}}{MGRP} - \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP$  and  $T_{SSB} < 0.5 * T_{SMTCperiod}$
- $P$  is  $\frac{P_{sharing\ factor}}{1 - \frac{T_{SSB}}{MGRP}}$ , when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5 * T_{SMTCperiod}$
- $P = \frac{1}{1 - \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when SSB is partially overlapped with measurement gap ( $T_{SSB} < MGRP$ ) and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P$  is  $\frac{P_{sharing\ factor}}{1 - \frac{T_{SSB}}{MGRP}}$ , when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{sharing\ factor} = 1$ , if the SSB configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,
- $P_{sharing\ factor} = 3$ , otherwise.

Where:

- $T_{SSB} = ssb\text{-periodicityServingCell}$
- $T_{SMTCperiod} =$  the configured SMTC period

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter *smtc1*.  $T_{SMTCperiod}$  is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

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

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

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period  $T_{identify\_CGI,E-UTRAN}$  when the UE is requested to decode an LTE CGI.

**Table 9.5.4.1-1: Measurement period  $T_{L1-RSRP\_Measurement\_Period\_SSB}$  for FR1**

| Configuration           | $T_{L1-RSRP\_Measurement\_Period\_SSB}$ (ms)  |
|-------------------------|---|
| non-DRX                 | $\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{SSB})$  |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(K \cdot M \cdot P) \cdot \max(T_{DRX}, T_{SSB}))$   |
| DRX cycle $> 320$ ms    | $\text{ceil}(M \cdot P) \cdot T_{DRX}$  |
| Note 1:                 | $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2:                 | $K = 1$ when $T_{SSB} \leq 40$ ms and <i>highSpeedMeasFlag-r16</i> are configured; otherwise $K = 1.5$ .  |
| Note 3:                 | When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> .                   |

**Table 9.5.4.1-2: Measurement period  $T_{L1-RSRP\_Measurement\_Period\_SSB}$  for FR2**

| Configuration           | $T_{L1-RSRP\_Measurement\_Period\_SSB}$ (ms)  |
|-------------------------|---|
| non-DRX                 | $\max(T_{Report}, \text{Ceil}(M \cdot P \cdot N) \cdot T_{SSB})$  |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot \max(T_{DRX}, T_{SSB}))$   |
| DRX cycle $> 320$ ms    | $\text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot T_{DRX}$  |
| Note:                   | $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |

### 9.5.4.2 CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of  $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$ .

The value of  $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$  is defined in Table 9.5.4.2-1 for FR1 and in Table 9.5.4.2-2 for FR2, where

- For periodic and semi-persistent CSI-RS resources,  $M=1$  if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and  $M=3$  otherwise
- For aperiodic CSI-RS resources  $M=1$
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF,  $N=1$ . The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON,  $N=\text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF,  $N=1$ . The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON,  $N=\text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF,  $N=1$ . The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON,  $N=1$ . UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR1,

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- $P=1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR2,

- $P=1$ , when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < \text{MGRP}$ )
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).
- $P = P_{\text{sharing factor}}$ , when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ).
- $P=1$ , when aperiodic CSI-RS resource is not overlapped with measurement gap
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}} - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{\text{SMTCperiod}} \neq \text{MGRP}$  or
  - $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} < 0.5 * T_{\text{SMTCperiod}}$
- $P = \frac{3}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} = 0.5 * T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when CSI-RS is partially overlapped with measurement gap ( $T_{\text{CSI-RS}} < \text{MGRP}$ ) and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P = \frac{P_{\text{sharing factor}}}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < \text{MGRP}$ )
- $P_{\text{sharing factor}} = 1$ , if the CSI-RS configured for L1-RSRP measurement outside measurement gap is



- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,
- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured
- $P_{\text{sharing factor}} = 3$ , otherwise.

Where:

$T_{\text{SMTCperiod}}$  = the configured SMTC period.

$T_{\text{CSI-RS}}$  = the periodicity of CSI-RS configured for L1-RSRP measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{\text{SMTCperiod}}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  corresponds to the value of higher layer parameter *smtc1*.  $T_{\text{SMTCperiod}}$  is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

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

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

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period  $T_{\text{identify\_CGI,E-UTRAN}}$  when the UE is requested to decode an LTE CGI.

**Table 9.5.4.2-1: Measurement period  $T_{\text{L1-RSRP\_Measurement\_Period\_CSI-RS}}$  for FR1**

| Configuration                 | $T_{\text{L1-RSRP\_Measurement\_Period\_CSI-RS}}$ (ms)  |
|-------------------------------|---|
| non-DRX                       | $\max(T_{\text{Report}}, \text{ceil}(M \cdot P) \cdot T_{\text{CSI-RS}})$   |
| DRX cycle $\leq 320\text{ms}$ | $\max(T_{\text{Report}}, \text{ceil}(K \cdot M \cdot P) \cdot \max(T_{\text{DRX}}, T_{\text{CSI-RS}}))$   |
| DRX cycle $> 320\text{ms}$    | $\text{ceil}(M \cdot P) \cdot T_{\text{DRX}}$   |
| Note 1:                       | $T_{\text{CSI-RS}}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ is configured periodicity for reporting. |
| Note 2:                       | the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.   |
| Note 3:                       | $K = 1$ when $T_{\text{CSI-RS}} \leq 40$ ms and <i>highSpeedMeasFlag-r16</i> are configured; otherwise $K = 1.5$ .  |
| Note 4:                       | When <i>highSpeedMeasFlag-r16</i> is configured, the requirements apply only to UE supporting either <i>measurementEnhancement-r16</i> or <i>intraNR-MeasurementEnhancement-r16</i> .       |

**Table 9.5.4.2-2: Measurement period  $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$  for FR2**

| Configuration                 | $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$ (ms)  |
|-------------------------------|--|
| non-DRX                       | $\max(T_{Report}, \text{ceil}(M \cdot P \cdot N) \cdot T_{CSI-RS})$  |
| DRX cycle $\leq 320\text{ms}$ | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot \max(T_{DRX}, T_{CSI-RS}))$   |
| DRX cycle $> 320\text{ms}$    | $\text{ceil}(M \cdot P \cdot N) \cdot T_{DRX}$   |
| Note 1:                       | $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2:                       | the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.                                  |

## 9.5.4A Void

### 9.5.4A.1 Void

## 9.5.5 Measurement restriction for CSI-RS and SSB for L1-RSRP measurement

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

### 9.5.5.1 Measurement restriction for SSB based L1-RSRP

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the SSB for L1-RSRP measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, if the network configures same or mixed numerology between SSB for L1-RSRP measurement on one FR2 band and CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the other FR2 band, UE shall be able to perform the related SSB based measurements in one band without any measurement restrictions in the other band, provided that UE is capable of independent beam management on this FR2 band pair.

### 9.5.5.2 Measurement restriction for CSI-RS based L1-RSRP

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

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

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

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

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

For FR2, when the CSI-RS for L1-RSRP measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD or L1-RSRP measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for L1-RSRP measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-RSRP measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

## 9.5.6 Scheduling availability of UE during L1-RSRP measurement

Scheduling availability restrictions when the UE is performing L1-RSRP measurement are described in the following clauses.

### 9.5.6.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as RS for L1-RSRP measurement with the same SCS as PDSCH/PDCCH in FR1.

### 9.5.6.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured for L1-RSRP measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols corresponding to the SSB indexes configured for L1-RSRP measurement.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions

on FR1 serving cell(s) configured in other bands than the bands in which the serving cell where L1-RSRP measurement is performed is configured.

### 9.5.6.3 Scheduling availability of UE performing L1-RSRP measurement on FR2

The following scheduling restriction applies due to L1-RSRP measurement.

- For the case where RS for L1-RSRP measurement is CSI-RS which is QCLed with active TCI state for PDCCH/PDSCH and not in a CSI-RS resource set with repetition ON, and  $N=1$  applies as specified in clause 9.5.4.2
  - There are no scheduling restrictions due to L1-RSRP measurement performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on
    - symbols corresponding to the SSB indexes configured for L1-RSRP measurement, and/or
    - symbols corresponding to the periodic CSI-RS resource configured for L1-RSRP measurement, and/or
    - symbols corresponding to the semi-persistent CSI-RS resource configured for L1-RSRP measurement when the resource is activated, and/or
    - symbols corresponding to the aperiodic CSI-RS resource configured for L1-RSRP measurement when the reporting is triggered.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to L1-RSRP measurement performed on FR2 serving cell(s) in different band(s), provided that UE is capable of independent beam management on this FR2 band pair. Additionally, there is no scheduling restriction if the UE is configured with different numerology between SSB on one FR2 band and data on the other FR2 band provided the UE is configured for IBM operation for the band pair.

If following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for L1-RSRP measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for L1-RSRP measurement.

### 9.5.6.4 Scheduling availability of UE performing L1-RSRP measurement on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to L1-RSRP measurement performed on FR2 serving cell(s).

There are no scheduling restrictions on FR2 serving cell(s) due to L1-RSRP measurement performed on FR1 serving cell(s).

## 9.5A L1-RSRP measurements for Reporting under CCA

### 9.5A.1 Introduction

When configured by the network, the UE shall be able to perform L1-RSRP measurements of configured SSB resources for L1-RSRP. The measurements shall be performed for a serving cell under CCA operating mode, including PCell, PSCell, or SCell, on the resources configured for L1-RSRP measurements within the active BWP.

The UE shall be able to measure all SSB resources of the *csi-SSB-ResourceSet* within the *CSI-ResourceConfig* settings configured for L1-RSRP for the active BWP, provided that the number of resources does not exceed the UE capability indicated by *beamManagementSSB-CSI-RS*.

The UE shall report the measurement quantity (*reportQuantity*) and send periodic, semi-persistent or aperiodic reports, according to the *reportConfigType* according to the CSI reporting configuration(s) (*CSI-ReportConfig*) for the active BWP.

In EN-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected.

The requirements in clause 9.5A apply for any *channelAccessMode* configuration [TS 38.331, 2].

In the requirements of clause 9.5A, the term SSB occasion not available at the UE refers to when the SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SS/PBCH block index within the set of configured SSB are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation or measurement period; otherwise the SSB occasion is considered as available at the UE.

### 9.5A.2 Requirements applicability

The requirements in clause 9.5A apply, provided:

- The SSB resources configured for L1-RSRP measurements are measurable.

An SSB resource configured for L1-RSRP shall be considered measurable when for each relevant SSB the following conditions are met:

- L1-RSRP related side conditions given in clause 10.1.19.1 for FR1 for a corresponding band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.4.1 for a corresponding band.

An SSB resource configured for L1-RSRP shall be considered measurable when the measurable resource conditions are met for SSB resource.

Requirements are defined for periodic, semi-persistent and aperiodic resources.

### 9.5A.3 Measurement Reporting Requirements

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected if the UE is capable of per-FR gap, or an additional delay can be expected.

#### 9.5A.3.1 Periodic Reporting

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

### 9.5A.3.2 Semi-Persistent Reporting

Reported L1-RSRP measurements contained in a Semi-Persistent L1-RSRP measurement report shall meet the requirements in clauses 10.1.19. This requirement applies for semi-persistent L1-RSRP reports send on PUSCH or PUCCH.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUSCH, if a DCI request has been received.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUCCH, if an activation command [7] has been received.

The UE shall transmit the semi-persistent L1-RSRP reporting on PUSCH or PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

When CCA is used on target frequency, if UE cannot transmit HARQ-ACK for the MAC CE activation command due to UL CCA failure, the UE shall not perform MAC CE activation at the MAC action time based on the originally scheduled HARQ-ACK transmission time specified in clause 5.1.2.5.2 in TS 38.214 [26].

When CCA is used on target frequency, if UE cannot transmit HARQ-ACK for the MAC CE deactivation command due to UL CCA failure, the UE shall perform MAC CE deactivation at the MAC action time based on the originally scheduled HARQ-ACK transmission time specified in clause 5.2.1.5.2 in TS 38.214 [26].

### 9.5A.3.3 Aperiodic Reporting

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.1.2.1 in TS 38.214 [26].

## 9.5A.4 L1-RSRP measurement requirements

### 9.5A.4.1 SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of  $T_{L1-RSRP\_Measurement\_Period\_SSB\_CCA}$ .

The value of  $T_{L1-RSRP\_Measurement\_Period\_SSB\_CCA}$  is defined in Table 9.5A.4.1-1 for FR1, where

- $M=1$  if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and  $M=3$  otherwise

For FR1,

- $P = \frac{1}{1 - \frac{T_{SSB}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- $P=1$  when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Where:

$T_{SSB} = \text{ssb-periodicityServingCell}$

$T_{SMTCperiod} = \text{the configured SMTC1 period or SMTC2 period if configured}$

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{\text{SMTCPeiod}}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{\text{SMTCPeiod}}$  corresponds to the value of higher layer parameter *smtc1*.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

UE shall report RSRP\_0 (Not valid) if  $L_1 > L_{1\text{max}}$ , where  $L_1$  and  $L_{1\text{max}}$  are defined in Table 9.5A.4.1-1.

**Table 9.5A.4.1-1: Measurement period  $T_{\text{L1-RSRP\_Measurement\_Period\_SSB\_CCA}}$  for FR1**

| Configuration          | $T_{\text{L1-RSRP\_Measurement\_Period\_SSB\_CCA}}$ (ms)   |
|------------------------|--|
| non-DRX                | $\max(T_{\text{Report}}, \text{Ceil}((M+L_1)*P)*T_{\text{SSB}})$   |
| DRX cycle $\leq$ 320ms | $\max(T_{\text{Report}}, \text{Ceil}(1.5*(M+L_1)*P)*\max(T_{\text{DRX}}, T_{\text{SSB}}))$   |
| DRX cycle $>$ 320ms    | $\text{Ceil}((M+L_1)*P)*T_{\text{DRX}}$  |
| Note 1:                | $T_{\text{SSB}}$ = <i>ssb-periodicityServingCell</i> is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{\text{DRX}}$ is the DRX cycle length. $T_{\text{Report}}$ is configured periodicity for reporting.  |
| Note 2:                | $L_1=0$ if higher layer parameter <i>timeRestrictionForChannelMeasurement</i> is configured. Otherwise, when DRX is not configured $L_1$ is the number of SSBs not available at the UE during $T_{\text{L1-RSRP\_Measurement\_Period\_SSB\_CCA}}$ , and when DRX is configured $L_1$ is the number of DRX cycles in which at least one SSB is not available at the UE during $T_{\text{L1-RSRP\_Measurement\_Period\_SSB\_CCA}}$ , where $L_1 \leq L_{1\text{max}}$ . The UE is not required to determine the availability of SSB occasions more frequent than<br>Once per $\max(T_{\text{Report}}, P * T_{\text{SSB}})$ if no DRX is used,<br>Once per $\max(T_{\text{Report}}, \text{Ceil}(1.5 * P) * \max(T_{\text{DRX}}, T_{\text{SSB}}))$ if DRX cycle $\leq$ 320ms,<br>Once per $P * T_{\text{DRX}}$ if DRX cycle $>$ 320ms. |
| Note 3:                | $L_{1\text{max}}=7$ for $\max(T_{\text{DRX}}, T_{\text{SSB}}) \leq 40\text{ms}$ assuming $T_{\text{DRX}}=0$ for non-DRX,<br>$L_{1\text{max}}=5$ for $40\text{ms} < \max(T_{\text{DRX}}, T_{\text{SSB}}) \leq 320\text{ms}$ ,<br>$L_{1\text{max}}=3$ for $T_{\text{DRX}} > 320\text{ms}$ .  |

## 9.5A.5 Measurement restriction for L1-RSRP measurement

The UE is required to be capable of measuring SSB for L1-RSRP without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

### 9.5A.5.1 Measurement restriction for SSB based L1-RSRP

When the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for L1-RSRP measurement.

## 9.5A.6 Scheduling availability of UE during L1-RSRP measurement

Scheduling availability restrictions when the UE is performing L1-RSRP measurement are described in the following clauses.

### 9.5A.6.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB configured as RS for L1-RSRP measurement with the same SCS as PDSCH/PDCCH.

### 9.5A.6.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured for L1-RSRP measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols corresponding to the SSB indexes configured for L1-RSRP measurement.

When intra-band carrier aggregation is configured, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation is configured, there are no scheduling restrictions serving cell(s) configured in other bands than the bands in which the serving cell where L1-RSRP measurement is performed is configured.

### 9.5A.6.3 Scheduling availability of UE performing L1-RSRP measurement in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR2 serving cell(s) due to L1-RSRP measurement performed on serving cell(s) under CCA.

## 9.6 NE-DC: Measurements

### 9.6.1 Introduction

This clause contains requirements for UE supporting dual connectivity with NR PCell and E-UTRA FDD or TDD PCell. The requirements apply to UEs that have been configured with NE-DC.

### 9.6.2 SFTD Measurements

#### 9.6.2.1 Introduction

This clause contains requirements on UE capabilities for reporting of SFN and frame time difference between NR PCell and E-UTRA PCell in RRC\_CONNECTED state. The requirements comprise measurement reporting delay and measurement accuracy. The overall measurement reporting delay includes a RRC procedure delay specified in TS 38.331 [2], and the SFTD measurement reporting delay specified below.

#### 9.6.2.2 SFTD Measurement requirements

When no DRX is used in either of the NR PCell and E-UTRA PCell, the physical layer measurement period of the SFTD measurement shall be  $T_{\text{measure\_SFTD1}} = \max(0.2, 5 * \text{SMTC period})$  s.

When DRX is used in either of the NR PCell or the E-UTRA PCell, or in both PCell and PCell, the physical layer measurement period ( $T_{\text{measure\_SFTD1}}$ ) of the SFTD measurement shall be as specified in Table 9.6.2.2-1.

**Table 9.6.2.2-1: SFTD measurement requirement when DRX is used**

| DRX cycle length (s) <sup>Note2</sup> | $T_{\text{measure\_SFTD1}}$ (s)  |
|---------------------------------------|--|
| DRX cycle $\leq 0.04$                 | $\max(0.2, 5 \times \text{SMTC period})$ (Note1)   |
| $0.04 < \text{DRX cycle} \leq 0.32$   | $8 \times \max(\text{DRX cycle}, \text{SMTC period})$  |
| $0.32 < \text{DRX cycle} \leq 10.24$  | $5 \times \text{DRX cycle}$  |
| Note1:                                | Number of DRX cycles depends upon the DRX cycle in use   |
| Note2:                                | DRX cycle length in this table refers to the DRX cycle length configured for PCell or PCell. When DRX is used in both PCell and PCell, DRX cycle length in this table refers to the longer of the DRX cycle lengths for PCell and PCell. |



If PSCell is changed without changing carrier frequency of PSCell while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed  $T_{\text{measure\_SFTD2}}$  as defined by the following expression:

$$T_{\text{measure\_SFTD2}} = (M+1) \cdot (T_{\text{measure\_SFTD1}}) + M \cdot T_{\text{PSCell\_change\_NEDC}}$$

where:

$M$  is the number of times the E-UTRA PSCell is changed over the measurement period ( $T_{\text{measure\_SFTD2}}$ ), and

$T_{\text{PSCell\_change\_NEDC}}$  is the time necessary to change the PSCell; it can be up to 25 ms.

If PCell is changed, or if PSCell is changed to a different carrier frequency, the UE shall terminate the SFTD measurement.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in clause 10.1.21.1.

## 9.7 Cross Link Interference measurements

### 9.7.1 Introduction

The UE capable of performing CLI measurements shall be able to measure SRS-RSRP and CLI-RSSI which are defined in TS38.215 [4] within active DL BWP. The measurements requirements in this clause apply for TDD mode only.

CLI measurements are only applicable for RRC\_CONNECTED intra-frequency:

- when SRS-RSRP measurement resource is fully confined within BW of DL active BWP
- when CLI-RSSI measurement resource is configured within active BWP

When the UE measures SRS-RSRP and CLI-RSSI, a constant offset relative to the downlink reference timing in the serving cell shall be applied. The constant offset value is derived by UE implementation and shall be at least  $T_c \cdot N_{TA\_offset}$ .

For performing CLI measurement in FR2, UE can assume the configured CLI measurement resources are QCL-ed with TypeD to one of the latest received PDSCH and the latest monitored CORESET.

CLI measurement requirements defined in clause 9.7 are applicable if

- CLI measurement is not performed on an NR carrier in the same band as E-UTRA serving carrier; and
- UE supports simultaneous Rx/Tx for inter-band CA, inter-band EN-DC, inter-band NE-DC, and NR-DC.

### 9.7.2 SRS-RSRP measurements

#### 9.7.2.1 Introduction

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

#### 9.7.2.2 Requirements applicability

The requirements in clause 9.7.2 apply, provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 for FR1 and FR2 for a corresponding band,
- SRS<sub>RP</sub> and SRS  $\hat{E}_s/I_{ot}$  according to Annex B.2.7 for a corresponding band.

### 9.7.2.3 Measurement Reporting Requirements

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 for FR1 and FR2.

#### 9.7.2.3.1 Periodic Reporting

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

#### 9.7.2.3.2 Event-triggered Periodic Reporting

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.1.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.2.3.3.

#### 9.7.2.3.3 Event Triggered Reporting

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

### 9.7.2.4 Measurement capability

The UE shall be capable of performing SRS-RSRP measurements on the SRS resources configured for measurement, provided that the number of SRS to be monitored by UE does not exceed 8 within a slot, and the total number of SRSs to be monitored by the UE does not exceed 32.

### 9.7.2.5 SRS-RSRP measurement period

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of  $T_{SRS\_RSRP\_measurement\_period}$  for FR1 and FR2.

**Table 9.7.2.5-1 Measurement period  $T_{SRS\_RSRP\_measurement\_period}$**

| Configuration                 | $T_{SRS\_measurement\_period}$ (ms)  |
|-------------------------------|--|
| No DRX                        | $\text{Max}(60, 3 \times T_{SRS})$   |
| DRX cycle $\leq 320\text{ms}$ | $\text{Max}(60, \text{Ceil}(1.5 \times 3) \times \text{max}(T_{SRS}, T_{DRX}))$  |
| DRX cycle $> 320\text{ms}$    | $3 \times T_{DRX}$   |
| Note:                         | $T_{SRS}$ is SRS measurement periodicity configured <i>SRS-PeriodicityAndOffset</i> , and $T_{DRX}$ is the DRX cycle length. |

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for  $T_{\text{SRS\_RSRP\_measurement\_period}}$ .

## 9.7.3 CLI-RSSI measurements

### 9.7.3.1 Introduction

When configured by the network, the UE shall be able to perform CLI-RSSI measurement of configured *rsi-ResourceConfigCLI*. The subcarrier spacing for CLI-RSSI measurement resource configuration can be same or different from the subcarrier spacing of active BWP. UE shall perform CLI-RSSI measurement with the SCS of the active BWP.

### 9.7.3.2 Requirements applicability

The requirements in clause 9.7.3 apply, provided:

- The measurement resources configured for CLI-RSSI measurements are measurable.

A measurement resource configured for CLI-RSSI shall be considered measurable when for each relevant CLI-RSSI resource the following conditions are met:

- CLI-RSSI related side conditions given in clauses 10.1.22.2 for FR1 and FR2 for a corresponding band.

### 9.7.3.3 Measurement Reporting Requirements

The UE shall send CLI-RSSI reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when CLI-RSSI report is configured.

The UE shall report the CLI-RSSI value as a 7-bit value in the range [-100, -25] dBm with 1dB step size according to clause 10.1.22.2 for FR1 and FR2.

#### 9.7.3.3.1 Periodic Reporting

Reported CLI-RSSI measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.2.

#### 9.7.3.3.2 Event-triggered Periodic Reporting

Reported CLI-RSSI measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.2.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.3.3.3.

#### 9.7.3.3.3 Event Triggered Reporting

Reported CLI-RSSI measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.2.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{\text{DCCH}}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

### 9.7.3.4 Measurement capability

The UE should be capable of performing CLI-RSSI measurement based on the configured resource, provided that the maximum number of CLI-RSSI measurement resources for the UE does not exceed 64.

### 9.7.3.5 CLI-RSSI measurement period

The UE shall be capable of performing CLI-RSSI measurement based on the configured measurement resource within  $T_{\text{CLI\_RSSI\_measurement\_period}}$ . The UE shall be able to provide a single RSSI sample for each measurement resource configured for CLI-RSSI measurement occurring with a configured periodicity. The CLI-RSSI measurement period  $T_{\text{CLI\_RSSI\_measurement\_period}}$  corresponds to the CLI-RSSI measurement resource periodicity, which is configured for by higher layers via *RSSI-PeriodicityAndOffset*.

If the CLI-RSSI measurement resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for  $T_{\text{CLI\_RSSI\_measurement\_period}}$ .

## 9.7.4 Scheduling availability of UE during CLI measurements

Scheduling availability restrictions when the UE is performing CLI measurements which are SRS-RSRP and CLI-RSSI are described in the following clause.

### 9.7.4.1 Scheduling availability of UE performing measurement on FR1

The following scheduling restriction applies due to CLI measurements.

- The UE is not expected to transmit PUCCH/PUSCH/SRS on OFDM symbols on which the UE performs CLI measurements, and on 1 data symbol before an OFDM symbol used for CLI measurements for 15 kHz and 30 kHz subcarrier spacing.
- For the UE which does not support *cli-SRS-RSRP-FDM\_DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs SRS-RSRP measurements, and on 1 data symbol before an OFDM symbol used for SRS-RSRP measurements for 15 kHz and 30 kHz subcarrier spacing.
- For the UE which does not support *cli-RSSI-FDM-DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs CLI-RSSI measurements, and on 1 data symbol before an OFDM symbol used for CLI-RSSI measurements for 15 kHz and 30 kHz subcarrier spacing.
- The UE is not expected to transmit PUCCH/PUSCH/SRS on OFDM symbols on which the UE performs CLI measurement, and on 2 data symbols before an OFDM symbol used for CLI measurements for 60 kHz subcarrier spacing.
- For the UE which does not support *cli-SRS-RSRP-FDM\_DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs SRS-RSRP measurement, and on 2 data symbols before an OFDM symbol used for SRS-RSRP measurements for 60 kHz subcarrier spacing.
- For the UE which does not support *cli-RSSI-FDM-DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs CLI-RSSI measurement, and on 2 data symbols before an OFDM symbol used for CLI-RSSI measurements for 60 kHz subcarrier spacing.

When TDD intra-band carrier aggregation is configured, the scheduling restrictions on serving cell where CLI measurements are performed apply on all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

### 9.7.4.2 Scheduling availability of UE performing measurement on FR2

The following scheduling restriction applies due to CLI measurements.

- The UE is not expected to transmit PUCCH/PUSCH/SRS on OFDM symbols on which the UE performs CLI measurements, and on 1 data symbol before an OFDM symbol used for CLI measurements for 60 kHz subcarrier spacing.
- For the UE which does not support *cli-SRS-RSRP-FDM\_DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs SRS-RSRP measurements, and on 1 data symbol before an OFDM symbol used for SRS-RSRP measurements for 60 kHz subcarrier spacing.
- For the UE which does not support *cli-RSSI-FDM-DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs CLI-RSSI measurements, and on 1 data symbol before an OFDM symbol used for CLI-RSSI measurements for 60 kHz subcarrier spacing.
- The UE is not expected to transmit PUCCH/PUSCH/SRS on OFDM symbols on which the UE performs CLI measurements, and on 2 data symbols before an OFDM symbol used for CLI measurements for 120 kHz subcarrier spacing.
- For the UE which does not support *cli-SRS-RSRP-FDM\_DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs SRS-RSRP measurements, and on 2 data symbols before an OFDM symbol used for SRS-RSRP measurements for 120 kHz subcarrier spacing.
- For the UE which does not support *cli-RSSI-FDM-DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs CLI-RSSI measurements, and on 2 data symbols before an OFDM symbol used for CLI-RSSI measurements for 120 kHz subcarrier spacing.

When TDD intra-band carrier aggregation is configured, the scheduling restrictions on serving cell where CLI measurements are performed apply on all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

## 9.8 L1-SINR measurements for Reporting

### 9.8.1 Introduction

When configured by the network, the UE shall be able to perform L1-SINR measurements with the measurement resources configured as the selection of:

- CSI-RS based CMR and no dedicated IMR configured;
- SSB based CMR and dedicated IMR configured;
- CSI-RS based CMR and dedicated IMR configured.

The measurements shall be performed for a serving cell, including PCell, PSCell, or SCell, on the resources configured for L1-SINR measurements within the active BWP.

The UE shall be able to measure all CSI-RS resources and/or SSB resources and/or CSI-IM resources of the *nzp-CSI-RS-ResourceSet* and/or *csi-SSB-ResourceSet* and/or *CSI-IM-ResourceSet* within the *CSI-ResourceConfig* settings for L1-SINR for the active BWP and measure interference on corresponding NZP CSI-RS or CSI-IM resources if configured, provided that the number of resources does not exceed the UE capability indicated by *beamManagementSSB-CSI-RS*.

The UE shall report the measurement quantity (*reportQuantity*) and send periodic, semi-persistent or aperiodic reports, according to the *reportConfigType* according to the CSI reporting configuration(s) (*CSI-ReportConfig*) for the active BWP.

### 9.8.2 Requirements applicability

The requirements in clause 9.8 apply, provided:

- CMR resources configured for L1-SINR measurements are measurable, and
- NZP-IMR resources configured for L1-SINR measurements if applicable are measurable.

Requirements are defined for periodic, semi-persistent and aperiodic resources.

For CSI-RS based CMR and no dedicated IMR configured, a CSI-RS resource configured for L1-SINR shall be considered measurable when for each relevant CSI-RS the following conditions are met:

- L1-SINR related side conditions given in clauses 10.1.27 and 10.1.28 for FR1 and FR2, respectively, for a corresponding band,
- CSI-RS<sub>RP</sub> and CSI-RS  $\hat{E}_s/I_{ot}$  according to Annex B.2.8.1 for a corresponding band.

For SSB based CMR and dedicated IMR configured, a SSB and a dedicated IMR configured for L1-SINR shall be considered measurable when for each relevant SSB and IMR the following conditions are met:

- L1-SINR related side conditions given in clauses 10.1.27 and 10.1.28 for FR1 and FR2, respectively, for a corresponding band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.8.2 for a corresponding band.
- NZP-IMR  $\hat{E}_s/I_{ot}$  according to Annex B.2.8.2 for a corresponding band, if NZP-IMR is configured as dedicated IMR.

For CSI-RS based CMR and dedicated IMR configured, a CSI-RS and a dedicated IMR configured for L1-SINR shall be considered measurable when for each relevant CSI-RS and IMR the following conditions are met:

- L1-SINR related side conditions given in clauses 10.1.27 and 10.1.28 for FR1 and FR2, respectively, for a corresponding band,
- CSI-RS<sub>RP</sub> and CSI-RS  $\hat{E}_s/I_{ot}$  according to Annex B.2.8.3 for a corresponding band
- NZP-IMR  $\hat{E}_s/I_{ot}$  according to Annex B.2.8.3 for a corresponding band, if NZP-IMR is configured as dedicated IMR.

### 9.8.3 Measurement Reporting Requirements

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

#### 9.8.3.1 Periodic Reporting

Reported L1-SINR measurements contained in periodic L1-SINR measurement reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

#### 9.8.3.2 Semi-Persistent Reporting

Reported L1-SINR measurements contained in a Semi-Persistent L1-SINR measurement report shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively. This requirement applies for semi-persistent L1-SINR reports sent on PUSCH or PUCCH.

The UE shall only send semi-persistent L1-SINR measurement reports on PUSCH, if a DCI for triggering report has been received.

The UE shall only send semi-persistent L1-SINR measurement reports on PUCCH, if an activation command as described in clause 6.1.3.16 in TS38.321 [7] has been received.

The UE shall transmit the semi-persistent L1-SINR reporting on PUSCH or PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

### 9.8.3.3 Aperiodic Reporting

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

## 9.8.4 L1-SINR measurement requirements

### 9.8.4.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ .

The value of  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$  is defined in Table 9.8.4.1-1 for FR1 and in Table 9.8.4.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;
- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR1,

- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < \text{MGRP}$ )
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).
- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}} - \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{\text{SMTCperiod}} \neq \text{MGRP}$  or
  - $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} < 0.5 * T_{\text{SMTCperiod}}$
- $P = \frac{3}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{\text{SMTCperiod}} = \text{MGRP}$  and  $T_{\text{CSI-RS}} = 0.5 * T_{\text{SMTCperiod}}$
- $P = \frac{1}{1 - \frac{T_{\text{CSI-RS}}}{\min(T_{\text{SMTCperiod}}, \text{MGRP})}}$ , when CSI-RS is partially overlapped with measurement gap ( $T_{\text{CSI-RS}} < \text{MGRP}$ ) and CSI-RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P = \frac{3}{1 - \frac{T_{\text{CSI-RS}}}{\text{MGRP}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{\text{SMTCperiod}} < \text{MGRP}$ )

Where:

$T_{\text{SMTCperiod}}$  = the configured SMTC1 period or SMTC2 period if configured.

$T_{\text{CSI-RS}}$  = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured,  $T_{\text{SMTCperiod}}$  corresponds to the value of higher layer parameter *smtc2*; Otherwise  $T_{\text{SMTCperiod}}$  corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.



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

**Table 9.8.4.1-1: Measurement period  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$  for FR1**

| Configuration           | $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ (ms)   |
|-------------------------|--|
| non-DRX                 | $\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{CSI-RS})$  |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{DRX}, T_{CSI-RS}))$   |
| DRX cycle $> 320$ ms    | $\text{ceil}(M \cdot P) \cdot T_{DRX}$   |
| Note 1:                 | $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2:                 | the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.                                  |

**Table 9.8.4.1-2: Measurement period  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$  for FR2**

| Configuration           | $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ (ms)   |
|-------------------------|--|
| non-DRX                 | $\max(T_{Report}, \text{ceil}(M \cdot P \cdot N) \cdot T_{CSI-RS})$  |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot \max(T_{DRX}, T_{CSI-RS}))$   |
| DRX cycle $> 320$ ms    | $\text{ceil}(M \cdot P \cdot N) \cdot T_{DRX}$   |
| Note 1:                 | $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2:                 | the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.                                  |

#### 9.8.4.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ .

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$  is defined in Table 9.8.4.2-1 for FR1 and in Table 9.8.4.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR,  $M=1$  if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and  $M=3$  otherwise;

For the value of N in FR2

- $N = 8$ .

P is defined as the maximum value between  $P_{CMR}$  and  $P_{IMR}$ , i.e.,  $P = \max(P_{CMR}, P_{IMR})$ , where

- the value of  $P_{CMR}$  shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.
- the value of  $P_{IMR}$  shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 9.8.4.2-1: Measurement period  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$  for FR1**

| Configuration           | $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ (ms)   |
|-------------------------|--|
| non-DRX                 | $\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{SSB})$   |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{DRX}, T_{SSB}))$  |
| DRX cycle $> 320$ ms    | $\text{ceil}(M \cdot P) \cdot T_{DRX}$   |
| Note 1:                 | $T_{SSB} = \text{ssb-periodicityServingCell}$ is the periodicity of the SSB-Index configured for L1-SINR channel measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2:                 | The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.                 |

**Table 9.8.4.2-2: Measurement period  $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$  for FR2**

| Configuration           | $T_{L1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ (ms)   |
|-------------------------|--|
| non-DRX                 | $\max(T_{Report}, \text{ceil}(M \cdot P \cdot N) \cdot T_{SSB})$   |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot \max(T_{DRX}, T_{SSB}))$  |
| DRX cycle $> 320$ ms    | $\text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot T_{DRX}$   |
| Note 1:                 | $T_{SSB} = \text{ssb-periodicityServingCell}$ is the periodicity of the SSB-Index configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2:                 | The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.         |

### 9.8.4.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ .

$T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ .

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$  is defined in Table 9.8.4.3-1 for FR1 and in Table 9.8.4.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON,  $N = \text{ceil}(\text{maxNumberRxBeam} / N_{\text{res\_per\_set}})$ , where  $N_{\text{res\_per\_set}}$  is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between  $P_{\text{CMR}}$  and  $P_{\text{IMR}}$ , i.e.,  $P = \max(P_{\text{CMR}}, P_{\text{IMR}})$ , where

- The value of  $P_{\text{CMR}}$  and  $P_{\text{IMR}}$  shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

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

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 9.8.4.3-1: Measurement period  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$  for FR1**

| Configuration           | $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ (ms)   |
|-------------------------|---|
| non-DRX                 | $\max(T_{Report}, \text{ceil}(M \cdot P) \cdot T_{CSI-RS})$   |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P) \cdot \max(T_{DRX}, T_{CSI-RS}))$  |
| DRX cycle $> 320$ ms    | $\text{ceil}(M \cdot P) \cdot T_{DRX}$  |
| Note 1:                 | $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.                                    |
| Note 2:                 | the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.   |
| Note 3:                 | The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. |

**Table 9.8.4.3-2: Measurement period  $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$  for FR2**

| Configuration           | $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ (ms)   |
|-------------------------|---|
| non-DRX                 | $\max(T_{Report}, \text{ceil}(M \cdot P \cdot N) \cdot T_{CSI-RS})$   |
| DRX cycle $\leq 320$ ms | $\max(T_{Report}, \text{ceil}(1.5 \cdot M \cdot P \cdot N) \cdot \max(T_{DRX}, T_{CSI-RS}))$  |
| DRX cycle $> 320$ ms    | $\text{ceil}(M \cdot P \cdot N) \cdot T_{DRX}$  |
| Note 1:                 | $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.                                    |
| Note 2:                 | the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.   |
| Note 3:                 | The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. |

## 9.8.5 Measurement restriction for L1-SINR measurement

The UE is required to be capable of measuring L1-SINR without measurement gaps. The UE is required to perform the SSB and CSI-RS/CSI-IM measurements with measurement restrictions as described in the following clauses.

### 9.8.5.1 Measurement restriction if SSB configured for L1-SINR Measurement

For FR1, when the SSB configured as CMR for L1-SINR measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for L1-SINR measurement and CSI-RS. Longer measurement period for SSB based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the SSB configured as CMR for L1-SINR measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for L1-SINR measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, there is no measurement restriction allowed when the network configures mixed numerology between SSB configured as CMR for L1-SINR measurement on one FR2 band and CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-

SINR measurement on the other FR2 band, provided that UE is capable of independent beam management on this FR2 band pair.

### 9.8.5.2 Measurement restriction if CSI-RS configured for L1-SINR measurement

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

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

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

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

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

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

### 9.8.5.3 Measurement restriction if CSI-IM configured for L1-SINR measurement

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same

symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and SSB. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as the CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and CSI-RS. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS in a resource set configured with repetition ON, or
  - The CSI-IM or the CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The CSI-RS is configured in  $q_1$  and beam failure is detected, or
  - The CMR for L1-SINR measurement and the CSI-RS are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

## 9.8.6 Scheduling availability of UE during L1-SINR measurement

Scheduling availability restrictions when the UE is performing L1-SINR measurement are described in the following clauses.

### 9.8.6.1 Scheduling availability of UE performing L1-SINR measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-SINR measurement performed on SSB and CSI-RS configured for L1-SINR measurement with the same SCS as PDSCH/PDCCH in FR1.

### 9.8.6.2 Scheduling availability of UE performing L1-SINR measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-SINR measurement based on SSB configured for L1-SINR measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-SINR measurement based on SSB configured for L1-SINR measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking /CSI-RS for CQI on SSB symbols to be measured for L1-SINR measurement.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on serving cell where L1-SINR measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which the serving cell where L1-SINR measurement is performed is configured.

### 9.8.6.3 Scheduling availability of UE performing L1-SINR measurement on FR2

The following scheduling restriction applies due to L1-SINR measurement.

- For the cases of CSI-RS used for L1-SINR measurement of CSI-RS based CMR only case and CSI-RS based CMR plus CSI-RS based ZP-IMR/NZP-IMR case and CSI-RS based CMR plus ZP-IMR case, where CSI-RS is QCLed with active TCI state for PDCCH/PDSCH and not in a CSI-RS resource set with repetition ON, and  $N=1$  applies as specified in clause 9.8.4
  - There are no scheduling restrictions due to L1-SINR measurement performed based on the CSI-RS.

- Otherwise
  - The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on the symbols to be measured for L1-SINR.

When intra-band carrier aggregation is performed, the scheduling restrictions on serving cell where L1-SINR measurement is performed apply to all serving cells in the band on the symbols that fully or partially overlap with restricted symbols.

If following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

for the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for L1-SINR measurement; and

for the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for L1-SINR measurement.

#### 9.8.6.4 Scheduling availability of UE performing L1-SINR measurement on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to L1-SINR measurement performed on FR2 serving cell(s).

There are no scheduling restrictions on FR2 serving cell(s) due to L1-SINR measurement performed on FR1 serving cell(s).

## 9.9 NR measurements for positioning

### 9.9.1 Introduction

This clause contains requirements for UE capable of performing NR positioning measurements defined in TS 38.215 [4], including RSTD, PRS-RSRP, UE Rx-Tx time difference, and NR E-CID measurements.

For RSTD, PRS-RSRP and UE Rx-Tx time difference measurements, the requirements in clauses 9.9.2, 9.9.3 and 9.9.4 apply provided:

- UE is configured with per-UE measurement gaps
- No active BWP switching occurs during the measurement gaps for PRS measurement, and

All measurement requirements specified in clause 9.9.2, 9.9.3 and 9.9.4 shall apply without DRX as well as for any DRX configuration specified in TS 38.331 [2].

UE is not required to perform additional SSB measurement for the SSB configured as QCL source of PRS resources.

UE is only required to measure PRS resources that are fully or partially overlapped with measurement gaps, and the requirements in clause 9.9.2, 9.9.3 and 9.9.4 are applicable to PRS resources that are fully or partially overlapped with measurement gaps.

A PRS resource is considered to be fully (partially) overlapped with measurement gaps if all (some) of its instances are overlapped with a measurement gap occasion. A PRS resource instance is considered to be overlapped with measurement gap occasion if the minimum number of unmuted repetitions of the instance taking into account *nr-DL-PRS-ExpectedRSTD-Uncertainty* and *nr-DL-PRS-ExpectedRSTD* is fully covered by the MGL excluding RF switching time, where the minimum number is given in the accuracy requirements in clause 10.1.23, 10.1.24 and 10.1.25 for RSTD, PRS-RSRP and UE Rx-Tx time difference, respectively.

When UE is configured with measurement for more than one positioning requests, the measurement period for each request may be longer than measurement period when UE is configured with measurement for single positioning request.

## 9.9.2 RSTD measurements

### 9.9.2.1 Introduction

The requirements in clause 9.9.2 shall apply provided the UE has received *NR-DL-TDOA-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to measure and report DL RSTD measurements defined in TS 38.215 [4].

### 9.9.2.2 Requirements Applicability

The requirements in clause 9.9.2 apply for periodic and triggered RSTD measurements, provided:

- PRS-RSTD related side conditions given in clause 10.1.23 for FR1 and FR2 are fulfilled, for a corresponding Band.

### 9.9.2.3 Measurement Capability

UE PRS RSTD measurement capability is as indicated by the UE in *NR-DL-TDOA-ProvideCapabilities*, according to TS 37.355[34].

### 9.9.2.4 Measurement Reporting Requirements

The measurement reporting delay is defined as the time between the moment when the periodic measurement report is triggered and the moment when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The reported RSTD measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in clauses 10.1.23.3.

The RSTD measurements performed and reported according to this section shall meet the RSTD measurement accuracy requirements in clause 10.1.23, for each measured DL PRS resource.

9.9.2.4.1 Void

9.9.2.4.2 Void

9.9.2.4.3 Void

### 9.9.2.5 Measurements Period Requirements

When physical layer receives last of *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message from LMF via LPP [34], the UE shall be able to measure multiple (up to the UE capability specified in Clause 9.9.2.3) DL RSTD measurements, defined in TS 38.215 [4], during the measurement period  $T_{RSTD,Total}$  defined as:

$$T_{RSTD,Total} = \sum_{i=1}^L T_{RSTD,i} + (L - 1) * \max(T_{effect,i})$$

Where ,

$i$  is the index of positioning frequency layer,



$L$  is total number of positioning frequency layers, and

$T_{\text{effect},i}$  is the periodicity of the PRS RSTD measurement in positioning frequency layer  $i$

$T_{\text{RSTD},i}$  is the measurement period for PRS RSTD measurement in positioning frequency layer  $i$  as specified below:

$$T_{\text{RSTD},i} = \left( \text{CSSF}_{\text{PRS},i} * N_{\text{RxBeam},i} * \left\lceil \frac{N_{\text{PRS},i}^{\text{slot}}}{N} \right\rceil \left\lceil \frac{L_{\text{available\_PRS},i}}{N} \right\rceil * N_{\text{sample}} - 1 \right) * T_{\text{effect},i} + T_{\text{last},i},$$

where:

$N_{\text{RxBeam},i}$  is the UE Rx beam sweeping factor. In FR1,  $N_{\text{RxBeam},i} = 1$ ; and in FR2,  $N_{\text{RxBeam},i} = 8$ .

$\text{CSSF}_{\text{PRS},i}$  is the carrier-specific scaling factor for NR PRS-based positioning measurements in positioning frequency layer  $i$  as defined in clause 9.1.5.2.

$N_{\text{PRS},i}^{\text{slot}}$  is the maximum number of DL PRS resources in positioning frequency layer  $i$  configured in a slot.

$L_{\text{available\_PRS},i}$  is the time duration of available PRS in the positioning frequency layer  $i$  to be measured during  $T_{\text{available\_PRS},i}$ , and is calculated in the same way as PRS duration  $K$  defined in clause 5.1.6.5 of TS 38.214 [26]. For calculation of  $L_{\text{available\_PRS},i}$ , only the PRS resources unmuted and fully or partially overlapped with MG are considered.

$N_{\text{sample}}$  is the number of PRS RSTD samples and  $N_{\text{sample}} = 4$ .

$T_{\text{last},i}$  is the measurement duration for the last PRS RSTD sample in positioning frequency layer  $i$ , including the sampling time and processing time,  $T_{\text{last},i} = T_i + T_{\text{available\_PRS},i}$ ,

$T_{\text{effect},i}$  is the periodicity of the PRS RSTD measurement in positioning frequency layer  $i$  defined as:

$$T_{\text{effect},i} = \left\lceil \frac{T_i}{T_{\text{available\_PRS},i}} \right\rceil * T_{\text{available\_PRS},i}$$

Where,

$T_i$  corresponds to *durationOfPRS-ProcessingSymbolsInEveryTms* in TS 37.355 [34],

$T_{\text{available\_PRS},i} = \text{LCM}(T_{\text{PRS},i}, \text{MGRP}_i)$ , the least common multiple between  $T_{\text{PRS},i}$  and  $\text{MGRP}_i$ .

$\text{MGRP}_i$  is the repetition periodicity of the measurement gap applicable for measurement in the PRS frequency layer  $i$ .

$T_{\text{PRS},i}$  is the periodicity of DL PRS resource with muting on positioning frequency layer  $i$ .

If more than one PRS periodicities are configured in positioning frequency layer  $i$ , the least common multiple of PRS periodicities  $T_{\text{per}}^{\text{PRS with muting}}$  among all DL PRS resource sets in the positioning frequency layer is used to derive  $T_{\text{PRS},i}$ , where,

$T_{\text{per}}^{\text{PRS with muting}} = N_{\text{muting}} * T_{\text{per}}^{\text{PRS}}$ , is the PRS periodicity with muting per PRS resource,

$T_{\text{per}}^{\text{PRS}}$  is the periodicity of PRS resource sets given by the higher-layer parameter *DL-PRS-Periodicity*.

$N_{\text{muting}}$  is the scaling factor considering PRS resource muting.  $N_{\text{muting}} = T_{\text{muting}}^{\text{PRS}} * L_{\text{muting}}$ , where

$T_{\text{muting}}^{\text{PRS}}$  is the muting repetition factor given by the higher-layer parameter *DL-PRS-MutingBitRepetitionFactor*, and  $L_{\text{muting}}$  is the size of the bitmap  $\{b^1\}$ .

Note: For the purpose of calculating  $T_{\text{PRS},i}$ , only the PRS resources fully or partially covered by the MG are considered.

$\{N, T\}$  is UE capability combination per band where  $N$  is a duration of DL PRS symbols in ms corresponding to *durationOfPRS-ProcessingSymbols* in TS 37.355 [34] processed every  $T$  ms corresponding to *durationOfPRS-ProcessingSymbolsInEveryTms* in TS 37.355 [34] for a given maximum bandwidth supported by UE corresponding to *supportedBandwidthPRS* in TS 37.355 [34].

$N'$  is UE capability for number of DL PRS resources that it can process in a slot as indicated by *maxNumOfDL-PRS-ResProcessedPerSlot* specified in TS 37.355 [34].

Except for deferred MT-LR as defined in clause 4.1a.5 [TS 23.273], the time  $T_{RSTD,Total}$  starts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after both the *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message are delivered from LMF to the physical layer of UE via LPP [34].

For deferred MT-LR with other event than “Periodic Location” as defined in clause 4.1a.5.1 [TS 23.273], the time  $T_{RSTD,Total}$  starts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after the associated event(s) occurs.

*Editor’s Note: FFS the start of measurement period for deferred MT-LR with “Periodic Location”.*

Note: No per-positioning frequency layer requirement is applied in scenarios when multiple positioning frequency layers are configured.

If during the measurement period of one or more positioning frequency layers, the MG pattern is reconfigured, the measurement period can be longer. When PRS-RSRP is configured for DL-TDOA, RSTD and RSRP are performed over the same measurement period.

The measurement requirements in this clause apply, provided no PRS symbols are dropped during the measurement period  $T_{RSTD,Total}$  within measurement gaps due to collisions with other signals; otherwise, the measurement period can be longer.

If CSSF changes during the measurement period, the measurement period could be longer.

The measurement requirements do not apply for a PRS resource, if the PRS resource is across two sampling duration of  $N$  within duration  $L_{available\_PRS,i}$ .

The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability  $N$ .

The requirements in clause 9.9.2 do not apply if the PRS configuration given by higher layer parameters *NR-DL-PRS-AssistanceData* exceeds any of the UE measurement capabilities given by *NR-DL-PRS-ResourcesCapability* in *NR-DL-TDOA-ProvideCapabilities*, and it is up to UE implementation which PRS resources are measured, subject to UE measurement capabilities.

If handover occurs while RSTD measurements are being performed, then the UE shall continue and complete the ongoing RSTD measurements. The RSTD measurement period can be longer. The UE shall meet the RSTD measurement accuracy requirements in clause 10.1.23.

### 9.9.2.6 Void

## 9.9.3 PRS-RSRP measurements

### 9.9.3.1 Introduction

The requirements in clause 9.9.3.5 shall apply provided the UE has received a message from LMF via LPP [34] requesting the UE to measure and report PRS-RSRP measurements defined in TS 38.215 [4].

### 9.9.3.2 Requirements applicability

The requirements in clause 9.9.3 apply for periodic and triggered PRS-RSRP measurements, provided:

- PRS-RSRP related side conditions given in clause 10.1.24 are met for a corresponding Band.

### 9.9.3.3 Measurement Capability

UE PRS-RSRP measurement capability is as indicated by the UE in *NR-DL-AoD-ProvideCapabilities* according to TS 37.355 [34].

### 9.9.3.4 Measurement Reporting Requirements

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The reported PRS-RSRP measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in clauses 10.1.24.3.

The PRS-RSRP measurement accuracy for all measured PRS resources shall be fulfilled according to the accuracy requirements specified in the clauses 10.1.24.

### 9.9.3.5 Measurement Period Requirements

When the physical layer receives *NR-DL-AoD-ProvideAssistanceData* message and *NR-DL-AoD-RequestLocationInformation* message from LMF via LPP [34], the UE shall be able to measure multiple (up to the UE capability specified in Clause 9.9.3.3) PRS-RSRP measurements, defined in TS 38.215 [4], from configured PRS resources for configured TRPs on configured positioning frequency layers, within  $T_{PRS-RSRP, total}$  ms.

$$T_{PRS-RSRP, total} = \sum_{i=1}^L T_{PRS-RSRP, i} + (L - 1) * \max(T_{effect, i})$$

where

$i$  is the index of positioning frequency layer,

$L$  is total number of positioning frequency layers,

$T_{effect, i}$  is the periodicity of the PRS-RSRP measurement in positioning frequency layer  $i$ .

$$T_{PRS-RSRP, i} = \left( CSSF_i * N_{RxBeam, i} * \left\lceil \frac{N_{PRS, i}^{slot}}{N} \right\rceil \left\lfloor \frac{L_{available\_PRS, i}}{N} \right\rfloor * N_{sample} - 1 \right) * T_{effect, i} + T_{last}$$

where

$CSSF_i$  is the carrier specific scaling factor for PRS-RSRP measurements specified in clause 9.1.5.2,

$N_{RxBeam, i}$  is the scaling factor for Rx beam sweeping, and  $N_{RxBeam, i}=1$  if positioning frequency layer  $i$  is in FR1 and  $N_{RxBeam, i}=8$  if positioning frequency layer  $i$  is in FR2,

$L_{available\_PRS, i}$  is the time duration of available PRS to be measured in the positioning frequency layer  $i$  to be measured during  $T_{available\_PRS, i}$ , and is calculated in the same way as PRS duration  $K$  defined in clause 5.1.6.5 of TS 38.214 [26]. For calculation of  $L_{available\_PRS, i}$ , only the PRS resources unmuted and fully or partially overlapped with MG are considered.

$N_{PRS, i}^{slot}$  is the maximum number of DL PRS resources of positioning frequency layer  $i$  configured in a slot,

$\{N, T\}$  is UE capability combination per band where  $N$  is a duration of DL PRS symbols in ms corresponding to *durationOfPRS-ProcessingSymbols* in TS 37.355 [34] processed every  $T$  ms corresponding to *durationOfPRS-ProcessingSymbolsInEveryTms* in TS 37.355 [34] for a given maximum bandwidth supported by UE corresponding to *supportedBandwidthPRS* in TS 37.355 [34],

$N'$  is UE capability for number of DL PRS resources that it can process in a slot as indicated by *maxNumOfDL-PRS-ResProcessedPerSlot* in clause 6.4.3 of TS 37.355 [34],

$N_{sample}$  is the number of PRS-RSRP measurement samples and  $N_{sample} = 4$ ,

$T_{last} = T_i + T_{available\_PRS, i}$  is the measurement duration for the last PRS-RSRP sample, including the sampling time and processing time,

$T_{\text{effect},i} = \left\lceil \frac{T_i}{T_{\text{available\_PRS},i}} \right\rceil * T_{\text{available\_PRS},i}$  is the periodicity of PRS-RSRP measurement in positioning frequency layer  $i$ ,

$T_i$  corresponds to durationOfPRS-ProcessingSymbolsInEveryTms in TS 37.355 [34],

$T_{\text{available\_PRS},i} = LCM(T_{\text{PRS},i}, MGRP_i)$  is the least common multiple between  $T_{\text{PRS},i}$  and  $MGRP_i$ ,

$T_{\text{PRS},i}$  is the maximum PRS resource periodicity among all PRS resources in positioning frequency layer  $i$ ,

$MGRP_i$  is the measurement gap repetition period in positioning frequency layer  $i$ .

If positioning frequency layer  $i$  has more than one DL PRS resource set with different PRS periodicities with muting,  $T_{\text{per}}^{\text{PRS with muting}} = N_{\text{muting}} * T_{\text{per}}^{\text{PRS}}$ , the least common multiple of  $T_{\text{per}}^{\text{PRS with muting}}$  among the DL PRS resource sets is used to derive  $T_{\text{PRS},i}$ , where:

$T_{\text{per}}^{\text{PRS}}$  is the periodicity of PRS resource sets given by the higher-layer parameter *DL-PRS-Periodicity*.

$N_{\text{muting}}$  is the scaling factor considering PRS resource muting.  $N_{\text{muting}} = T_{\text{muting}}^{\text{PRS}} * L_{\text{muting}}$ , where  $T_{\text{muting}}^{\text{PRS}}$  is the muting repetition factor given by the higher-layer parameter *DL-PRS-MutingBitRepetitionFactor*, and  $L_{\text{muting}}$  is the size of the bitmap  $\{b^1\}$ .

Note: For the purpose of calculating  $T_{\text{PRS},i}$ , only the PRS resources fully or partially covered by the MG are considered.

When PRS-RSRP measurements are configured for DL-AoD, except for deferred MT-LR as defined in clause 4.1a.5 [TS 23.273], the time  $T_{\text{PRS-RSRP,total}}$  starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.

For deferred MT-LR with other event than “Periodic Location” as defined in clause 4.1a.5.1 [TS 23.273], the time  $T_{\text{PRS-RSRP,total}}$  starts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after the associated event(s) occurs.

*Editor’s Note: FFS the start of measurement period for deferred MT-LR with “Periodic Location”.*

Note: No per-positioning frequency layer requirement is applied in scenarios when multiple positioning frequency layers are configured.

When the PRS-RSRP measurement is configured together with RSTD measurement then the PRS-RSRP measurement shall meet the RSTD measurement requirements defined in clause 9.9.2.

When the PRS-RSRP measurement is configured together with UE Rx-Tx time difference measurement then the PRS-RSRP measurement shall meet the UE Rx-Tx time difference measurement requirements defined in clause 9.9.4.

If CSSF changes during the measurement period, the measurement period could be longer.

The measurement requirements do not apply for a PRS resource:

- if the PRS resource is across two sampling duration of  $N$  within duration  $L_{\text{available\_PRS},i}$  OR
- if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability  $N$ .

If during the measurement period of one or more positioning frequency layers, the MG pattern is reconfigured either per UE request or not per UE request, the measurement period can be longer.

The requirements in this section apply, provided no PRS symbols are dropped during the measurement period  $T_{\text{PRS-RSRP,total}}$  within measurement gaps due to collisions with other signals; otherwise, a longer measurement period may be used.

The requirements in clause 9.9.3 do not apply if the PRS configuration given by higher layer parameters *NR-DL-PRS-AssistanceData* exceeds any of the UE measurement capabilities given by *NR-DL-PRS-ResourcesCapability* in *NR-DL-AoD-ProvideCapabilities*, and it is up to UE implementation which PRS resources are measured, subject to UE measurement capabilities.

If handover occurs while PRS-RSRP measurements are being performed then the UE shall complete the ongoing PRS-RSRP measurements session. The PRS-RSRP measurement period can be longer. The UE shall meet the PRS-RSRP measurement accuracy requirements in clause 10.1.24.

## 9.9.4 UE Rx-Tx time difference measurements

### 9.9.4.1 Introduction

The requirements in this clause shall apply, provided the UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to measure and report one or more UE Rx-Tx time difference measurements defined in TS 38.215 [4].

### 9.9.4.2 Requirements Applicability

The requirements in clause 9.9.4 apply for periodic and triggered UE Rx-Tx time difference measurements, provided:

- UE Rx-Tx time difference measurement related side conditions given in clause 10.1.25 are met for a corresponding band.
- SRS is configured on at least one of the PCell, PSCell and SCell.
- The UE transmits SRS within [-160, 160] msec of at least one DL PRS resource of each of the TRPs in the assistance data.

### 9.9.4.3 Measurement Capability

UE Rx-Tx time difference measurement capability is as indicated by the UE in *NR-Multi-RTT-ProvideCapabilities*, according to TS 37.355 [34].

### 9.9.4.4 Measurement Reporting Requirements

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times \text{TTIDCCCH}$  where TTIDCCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The UE Rx-Tx time difference measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in clause 10.1.25.

The UE Rx-Tx time difference measurement accuracy for all measured DL PRS resources shall be fulfilled according to the accuracy requirements specified in clause 10.1.25.

### 9.9.4.5 Measurement Period Requirements

When physical layer receives last of *NR-Multi-RTT-ProvideAssistanceData* message and *NR-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34], UE shall be able to measure multiple (up to the UE capability specified in clause 9.9.4.3) UE Rx-Tx time difference measurements as defined in TS 38.215 [4] in configured positioning frequency layers within the measurement period  $T_{\text{UERxTx,Total}}$  ms.

$$T_{\text{UERxTx,Total}} = \sum_{i=1}^L T_{\text{UERxTx},i} + (L - 1) * \max(T_{\text{effect},i}).$$

where  $i$  is the index of positioning frequency layer,

$T_{\text{UERxTx},i}$  is the measurement period for UE Rx-Tx time difference measurements in positioning frequency layer  $i$  as further defined in this clause,

$L$  is total number of positioning frequency layers, and

$T_{\text{effect},i}$  is the periodicity of the UE Rx-Tx time difference measurement in positioning frequency layer  $i$  as defined further in this clause.

$$T_{\text{UERxTx},i} = \left( \text{CSSF}_i * N_{\text{RxBeam},i} * \left\lceil \frac{N_{\text{PRS},i}^{\text{slot}}}{N'} \right\rceil \left\lfloor \frac{L_{\text{available\_PRS},i}}{N} \right\rfloor * N_{\text{sample}} - 1 \right) * T_{\text{effect},i} + T_{\text{last},i}$$

Where

$\text{CSSF}_i$  is the carrier-specific scaling factor for NR PRS-based measurement in the positioning frequency layer  $i$  as defined in clause 9.1.5.2,

$N_{\text{RxBeam},i}$  is the scaling factor for Rx beam sweeping, and  $N_{\text{RxBeam},i}=1$  if positioning frequency layer  $i$  is in FR1 and  $N_{\text{RxBeam},i}=8$  if positioning frequency layer  $i$  is in FR2,

$L_{\text{available\_PRS},i}$  is the time duration of available PRS resources in the positioning frequency layer  $i$ , to be measured during  $T_{\text{available\_PRS},i}$ , and is calculated in the same way as PRS duration  $K$  defined in clause 5.1.6.5 of TS 38.214 [26]. For calculation of  $L_{\text{available\_PRS},i}$ , only the PRS resources unmuted and fully or partially overlapped with MG are considered.

$N_{\text{PRS},i}^{\text{slot}}$  is the maximum number of DL PRS resources of positioning frequency layer  $i$  configured in a slot,

$\{N, T\}$  is UE capability combination per band where  $N$  is a duration of DL PRS symbols in ms corresponding to *durationOfPRS-ProcessingSymbols* in TS 37.355 [34] processed every  $T$  ms corresponding to *durationOfPRS-ProcessingSymbolsInEveryTms* in TS 37.355 [34] for a given maximum bandwidth supported by UE corresponding to *supportedBandwidthPRS* in clause 4.2.7.2 of TS 37.355 [34],

$N'$  is UE capability for number of DL PRS resources that it can process in a slot corresponding to *maxNumOfDL-PRS-ResProcessedPerSlot* as specified in clause 6.4.3 of TS 37.355 [34],

$N_{\text{sample}}$  is the number of UE Rx-Tx time difference measurement samples and  $N_{\text{sample}} = 4$ ,

$T_{\text{last},i}$  is the measurement duration for the last UE Rx-Tx time difference measurement sample in the positioning layer  $i$ , including the sampling time and processing time,  $T_{\text{last},i} = T_i + T_{\text{available\_PRS},i}$ ,

$T_{\text{effect},i}$  is periodicity of UE Rx-Tx time difference measurement in positioning frequency layer  $i$ :

$$T_{\text{effect},i} = \left\lceil \frac{T_i}{T_{\text{available\_PRS},i}} \right\rceil * T_{\text{available\_PRS},i}$$

where

$T_i$  corresponds to *durationOfPRS-ProcessingSymbolsInEveryTms* in TS 37.355 [34],

$T_{\text{available\_PRS},i} = \text{LCM}(T_{\text{PRS},i}, \text{MGRP}_i)$ , the least common multiple between  $T_{\text{PRS},i}$  and  $\text{MGRP}_i$

$\text{MGRP}_i$  is the measurement gap repetition periodicity in positioning frequency layer  $i$ .

$T_{\text{PRS},i}$  is the PRS resource periodicity in positioning frequency layer  $i$ . If the positioning frequency layer  $i$  has more than one DL PRS resource sets with different PRS periodicities with muting,  $T_{\text{per}}^{\text{PRS with muting}} = N_{\text{muting}} * T_{\text{per}}^{\text{PRS}}$ , the least common multiple of  $T_{\text{per}}^{\text{PRS with muting}}$  among DL PRS resource sets is used to derive  $T_{\text{PRS},i}$ , where

$T_{\text{per}}^{\text{PRS}}$  is the periodicity of PRS resource sets given by the higher-layer parameter *DL-PRS-Periodicity*.

$N_{\text{muting}}$  is the scaling factor considering PRS resource muting.  $N_{\text{muting}} = T_{\text{muting}}^{\text{PRS}} * L_{\text{muting}}$ , where  $T_{\text{muting}}^{\text{PRS}}$  is the muting repetition factor given by the higher-layer parameter *DL-PRS-MutingBitRepetitionFactor*, and  $L_{\text{muting}}$  is the size of the bitmap  $\{b^1\}$ .

Note: For the purpose of calculating  $T_{\text{PRS},i}$ , only the PRS resources fully or partially covered by the MG are considered.

Except for deferred MT-LR as defined in clause 4.1a.5 [TS 23.273], the time  $T_{UE\text{RxTx},\text{Total}}$  starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-Multi-RTT-RequestLocationInformation* message and *NR-Multi-RTT-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.

For deferred MT-LR with other event than “Periodic Location” as defined in clause 4.1a.5.1 [TS 23.273], the time  $T_{UE\text{RxTx},\text{Total}}$  starts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after the associated event(s) occurs.

*Editor’s Note: FFS the start of measurement period for deferred MT-LR with “Periodic Location”.*

Note: No per-positioning frequency layer requirement is applied in scenarios when multiple positioning frequency layers are configured.

The UE Rx-Tx time difference measurement period is restarted if HO occurs during the measurement period and after SRS reconfiguration on the target cell is complete.

The measurement requirements do not apply for a PRS resource:

- if the PRS resource is across two sampling duration of N within duration  $L_{\text{available\_PRS},i}$  OR
- if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability N.

If during the measurement period of one or more positioning frequency layers, the MG pattern is reconfigured either per UE request or not per UE request, the measurement period can be longer.

The requirements in this section apply, provided no PRS symbols are dropped during the measurement period  $T_{UE\text{RxTx},\text{Total}}$  within measurement gaps due to collisions with other signals; otherwise, a longer measurement period may be used.

When PRS-RSRP is configured for multi-RTT, the UE Rx-Tx time difference measurements and PRS-RSRP measurements are performed over the same measurement period.

The requirements in clause 9.9.4 do not apply if the PRS configuration given by higher layer parameters *NR-DL-PRS-AssistanceData* exceeds any of the UE measurement capabilities given by *NR-DL-PRS-ResourcesCapability* in *NR-Multi-RTT-ProvideCapabilities*, and it is up to UE implementation which PRS resources are measured, subject to UE measurement capabilities.

When PSCell or SCell addition or release does not cause SRS reconfiguration during the measurement period, UE continues the UE Rx-Tx time difference measurement, and the measurement period requirements apply.

When PSCell or SCell addition or release causes SRS reconfiguration during the measurement period, UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete.

When SRS is reconfigured without serving cell change during the measurement period, UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration is complete. If UE uplink transmission timing changes due to the network-configured Timing Advance command during the UE Rx-Tx measurement period, then the UE Rx-Tx time difference measurement period is restarted after uplink transmission timing changes, and the UE Rx-Tx time difference measurement period requirements in this clause shall not apply.

If UE uplink transmission timing changes due to the change in the  $N_{\text{TA\_offset}}$  defined in Table 7.1.2-2 during the UE Rx-Tx measurement period, then the UE Rx-Tx time difference measurement period is restarted after uplink transmission timing changes, and the UE Rx-Tx time difference measurement period requirements in this clause shall not apply.

If UE uplink transmission timing changes due to the UE autonomous timing adjustment defined in clause 7.1.2 during the UE Rx-Tx measurement period, then:

- UE Rx-Tx measurement period requirements in this clause shall apply for a cell, which is also the downlink reference cell (defined in section 7.1.1) for SRS transmission.
- UE Rx-Tx measurement period requirements in this clause shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1.1) for SRS transmission. The UE Rx-Tx time difference measurement period may be restarted in such case.

## 9.9.5 NR E-CID measurements

### 9.9.5.1 Introduction

The requirements in clause 9.9.5 shall apply provided the UE has received *nr-ECID-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more of the following measurements for NR E-CID positioning [22]: SS-RSRP, SS-RSRQ, CSI-RSRP, and CSI-RSRQ.

### 9.9.5.2 Measurement Requirements

#### 9.9.5.2.1 Intra-frequency Measurement Requirements

The intra-frequency NR E-CID measurements shall meet the requirements in clause 9.2 and clause 9.10.2, except the measurement reporting requirements. The NR E-CID measurement reporting requirements are defined in clause 9.9.5.2.3.

The reported intra-frequency NR E-CID measurements shall also meet:

- for FR1 SS-RSRP, the accuracy requirements in clauses 10.1.2.1,
- for FR1 SS-RSRQ, the accuracy requirements in clauses 10.1.7.1,
- for FR1 CSI-RSRP, the accuracy requirements in clause 10.1.2.3,
- for FR1 CSI-RSRQ, the accuracy requirements in clause 10.1.7.2,
- for FR2 SS-RSRP, the accuracy requirements in clauses 10.1.3.1,
- for FR2 SS-RSRQ, the accuracy requirements in clauses 10.1.8.1,
- for FR2 CSI-RSRP, the accuracy requirements in clause 10.1.3.3,
- for FR2 CSI-RSRQ, the accuracy requirements in clause 10.1.8.2.

#### 9.9.5.2.2 Inter-frequency Measurement Requirements

The inter-frequency NR E-CID measurements shall meet the requirements in clause 9.3 and 9.10.4, except the measurement reporting requirements. The NR E-CID measurement reporting requirements are defined in clause 9.9.5.2.3.

The reported inter-frequency NR E-CID measurements shall also meet:

- for FR1 SS-RSRP, the accuracy requirements in clauses 10.1.4.1,
- for FR1 SS-RSRQ, the accuracy requirements in clauses 10.1.9.1,
- for FR1 CSI-RSRP, the accuracy requirements 10.1.4.3,
- for FR1 CSI-RSRQ, the accuracy requirements 10.1.9.2,
- for FR2 SS-RSRP, the accuracy requirements in clauses 10.1.5.1,
- for FR2 SS-RSRQ, the accuracy requirements in clauses 10.1.10.1,
- for FR2 CSI-RSRP, the accuracy requirements 10.1.5.3,
- for FR2 CSI-RSRQ, the accuracy requirements 10.1.10.2.



### 9.9.5.2.3 Measurement Reporting Delay

The measurement reporting delay is defined as the time between the moment when the periodic measurement report is triggered and the moment when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The reported NR E-CID measurement values contained in periodically triggered measurement reports shall be based on the measurement report mapping requirements specified in clause 10.1.6 for SS-RSRP and CSI-RSRP, and clause 10.1.11 for SS-RSRQ and CSI-RSRQ.

The UE shall not send any measurement reports as long as no corresponding reporting criteria specified in clause 9.1.4 are fulfilled.

## 9.10 CSI-RS based L3 measurements

### 9.10.1 Introduction

This clause contains general requirements on the UE regarding CSI-RS based measurement reporting in RRC\_CONNECTED state. The requirements are split in intra-frequency and inter-frequency measurements requirements.

The requirements in this clause apply, provided:

- Only one MO is configured per CSI-RS frequency layer, and
- all CSI-RS resources in the same MO are configured with the same *csi-rs-MeasurementBW*, and
- all CSI-RS resources in the same MO are configured with the same periodicity, and
- *associatedSSB* is configured in *CSI-RS-Resource-Mobility* and detectable, and
- the associated SSB is QCLed with the corresponding CSI-RS resources in FR2, and
- the number of CSI-RS resources in any duration that equals to the length of a slot is no larger than UE capability *maxNumberCSI-RS-RRM-RS-SINR*.
- When there are mixed numerologies, the length of a slot is defined based on the smallest SCS

### 9.10.2 CSI-RS based intra-frequency measurements

#### 9.10.2.1 Introduction

A measurement is defined as a CSI-RS based intra-frequency measurement provided that:

- the SCS of the CSI-RS resource of the neighbour cell configured for measurement is the same as the SCS of the CSI-RS resource on the serving cell indicated for measurement, and
- the CP type of the CSI-RS resource of neighbour cell configured for measurement is the same as the CP type of the CSI-RS resource of the serving cell indicated for measurement, and
  - It is applied for SCS = 60KHz
- the centre frequency of the CSI-RS resource of the neighbour cell configured for measurement is the same as the centre frequency of the CSI-RS resource of the serving cell indicated for measurement

The UE shall be able to identify new intra-frequency cells and perform CSI-RSRP, CSI-RSRQ and CSI-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell or the PSCell.

No measurement gap is needed for intra-frequency CSI-RS resources measurements.

For intra-frequency CSI-RS based measurements, UE may cause scheduling restriction as specified in clause 9.10.2.6.

Note: Extended CP for CSI-RS based measurement is not supported in this release.

### 9.10.2.2 Requirements applicability

The measurement of the associated SSB follows the same requirements as SSB based measurements defined in 9.2.

The requirements in clause 9.10.2 apply, provided:

- Only one intra-frequency CSI-RS layer per serving cell is configured, and
- The BW of the CSI-RS on the intra-frequency neighbor cell is within the active BWP of the UE, and
- The associated SSB of the CSI-RS resources being identified or measured are detectable, and the CSI-RS resources configured for CSI-RS based L3 measurements are measurable, and
- The bandwidth of CSI-RS resources of intra-MO is the same as that of the CSI-RS resources configured for the serving cell, and
- All CSI-RS resources on one intra-frequency layer are configured within up to two separate windows where each window is up to 5ms, and
  - for the case of single window further provided
    - The periodicity of the configured CSI-RS resources is 10ms, 20ms or 40ms
  - for the case of two separate windows further provided
    - The two windows are either both fully non-overlapped with MG or both partially overlapped with MG
    - The periodicity of the configured CSI-RS resources is 20ms or 40ms
  - The starting point of the first window is the slot boundary of the serving cell, where the corresponding slot contains the configured L3 CSI-RS resource of the serving cell in the servingCellMO with the smallest offset, and
  - The starting point of the second window if configured is determined by an offset of half of the CSI-RS periodicity in slots with regards to the starting point of the first window, and
- Numerology for intra-frequency CSI-RS and data of serving cell are the same.

An intra-frequency cell shall be considered detectable when for each relevant associated SSB:

- SS-RSRP related side conditions given in clauses 10.1.2.1 and 10.1.3.1 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.7.1 and 10.1.8.1 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.12.1 and 10.1.13.1 for FR1 and FR2, respectively, for a corresponding Band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.2 for a corresponding Band.

A CSI-RS resource shall be considered measurable when for each relevant CSI-RS resource:

- CSI-RSRP related side conditions given in clauses 10.1.2.3 and 10.1.3.3 for FR1 and FR2, respectively, for a corresponding Band,
- CSI-RSRQ related side conditions given in clauses 10.1.7.2 and 10.1.8.2 for FR1 and FR2, respectively, for a corresponding Band,
- CSI-SINR related side conditions given in clauses 10.1.12.2 and 10.1.13.2 for FR1 and FR2, respectively, for a corresponding Band,
- CSI<sub>RP</sub> and CSI-RS  $\hat{E}_s/I_{ot}$  according to Annex B.2.12 for a corresponding Band.

### 9.10.2.3 Number of cells and number of CSI-RS

#### 9.10.2.3.1 Requirements for FR1

For each intra-frequency CSI-RS layer, during each layer 1 measurement period, the UE shall be capable of performing CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements for at least:

- 32 CSI-RSs with different CSI-RS index and/or PCI on the intra-frequency layer, and
- the cells to be monitored based on CSI-RS are the same set or a subset of the cells monitored based on the layer of the associated SSB

#### 9.10.2.3.2 Requirements for FR2

For one single intra-frequency CSI-RS layer in a band, during each layer 1 measurement period, the UE shall be capable of performing CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements for at least:

- 32 CSI-RSs with different CSI-RS index and/or PCI, and
- the cells to be monitored based on CSI-RS are the same set or a subset of the cells monitored based on the layer of the associated SSB.

where this single intra-frequency layer shall be:

- PCC on which UE is configured to report CSI-RS measurement when UE is configured with SA NR operation mode with PCC in the band; or
- PSCC on which UE is configured to report CSI-RS measurement when UE is configured with EN-DC with PSCC in the band; or
- One of the SCCs on which UE is configured to report CSI-RS based measurements when neither PCC nor PSCC is in the same band, so that the selected SCC shall be an SCC where the UE is configured with CSI-RSRP measurement reporting if such SCC exists, otherwise the selected SCC is determined by UE implementation.

The UE shall also be capable of performing CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements for at least 2 CSI-RSs on serving cell for each of the other intra-frequency layer(s) in the same band.

For each FR2 band, UE is only required to measure neighbour cell CSI-RS on the CSI-RS layer, whose associated SSB should be on the same SSB layer as the one where UE is required to measure neighbour cell SSB.

### 9.10.2.4 Measurement Reporting Requirements

Note: The UE is not required to report CSI-RS based L3 measurements when the timing offset between the reference measurement timing and the target CSI-RS in one layer is larger than one CP. If the UE reports CSI-RS based L3 measurements when the timing offset exceeds one CP, the UE may not meet the CSI-RS based L3 measurement accuracy requirements for CSI-RSRP, CSI-RSRQ and CSI-SINR in TS 38.133 section 10.1, which apply only when the timing offset is no larger than one CP.

#### 9.10.2.4.1 Periodic Reporting

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in periodic measurement reports shall meet the requirements in clauses 10.1.2.3, 10.1.3.3, 10.1.7.2, 10.1.8.2, 10.1.12.2 and 10.1.13.2.

#### 9.10.2.4.2 Event-triggered Periodic Reporting

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.1.2.3, 10.1.3.3, 10.1.7.2, 10.1.8.2, 10.1.12.2 and 10.1.13.2.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.10.2.4.3.

### 9.10.2.4.3 Event Triggered Reporting

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.2.3, 10.1.3.3, 10.1.7.2, 10.1.8.2, 10.1.12.2 and 10.1.13.2.

The UE shall not send any event triggered measurement reports as long as no reporting criterion is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than the CSI-RS based measurement defined in clause 9.10.2.5. When L3 filtering is used an additional delay can be expected.

### 9.10.2.5 Intra-frequency measurements without measurement gaps

If a UE is configured with the higher layer parameters *CSI-RS-Resource-Mobility* and *associatedSSB*, the CSI-RS based measurement shall include PSS/SSS detection time of associatedSSB, the time period used to acquire the SFN information and CSI-RS based measurement period without gap.

- PSS/SSS detection time of associatedSSB is the intra-frequency  $T_{PSS/SSS\_sync\_intra}$  in Clause 9.2.5.1.
- The time period used to acquire the SFN information is equal to 0 if the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, the time period used to acquire the SFN information is  $T_{CSI-RS\_SFN\_intra}$  as shown in Table 9.10.2.5-3 for FR1. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.
- If the associatedSSB, which has been detectable at least for the time period  $T_{identify\_intra\_with\_index}$  defined in clause 9.2.5.1, becomes undetectable for a period  $\leq 5$  seconds and then the associatedSSB becomes detectable again with the same spatial reception parameter provided the timing to that cell has not changed more than  $\pm 3200/2^{\mu}$   $T_c$ , where  $\mu$  is the SCS configuration as defined in clause 4.2 of TS 38.211 [3], PSS/SSS detection time and time period used to acquire the SFN information are equal to 0.

The measurement period for CSI-RS based intra-frequency measurements without gaps is as shown in table 9.10.2.5-1 and Table 9.10.2.5-2.

Additionally, for a given CSI-RS resource, if the associated SS/PBCH block is configured but not detected by the UE, or if CSI-RS is configured with associated SSB but not QCL-ed to the associated SSB, the UE is not required to monitor the corresponding CSI-RS resource.

**Table 9.10.2.5-1: Measurement period for intra-frequency CSI-RS based measurements without gaps (FR1)**

| DRX cycle  | $T_{\text{CSI-RS\_measurement\_period\_intra}}$  |
|--|--|
| No DRX   | $\max(200\text{ms}, \text{ceil}(5 \times K_{p\_CSI-RS}) \times \text{CSI-RS period}) \times \text{CSSF}_{\text{intra}}$                                    |
| DRX cycle $\leq 320\text{ms}$  | $\max(200\text{ms}, \text{ceil}(1.5 \times 5 \times K_{p\_CSI-RS}) \times \max(\text{CSI-RS period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle $> 320\text{ms}$   | $\text{ceil}(5 \times K_{p\_CSI-RS}) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$  |
| NOTE 1: The requirements apply assuming CSI-RS configuration with $\{D=3$ with PRBs $\geq 48\}$ . D is frequency domain density for the 1-port CSI-RS for L3 mobility defined in clause 7.4.1 of TS38.211 [6]. |  |

**Table 9.10.2.5-2: Measurement period for intra-frequency CSI-RS based measurements without gaps (FR2)**

| DRX cycle  | $T_{\text{CSI-RS\_measurement\_period\_intra}}$   |
|--|---|
| No DRX   | $\max(400\text{ms}, \text{ceil}(M_{\text{meas\_period\_w/o\_gaps}} \times K_{p\_CSI-RS}) \times \text{CSI-RS period}) \times \text{CSSF}_{\text{intra}}$                                    |
| DRX cycle $\leq 320\text{ms}$  | $\max(400\text{ms}, \text{ceil}(1.5 \times M_{\text{meas\_period\_w/o\_gaps}} \times K_{p\_CSI-RS}) \times \max(\text{CSI-RS period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle $> 320\text{ms}$   | $M_{\text{meas\_period\_w/o\_gaps}} \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$  |
| NOTE 1: The requirements apply assuming CSI-RS configuration with $\{D=3$ with PRBs $\geq 48\}$ . D is frequency domain density for the 1-port CSI-RS for L3 mobility defined in clause 7.4.1 of TS38.211 [6]. |   |

**Table 9.10.2.5-3: Time period for SFN acquisition for intra-frequency CSI-RS based measurements without gaps (FR1)**

| DRX cycle   | $T_{\text{CSI-RS\_SFN\_intra}}$   |
|---|---|
| No DRX  | $\max(200\text{ms}, \text{ceil}(5 \times K_p) \times \text{SMTC period})^{\text{Note 1}} \times \text{CSSF}_{\text{intra}}$                     |
| DRX cycle $\leq 320\text{ms}$   | $\max(2000\text{ms}, \text{ceil}(1.5 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| DRX cycle $> 320\text{ms}$  | $\text{Ceil}(5 \times K_p) \times \text{DRX cycle} \times \text{CSSF}_{\text{intra}}$   |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

$M_{\text{meas\_period\_w/o\_gaps}}$ : For a UE supporting power class 1,  $M_{\text{meas\_period\_w/o\_gaps}} = 40$ . For a UE supporting FR2 power class 2,  $M_{\text{meas\_period\_w/o\_gaps}} = 24$ . For a UE supporting power class 3,  $M_{\text{meas\_period\_w/o\_gaps}} = 24$ . For a UE supporting power class 4,  $M_{\text{meas\_period\_w/o\_gaps}} = 24$ .

$\text{CSSF}_{\text{intra}}$ : it is a carrier specific scaling factor and is determined according to  $\text{CSSF}_{\text{outside\_gap},i}$  in clause 9.1.5.

- if intra-frequency CSI-RS resource is fully non overlapping with measurement gaps,  $K_{p\_CSI-RS}=1$ ;
- if intra-frequency CSI-RS resource is partially overlapping with measurement gaps,  $K_{p\_CSI-RS} = 1/(1 - (\text{CSI-RS resource period} / \text{MGRP}))$ , where CSI-RS resource period  $<$  MGRP.

### 9.10.2.6 Scheduling availability of UE during CSI-RS based intra-frequency measurements

UE is required to be capable of measuring without measurement gaps when CSI-RS resources are completely contained in the active BWP of the UE. Note the configured CSI-RS symbol is indicated in *firstOFDMsymbolInTimeDomain* included in *CSI-RS-ResourceConfigMobility* for RRM. When UE is required to perform CSI-RS based RRM measurements, and any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note same numerology for intra-frequency CSI-RS and data of serving cell is considered in this release.

#### 9.10.2.6.1 Scheduling availability of UE performing CSI-RS based measurements in TDD bands

When UE performs CSI-RS intra-frequency measurements in a TDD band,

- UE is not expected to transmit PUCCH/PUSCH/SRS on configured CSI-RS resource symbols, and on 1 OFDM symbol before and after each consecutively configured CSI-RS symbols.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

#### 9.10.2.6.2 Scheduling availability of UE performing CSI-RS based measurements in FR2

When the UE performs CSI-RS based intra-frequency measurements for L3 mobility management in FR2, the following restrictions apply.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on the configured CSI-RS symbol within the configured slot as indicated in *slotConfig* of the corresponding CSI-RS resource to be measured for mobility.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to CSI-RSRP, CSI-RSRQ or CSI-SINR measurement on an FR2 intra-frequency cell in different bands, provided that UE is capable of independent beam management on this FR2 band pair.

### 9.10.3 CSI-RS based Inter-frequency measurements

#### 9.10.3.1 Introduction

A measurement is defined as a CSI-RS based inter-frequency measurement provided it is not defined as an intra-frequency measurement according to clause 9.10.2.

If a UE is configured with the higher layer parameter *CSI-RS-Resource-Mobility* and the higher layer parameter *associatedSSB* is configured, the UE shall be able to identify inter-frequency cells indicated for measurement and perform CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements of identified inter-frequency cells.

When measurement gaps are needed, the UE is not expected to detect the associated SSB nor perform measurement of the CSI-RS resource configured in *CSI-RS-Resource-Mobility* on an inter-frequency measurement object which start earlier than the gap starting time + switching time, and ends later than the gap end – switching time. When the inter-frequency cells are in FR2 and the per-FR gap is configured to the UE in EN-DC, SA NR, NE-DC and NR-DC, or the serving cells are in FR2, the inter-frequency cells are in FR2 and the per-UE gap is configured to the UE in SA NR and NR-DC, the switching time is 0.25ms. Otherwise the switching time is 0.5ms.

#### 9.10.3.2 Requirements applicability

The associated SSB layer of the CSI-RS follows the same requirements as SSB based measurements defined in 9.3.

The requirements in clause 9.10.3 apply, provided:

- The associated SSB of the cell being identified or measured is detectable, and
- All CSI-RS resources on one inter-frequency layer are configured within a window of up to 5ms, and
- The periodicity of the configured CSI-RS resources is 10ms, 20ms or 40ms, and
- CSI-RS resources for measurements and the associated SSB for cell identification are configured within measurement gap.

An inter-frequency cell shall be considered detectable when for each relevant associated SSB:

- SS-RSRP related side conditions given in clauses 10.1.4.1 and 10.1.5.1 for FR1 and FR2, respectively, for a corresponding Band,

- SS-RSRQ related side conditions given in clauses 10.1.9.1 and 10.1.10.1 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.14.1 and 10.1.15.1 for FR1 and FR2, respectively, for a corresponding Band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.3 for a corresponding Band.

A CSI-RS resource shall be considered measurable when for each relevant CSI-RS resource:

- CSI-RSRP related side conditions given in clauses 10.1.4.3 and 10.1.5.3 for FR1 and FR2, respectively, for a corresponding Band,
- CSI-RSRQ related side conditions given in clauses 10.1.9.2 and 10.1.10.2 for FR1 and FR2, respectively, for a corresponding Band,
- CSI-SINR related side conditions given in clauses 10.1.14.2 and 10.1.15.2 for FR1 and FR2, respectively, for a corresponding Band,
- CSI<sub>RP</sub> and CSI-RS  $\hat{E}_s/I_{ot}$  according to Annex B.2.13 for a corresponding Band.

### 9.10.3.3 Number of cells and number of CSI-RS resources

#### 9.10.3.3.1 Requirements for FR1

For each inter-frequency CSI-RS layer, during each layer 1 measurement period, the UE shall be capable of performing CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements for at least:

- 14 CSI-RSs with different CSI-RS index and/or PCI, and
- The cells to be monitored based on CSI-RS are the same set or a subset of the cells monitored based on the layer of the associated SSB.

#### 9.10.3.3.2 Requirements for FR2

For each inter-frequency CSI-RS layer, during each layer 1 measurement period, the UE shall be capable of performing CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements for at least:

- 24 CSI-RSs with different CSI-RS index and/or PCI, and
- The cells to be monitored based on CSI-RS are the same set or a subset of the cells monitored based on the layer the associated SSB.

### 9.10.3.4 Measurements reporting requirements

Note: The UE is not required to report CSI-RS based L3 measurements when the timing offset between the reference measurement timing and the target CSI-RS in one layer is larger than one CP. If the UE reports CSI-RS based L3 measurements when the timing offset exceeds one CP, the UE may not meet the CSI-RS based L3 measurement accuracy requirements for CSI-RSRP, CSI-RSRQ and CSI-SINR in TS 38.133 section 10.1, which apply only when the timing offset is no larger than one CP.

#### 9.10.3.4.1 Periodic Reporting

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.2, 10.1.5.2, 10.1.9.2, 10.1.10.2, 10.1.14.2 and 10.1.15.2.

#### 9.10.3.4.2 Event-triggered Periodic Reporting

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.2, 10.1.5.2, 10.1.9.2, 10.1.10.2, 10.1.14.2 and 10.1.15.2.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.10.3.4.3.

#### 9.10.3.4.3 Event-triggered Reporting

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.2, 10.1.5.2, 10.1.9.2, 10.1.10.2, 10.1.14.2 and 10.1.15.2.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within CSI-RS based measurement defined in clause 9.10.3.5. When L3 filtering is used an additional delay can be expected.

#### 9.10.3.5 Inter frequency measurements with measurement gaps

When measurement gaps are provided, if configured with the higher layer parameters *CSI-RS-Resource-Mobility* and *associatedSSB*, the UE shall be able to identify a new detectable CSI-RS based inter frequency cell within  $T_{CSI-RS\_identify\_inter}$ ,

$$T_{CSI-RS\_identify\_inter} = (T_{PSS/SSS\_sync} + T_{CSI-RS\_measurement\_period\_inter} + T_{CSI-RS\_SFN\_inter}) \text{ ms}$$

Where:

$T_{PSS/SSS\_sync}$  is the time period used in PSS/SSS detection which is determined according to  $T_{PSS/SSS\_sync\_inter}$  in clause 9.3.4,

$T_{CSI-RS\_SFN\_inter}$  is the time period used to acquire the SFN information of the cell being measured, which is shown in Table 9.10.3.5-3 for FR1 and equals inter-frequency  $T_{SSB\_time\_index\_inter}$  in Clause 9.3.4 for FR2,

$T_{CSI-RS\_measurement\_period\_inter}$ : equal to a measurement period of CSI-RS based measurement given in table 9.10.3.5-1 and table 9.10.3.5-2.

$M_{meas\_period\_inter}$ : For a UE supporting FR2 power class 1,  $M_{meas\_period\_inter} = 8 \times N$  samples. For a UE supporting FR2 power class 2,  $M_{meas\_period\_inter} = 5 \times N$  samples. For a UE supporting FR2 power class 3,  $M_{meas\_period\_inter} = 5 \times N$  samples. For a UE supporting FR2 power class 4,  $M_{meas\_period\_inter} = 5 \times N$  samples. Note that scaling factor  $N = [8].CSSF_{inter}$ ; it is a carrier specific scaling factor and is determined according to  $CSSF_{within\_gap,i}$  in clause 9.1.5 for measurement conducted within measurement gaps.

Additionally, for a given CSI-RS resource, if the associated SSB is configured but not detected by the UE, or if CSI-RS configured with associated SSB but not QCL-ed to the associated SSB, the UE is not required to monitor the corresponding CSI-RS resource.

**Table 9.10.3.5-1: Measurement period for CSI-RS based inter-frequency measurements with gaps (FR1)**

| Condition <sup>NOTE1,2</sup>   | $T_{CSI-RS\_measurement\_period\_inter}$  |
|--|---|
| No DRX   | $\text{Max}(200\text{ms}, 8 \times \text{Max}(\text{MGRP}, \text{CSI-RS period})) \times \text{CSSF}_{inter}$   |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(200\text{ms}, \text{Ceil}(8 \times 1.5) \times \text{Max}(\text{MGRP}, \text{CSI-RS period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$ |
| DRX cycle $> 320\text{ms}$   | $8 \times \text{DRX cycle} \times \text{CSSF}_{inter}$  |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |   |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |   |



**Table 9.10.3.5-2: Measurement period for CSI-RS based inter-frequency measurements with gaps (FR2)**

| Condition <sup>NOTE1,2</sup>   | $T_{\text{CSI-RS\_measurement\_period\_inter}}$  |
|--|--|
| No DRX   | $\text{Max}(400 \text{ ms}, M_{\text{meas\_period\_inter}} \times \text{Max}(\text{MGRP, CSI-RS period})) \times \text{CSSF}_{\text{inter}}$                         |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(400 \text{ ms}, (1.5 \times M_{\text{meas\_period\_inter}}) \times \text{Max}(\text{MGRP, CSI-RS period, DRX cycle})) \times \text{CSSF}_{\text{inter}}$ |
| DRX cycle $> 320\text{ms}$   | $M_{\text{meas\_period\_inter}} \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$   |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |  |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |  |

**Table 9.10.3.5-3: Time period for SFN acquisition for interfrequency CSI-RS based measurements with gaps (FR1)**

| Condition <sup>NOTE1,2</sup>   | $T_{\text{CSI-RS\_SFN\_inter}}$  |
|--|--|
| No DRX   | $\text{Max}(200\text{ms}, 5 \times \text{Max}(\text{MGRP, SMTC period})) \times \text{CSSF}_{\text{inter}}$                                    |
| DRX cycle $\leq 320\text{ms}$  | $\text{Max}(200\text{ms}, \text{Ceil}(5 \times 1.5) \times \text{Max}(\text{MGRP, SMTC period, DRX cycle})) \times \text{CSSF}_{\text{inter}}$ |
| DRX cycle $> 320\text{ms}$   | $5 \times \text{DRX cycle} \times \text{CSSF}_{\text{inter}}$  |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1  |  |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |  |

## 9.11 NR measurements with autonomous gaps

### 9.11.1 Introduction

The requirements in this clause are applicable for CGI identification of an intra frequency and inter frequency NR target cell.

The requirements in this clause are specified for CGI identification of an NR target cell and are applicable for a UE:

- in RRC\_CONNECTED state, and
- configured with SA or NR-DC or NE-DC operation mode, or with EN-DC operation mode for CGI identification requested by NR PSCell.

The overall CGI reporting delay is defined in clause 9.11.3.

### 9.11.2 CGI identification of an NR cell with autonomous gaps

The UE shall identify and report the CGI of a known NR target cell when requested by the network for the purpose of reportCGI. Only one cell is provided to the UE with *cellForWhichToReportCGI* for identifying the CGI. The UE may make autonomous gaps in both downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3 of TS 38.331 [2]. Note that a UE is not required to use autonomous gap if *useAutonomousGaps* is set to false. If autonomous gaps are used for measurement with the purpose of reportCGI, regardless of whether DRX is used or not, or whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of NR cell within:

$$T_{\text{identify\_CGI}} = (T_{\text{MIB}} + T_{\text{SIB1}}) \text{ ms}$$

Where:

$T_{\text{MIB}}$  is the time period used to acquire MIB message.  $T_{\text{MIB}} = 6 * T_{\text{SMTC}}$  ms for target cell carrier frequency on FR1 and  $T_{\text{MIB}} = 25 * T_{\text{SMTC}}$  ms for target cell carrier frequency on FR2.

$T_{\text{SIB1}}$  is the time period used to acquire SIB1 message.  $T_{\text{SIB1}} = 6 * T_{\text{RMSI-scheduling}}$  ms.

Where  $T_{\text{SMTC}}$  is the SMTC periodicity configured for the target cell measurement, and  $T_{\text{RMSI-scheduling}}$  is

- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and 20ms when SSB and RMSI CORESET multiplexing pattern is 1
- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and  $T_{\text{SMTC}}$  when SSB and RMSI CORESET multiplexing pattern is 2 or 3.

The requirement for identifying the CGI of an NR cell within  $T_{\text{identify\_CGI}}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

Within the time  $T_{\text{identify\_CGI}}$ , over which the UE identifies the CGI of an NR cell, the UE shall fulfil interruption requirements specified in,

- Clause 8.2.1.2.16 for NR serving cells and Clause 7.32.2.15 in TS36.133 [15] for E-UTRA serving cells if the UE is configured with EN-DC operation mode,
- Clause 8.2.2.2.14 if the UE is configured with SA operation mode,
- Clause 8.2.3.2.14 for NR serving cells and Clause 7.36.2.14 in TS36.133 [15] for E-UTRA serving cells if the UE is configured with NE-DC operation mode,
- Clause 8.2.4.2.11 if the UE is configured with NR-DC operation mode.

In the requirement a cell is known if,

- During the last 5 seconds for FR1 or 3 seconds for FR2 before the reception of the report CGI command:
  - The UE has sent a valid L3-RSRP measurement report with SSB index for the target cell and
- During MIB decoding at least reported SSBs remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 of TS 38.133, and
- During SIB1 decoding the SSB used for MIB decoding remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 of TS 38.133, and
- During MIB decoding, the SSB for MIB decoding remains detectable with  $\text{SNR} \geq -3\text{dB}$
- During SIB1 decoding, the PDSCH for SIB1 decoding remains detectable with  $\text{SNR} \geq -3\text{dB}$

### 9.11.3 CGI reporting delay

The CGI reporting delay is defined as the time between a command that will trigger a CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of  $2 \times T_{\text{TI}_{\text{DCCH}}}$  resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than  $T_{\text{identify\_CGI}}$  defined in clause 9.11.2 plus RRC procedure delay defined in clause 12 in TS 38.331 [2], and additional 20ms margin if target cell is on FR2.

## 10 Measurement Performance requirements

### 10.1 NR measurements

#### 10.1.1 Introduction

The requirements in clause 10.1 apply as follows:

- intra-frequency requirements apply for PCell measurements in SA, NR-DC, or NE-DC operation mode,
- intra-frequency requirements apply for PSCell measurements in NR-DC or EN-DC operation mode,

- intra-frequency requirements apply for SCell measurements in SA operation mode with NR CA or any MR-DC operation mode with NR CA,
- inter-frequency requirements apply for non-serving cell measurements on NR carrier frequencies.
- inter-frequency requirements apply for measurements from one cell on a frequency compared to the measurement from another cell on a different frequency.

In the requirements of clause 10.1, the exceptions for side conditions apply as follows:

- for the UE capable of CA but not configured with any SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1 for UE supporting CA in FR1, and clause B.3.2.3 for UE supporting CA in FR2, respectively;
- for the UE capable of CA and configured with at least one SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.2 for UE configured with CA in FR1, and clause B.3.2.4 for UE supporting CA in FR2 respectively;
- for the UE capable of SUL but not configured with SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1;
- for the UE capable of SUL and configured with at least one SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.2 for UE configured with SUL in FR1.

## 10.1.2 Intra-frequency RSRP accuracy requirements for FR1

### 10.1.2.1 Intra-frequency SS-RSRP accuracy requirements

#### 10.1.2.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR1. The accuracy requirements in this clause are also applicable when *highSpeedMeasFlag-r16* is configured.

The accuracy requirements in Table 10.1.2.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR1

| Accuracy         |                   | Conditions                 |   |                              |                              |                     |                     |
|------------------|-------------------|----------------------------|---|------------------------------|------------------------------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 1</sup> range   |                              |                              |                     |                     |
|                  |                   |                            | NR operating band groups <sup>Note 2</sup>  | Minimum $I_o$                |                              | Maximum $I_o$       |                     |
| dB               | dB                | dB                         |   | dBm / $SCS_{SSB}$            |                              | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                            |   | $SCS_{SSB} = 15 \text{ kHz}$ | $SCS_{SSB} = 30 \text{ kHz}$ |                     |                     |
| $\pm 4.5$        | $\pm 9$           | $\geq -6$                  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A  | -121                         | -118                         | N/A                 | -70                 |
|                  |                   |                            | NR_FDD_FR1_B  | -120.5                       | -117.5                       | N/A                 | -70                 |
|                  |                   |                            | NR_TDD_FR1_C  | -120                         | -117                         | N/A                 | -70                 |
|                  |                   |                            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D   | -119.5                       | -116.5                       | N/A                 | -70                 |
|                  |                   |                            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E   | -119                         | -116                         | N/A                 | -70                 |
|                  |                   |                            | NR_FDD_FR1_F  | -118.5                       | -115.5                       | N/A                 | -70                 |
|                  |                   |                            | NR_FDD_FR1_G  | -118                         | -115                         | N/A                 | -70                 |
|                  |                   |                            | NR_FDD_FR1_H  | -117.5                       | -114.5                       | N/A                 | -70                 |
| $\pm 8$          | $\pm 11$          | $\geq -6$                  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | N/A                          | N/A                          | -70                 | -50                 |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

10.1.2.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR1. The accuracy requirements in this clause are also applicable when *highSpeedMeasFlag-r16* is configured.

The accuracy requirements in Table 10.1.2.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.2-1: SS-RSRP Intra frequency relative accuracy in FR1

| Accuracy         |                   |                                      | Conditions                                     |                              |                              |                            |                            |
|------------------|-------------------|--------------------------------------|--|------------------------------|------------------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $l_o$ Note 1 range                             |                              |                              |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 4             | Minimum $l_o$                |                              | Maximum $l_o$              |                            |
| dB               | dB                | dB                                   |  | dBm / $SCS_{SSB}$            |                              | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      |  | $SCS_{SSB} = 15 \text{ kHz}$ | $SCS_{SSB} = 30 \text{ kHz}$ |                            |                            |
| $\pm 2$          | $\pm 3$           | $\geq 3$                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                         | -118                         | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_B                                   | -120.5                       | -117.5                       | N/A                        | -50                        |
|                  |                   |                                      | NR_TDD_FR1_C                                   | -120                         | -117                         | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                       | -116.5                       | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                         | -116                         | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_F                                   | -118.5                       | -115.5                       | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_G                                   | -118                         | -115                         | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_H                                   | -117.5                       | -114.5                       | N/A                        | -50                        |
| $\pm 3$          | $\pm 3$           | $\geq 6$                             | Note 3   | Note 3                       | Note 3                       | N/A                        | Note 3                     |

NOTE 1:  $l_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $l_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.2.2 Void

### 10.1.2.3 Intra-frequency CSI-RSRP accuracy requirements

#### 10.1.2.3.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the same center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR1.

The accuracy requirements in Table 10.1.2.3.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.2.3.1-1.- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

**Table 10.1.2.3.1-1: CSI-RSRP Intra frequency absolute accuracy in FR1**

| Accuracy         |                   | Conditions             |  |  |                                |                                |                           |                           |
|------------------|-------------------|------------------------|--|--|--------------------------------|--------------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}$ s/lot | NR operating band groups <sup>Note 2</sup>   | I <sub>o</sub> <sup>Note 1</sup> range |                                |                                | Maximum I <sub>o</sub>    |                           |
|                  |                   |                        |  | Minimum I <sub>o</sub>                 |                                |                                |                           |                           |
| dB               | dB                | dB                     |  | dBm / SCS <sub>CSI-RS</sub>            |                                |                                | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                        |  | SCS <sub>CSI-RS</sub> = 15 kHz         | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |                           |                           |
| ±4.5             | ±9                | ≥6                     | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A   | -121                                   | -118                           | -115                           | N/A                       | -70                       |
|                  |                   |                        | NR_FDD_FR1_B   | -120.5                                 | -117.5                         | -114.5                         | N/A                       | -70                       |
|                  |                   |                        | NR_TDD_FR1_C   | -120                                   | -117                           | -114                           | N/A                       | -70                       |
|                  |                   |                        | NR_FDD_FR1_D, NR_TDD_FR1_D   | -119.5                                 | -116.5                         | -113.5                         | N/A                       | -70                       |
|                  |                   |                        | NR_FDD_FR1_E, NR_TDD_FR1_E   | -119                                   | -116                           | -113                           | N/A                       | -70                       |
|                  |                   |                        | NR_FDD_FR1_F   | -118.5                                 | -115.5                         | -112.5                         | N/A                       | -70                       |
|                  |                   |                        | NR_FDD_FR1_G   | -118                                   | -115                           | -112                           | N/A                       | -70                       |
|                  |                   |                        | NR_FDD_FR1_H   | -117.5                                 | -114.5                         | -111.5                         | N/A                       | -70                       |
| ±8               | ±11               | ≥6                     | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H | N/A                                    | N/A                            | N/A                            | -70                       | -50                       |

NOTE 1: I<sub>o</sub> is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

**10.1.2.3.2 Relative CSI-RSRP Accuracy**

The relative accuracy of CSI-RSRP is defined as the CSI-RSRP measured from one cell compared to the CSI-RSRP measured from another cell on the same center frequency, or between any two CSI-RSRP levels measured on the same cell in FR1.

The accuracy requirements in Table 10.1.2.3.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.2.3.2-1. - The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

Table 10.1.2.3.2-1: CSI-RSRP Intra frequency relative accuracy in FR1

| Accuracy         |                   | Conditions                              |  |  |  |  |                           |                           |
|------------------|-------------------|---|--|--|--|--|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$<br>Note 2 | NR operating band groups<br>Note 4             | $I_0$ Note 1 range                     |  |  | Maximum $I_0$             |                           |
|                  |                   |   |  | Minimum $I_0$                          |  |  |                           |                           |
| dB               | dB                | dB                                      |  | dBm / $SCS_{\text{CSI-RS}}$            |  |  | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |   |  | $SCS_{\text{CSI-RS}} = 15 \text{ kHz}$ | $SCS_{\text{CSI-RS}} = 30 \text{ kHz}$ | $SCS_{\text{CSI-RS}} = 60 \text{ kHz}$ |                           |                           |
| $\pm 2$          | $\pm 3$           | $\geq -3$                               | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                                   | -118                                   | -115                                   | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_B                                   | -120.5                                 | -117.5                                 | -114.5                                 | N/A                       | -50                       |
|                  |                   |   | NR_TDD_FR1_C                                   | -120                                   | -117                                   | -114                                   | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                                 | -116.5                                 | -113.5                                 | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                                   | -116                                   | -113                                   | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_F                                   | -118.5                                 | -115.5                                 | -112.5                                 | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_G                                   | -118                                   | -115                                   | -112                                   | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_H                                   | -117.5                                 | -114.5                                 | -111.5                                 | N/A                       | -50                       |
| $\pm 3$          | $\pm 3$           | $\geq -6$                               | Note 3   | Note 3                                 | Note 3                                 | Note 3                                 | N/A                       | Note 3                    |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter CSI-RS  $\hat{E}_s/\text{lot}$  is the minimum CSI-RS  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.2B Intra-frequency RSRP accuracy requirements for FR1 for CA/DC Idle Mode Measurements

### 10.1.2B.1 Intra-frequency SS-RSRP accuracy requirements

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRP.

#### 10.1.2B.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to the serving cell in FR1.

The accuracy requirements in Table 10.1.2B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.1.2 for a corresponding Band for each relevant SSB.

Table 10.1.2B.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR1

| Accuracy         |                   | Conditions |   |                             |                             |                           |                           |
|------------------|-------------------|------------|---|-----------------------------|-----------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB Es/lot | Io <sup>Note 1</sup> range  |                             |                             |                           |                           |
|                  |                   |            | NR operating band groups <sup>Note 2</sup>  | Minimum Io                  |                             | Maximum Io                |                           |
| dB               | dB                | dB         |   | dBm / SCS <sub>SSB</sub>    |                             | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |                           |                           |
| ±6               | ±10.5             | ≥-4        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A  | -121                        | -118                        | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_B  | -120.5                      | -117.5                      | N/A                       | -70                       |
|                  |                   |            | NR_TDD_FR1_C  | -120                        | -117                        | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D   | -119.5                      | -116.5                      | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E   | -119                        | -116                        | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_F  | -118.5                      | -115.5                      | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_G  | -118                        | -115                        | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_H  | -117.5                      | -114.5                      | N/A                       | -70                       |
| ±9.5             | ±12.5             | ≥-4        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | N/A                         | N/A                         | -70                       | -50                       |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.3 Intra-frequency RSRP accuracy requirements for FR2

#### 10.1.3.1 Intra-frequency SS-RSRP accuracy requirements

##### 10.1.3.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.3.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].



**Table 10.1.3.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2**

| Accuracy   |                   | Conditions         |   |                      |                     |
|--|-------------------|--------------------|---|----------------------|---------------------|
| Normal condition   | Extreme condition | SSB $\hat{E}s/lot$ | $I_o$ <sup>Note 2</sup> range   |                      |                     |
|  |                   |                    | Minimum $I_o$   |                      | Maximum $I_o$       |
| dB   | dB                | dB                 | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                      | dBm/ $BW_{Channel}$ |
|  |                   |                    | $SCS_{SSB} = 120kHz$  | $SCS_{SSB} = 240kHz$ |                     |
| $\pm 6$  | $\pm 9$           | $\geq -6$          | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |                      | N/A                 |
| $\pm 8$  | $\pm 11$          |                    | N/A   |                      | -70                 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table. |                   |                    |   |                      |                     |

### 10.1.3.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR2.

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.3.1.2-1: SS-RSRP Intra frequency relative accuracy in FR2**

| Accuracy  |                   | Conditions         |   |                      |                     |
|---|-------------------|--------------------|---|----------------------|---------------------|
| Normal condition  | Extreme condition | SSB $\hat{E}s/lot$ | $I_o$ <sup>Note 2</sup> range   |                      |                     |
|   |                   |                    | Minimum $I_o$   |                      | Maximum $I_o$       |
| dB  | dB                | dB                 | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                      | dBm/ $BW_{Channel}$ |
|   |                   |                    | $SCS_{SSB} = 120kHz$  | $SCS_{SSB} = 240kHz$ |                     |
| $\pm 6$   | $\pm 9$           | $\geq -6$          | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |                      | -50                 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table.<br>Note 4: The parameter SSB $\hat{E}s/lot$ is the minimum SSB $\hat{E}s/lot$ of the pair of cells to which the requirement applies. |                   |                    |   |                      |                     |

10.1.3.2 Void

10.1.3.3 Intra-frequency CSI-RSRP accuracy requirements

10.1.3.3.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the same center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR2.

The accuracy requirements in Table 10.1.3.3.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB(s).
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.3.3.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.3.3.1-1: CSI-RSRP Intra frequency absolute accuracy in FR2**

| Accuracy  |                   | Conditions                    |   |                                       |                           |
|---|-------------------|-------------------------------|---|---------------------------------------|---------------------------|
| Normal condition  | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                                       |                           |
|   |                   |                               | Minimum $I_o$   |                                       | Maximum $I_o$             |
| dB  | dB                | dB                            | dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 1</sup>   |                                       | dBm/BW <sub>Channel</sub> |
|   |                   |                               | $SCS_{\text{CSI-RS}} = 60\text{kHz}$  | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |                           |
| $\pm 6$   | $\pm 9$           | $\geq -6$                     | Same value as CSI-RS_RP in Table B.2.12-2, according to UE Power class, operating band and angle of arrival |                                       | N/A                       |
| $\pm 8$   | $\pm 11$          |                               | N/A   |                                       | -70                       |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                               |   |                                       |                           |

10.1.3.3.2 Relative CSI-RSRP Accuracy

The relative accuracy of CSI-RSRP is defined as the CSI-RSRP measured from one cell compared to the CSI-RSRP measured from another cell on the same center frequency, or between any two CSI-RSRP levels measured on the same cell in FR2.

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB(s).
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band for each CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.3.3.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.3.3.2-1: CSI-RSRP Intra frequency relative accuracy in FR2**

| Accuracy   |                   | Conditions                    |  |                                |
|--|-------------------|-------------------------------|--|--------------------------------|
| Normal condition   | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range  |                                |
|  |                   |                               | Minimum $I_o$  | Maximum $I_o$                  |
| dB   | dB                | dB                            | dBm / SCS <sup>Note 1</sup>  |                                |
|  |                   |                               | SCS <sup>CSI-RS</sup> = 60kHz  | SCS <sup>CSI-RS</sup> = 120kHz |
|  |                   |                               | dBm/BW <sub>Channel</sub>  |                                |
| ±6   | ±9                | ≥-6                           | Same value as CSI-RS <sub>RP</sub> in Table B.2.12-2, according to UE Power class, operating band and angle of arrival |                                |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table.<br>Note 4: The parameter CSI-RS $\hat{E}_s/\text{lot}$ is the minimum CSI-RS $\hat{E}_s/\text{lot}$ of the pair of cells to which the requirement applies. |                   |                               |  |                                |

### 10.1.3B Intra-frequency RSRP accuracy requirements for FR2 for CA/DC Idle Mode Measurements

#### 10.1.3B.1 Intra-frequency SS-RSRP accuracy requirements

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRP.

### 10.1.3B.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to the serving cell in FR2.

The accuracy requirements in Table 10.1.3B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.1.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.3B.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2**

| Accuracy  |                   | Conditions                 |   |                             |                     |
|---|-------------------|----------------------------|---|-----------------------------|---------------------|
| Normal condition  | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                             |                     |
|   |                   |                            | Minimum $I_o$   |                             | Maximum $I_o$       |
| dB  | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                             | dBm/ $BW_{Channel}$ |
|   |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |                     |
| $\pm 7.5$   | $\pm 10.5$        | $\geq -4$                  | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |                             | N/A                 |
| $\pm 9.5$   | $\pm 12.5$        |                            | N/A   |                             | -70                 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                            |   |                             |                     |

## 10.1.4 Inter-frequency RSRP accuracy requirements for FR1

### 10.1.4.1 Inter-frequency SS-RSRP accuracy requirements

#### 10.1.4.1.1 Absolute Accuracy of SS-RSRP in FR1

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.4.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.4.1.1-1: SS-RSRP Inter frequency Absolute accuracy in FR1

| Accuracy         |                   | Conditions                       |   |                      |                      |                     |                     |
|------------------|-------------------|----------------------------------|---|----------------------|----------------------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/I_{ot}$<br>Note 2 | $I_o$ Note 1 range  |                      |                      |                     |                     |
|                  |                   |                                  | NR operating band groups<br>Note 3  | Minimum $I_o$        |                      | Maximum $I_o$       |                     |
| dB               | dB                | dB                               |   | dBm / $SCS_{SSB}$    |                      | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                                  |   | $SCS_{SSB} = 15$ kHz | $SCS_{SSB} = 30$ kHz |                     |                     |
| $\pm 4.5$        | $\pm 9$           | $\geq -6$                        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A  | -121                 | -118                 | N/A                 | -70                 |
|                  |                   |                                  | NR_FDD_FR1_B  | -120.5               | -117.5               | N/A                 | -70                 |
|                  |                   |                                  | NR_TDD_FR1_C  | -120                 | -117                 | N/A                 | -70                 |
|                  |                   |                                  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D   | -119.5               | -116.5               | N/A                 | -70                 |
|                  |                   |                                  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E   | -119                 | -116                 | N/A                 | -70                 |
|                  |                   |                                  | NR_FDD_FR1_F  | -118.5               | -115.5               | N/A                 | -70                 |
|                  |                   |                                  | NR_FDD_FR1_G  | -118                 | -115                 | N/A                 | -70                 |
|                  |                   |                                  | NR_FDD_FR1_H  | -117.5               | -114.5               | N/A                 | -70                 |
| $\pm 8$          | $\pm 11$          | $\geq -6$                        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | N/A                  | N/A                  | -70                 | -50                 |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: Void  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.4.1.2 Relative Accuracy of SS-RSRP in FR1

The relative accuracy of SS-RSRP in inter frequency case is defined as the RSRP measured from one cell on a frequency in FR1 compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.4.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB\_RP1_{dBm} - SSB\_RP2_{dBm}| \leq 27$  dB
- $|Channel\ 1\_I_o - Channel\ 2\_I_o| \leq 20$  dB

Table 10.1.4.1.2-1: SS-RSRP Inter frequency relative accuracy in FR1

| Accuracy         |                   | Conditions                           |  |                      |                      |                            |                            |
|------------------|-------------------|--------------------------------------|--|----------------------|----------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                             |                      |                      |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 3             | Minimum $I_o$        |                      | Maximum $I_o$              |                            |
| dB               | dB                | dB                                   |  | dBm / $SCS_{SSB}$    |                      | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      |  | $SCS_{SSB} = 15$ kHz | $SCS_{SSB} = 30$ kHz |                            |                            |
| $\pm 4.5$        | $\pm 6$           | $\geq -6$                            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                 | -118                 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_B                                   | -120.5               | -117.5               | N/A                        | -50                        |
|                  |                   |                                      | NR_TDD_FR1_C                                   | -120                 | -117                 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5               | -116.5               | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                 | -116                 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_F                                   | -118.5               | -115.5               | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_G                                   | -118                 | -115                 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_H                                   | -117.5               | -114.5               | N/A                        | -50                        |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.4.2 Void

#### 10.1.4.3 Inter-frequency CSI-RSRP accuracy requirements

##### 10.1.4.3.1 Absolute Accuracy of CSI-RSRP in FR1

The requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the different center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR1.

The accuracy requirements in Table 10.1.4.3.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.4.3.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

Table 10.1.4.3.1-1: CSI-RSRP Inter frequency Absolute accuracy in FR1

| Accuracy         |                   | Conditions                    |  |                                |                                |        |                           |                           |
|------------------|-------------------|-------------------------------|--|--------------------------------|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{\epsilon}$ s/lot | $I_o$ <sup>Note 1</sup> range  |                                |                                |        |                           |                           |
|                  |                   |                               | NR operating band groups <sup>Note 2</sup>   | Minimum $I_o$                  |                                |        | Maximum $I_o$             |                           |
| dB               | dB                | dB                            |  | dBm / SCS <sub>CSI-RS</sub>    |                                |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                               | SCS <sub>CSI-RS</sub> = 15 kHz   | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |        |                           |                           |
| ±4.5             | ±9                | ≥-6                           | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A   | -121                           | -118                           | -115   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_B   | -120.5                         | -117.5                         | -114.5 | N/A                       | -70                       |
|                  |                   |                               | NR_TDD_FR1_C   | -120                           | -117                           | -114   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_D, NR_TDD_FR1_D   | -119.5                         | -116.5                         | -113.5 | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_E, NR_TDD_FR1_E   | -119                           | -116                           | -113   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_F   | -118.5                         | -115.5                         | -112.5 | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_G   | -118                           | -115                           | -112   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_H   | -117.5                         | -114.5                         | -111.5 | N/A                       | -70                       |
| ±8               | ±11               | ≥-6                           | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H | N/A                            | N/A                            | N/A    | -70                       | -50                       |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

10.1.4.3.2 Relative Accuracy of CS-RSRP in FR1

The relative accuracy of CSI-RSRP in inter frequency case is defined as the CSI-RSRP measured from one cell on a frequency in FR1 compared to the CSI-RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.4.3.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.4.3.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

-  $|CSI\_RP1_{dBm} - CSI\_RP2_{dBm}| \leq 27$  dB

- | Channel 1\_Io -Channel 2\_Io | ≤ 20 dB

**Table 10.1.4.3.2-1: CSI-RSRP Inter frequency relative accuracy in FR1**

| Accuracy         |                   | Conditions                              |  |                                |                                |        |               |                            |
|------------------|-------------------|---|--|--------------------------------|--------------------------------|--------|---------------|----------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                             |                                |                                |        |               |                            |
|                  |                   |   | NR operating band groups<br>Note 4             | Minimum $I_o$                  |                                |        | Maximum $I_o$ |                            |
| dB               | dB                | dB                                      |  | dBm / $SCS_{\text{CSI-RS}}$    |                                |        |               | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |   | $SCS_{\text{CSI-RS}} = 15$ kHz                 | $SCS_{\text{CSI-RS}} = 30$ kHz | $SCS_{\text{CSI-RS}} = 60$ kHz |        |               |                            |
| ±4.5             | ±6                | ≥-6                                     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | -115   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | -114.5 | N/A           | -50                        |
|                  |                   |   | NR_TDD_FR1_C                                   | -120                           | -117                           | -114   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | -113.5 | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | -113   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | -112.5 | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_G                                   | -118                           | -115                           | -112   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_H                                   | -117.5                         | -114.5                         | -111.5 | N/A           | -50                        |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The parameter CSI-RS  $\hat{E}_s/\text{lot}$  is the minimum CSI-RS  $\hat{E}_s/\text{lot}$  of the pair of CSI-RS resources to which the requirement applies.  
 NOTE 3: Void  
 NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.4B Inter-frequency RSRP accuracy requirements for FR1 for CA/DC Idle Mode Measurements

#### 10.1.4B.1 Inter-frequency SS-RSRP accuracy requirements

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRP.

##### 10.1.4B.1.1 Absolute Accuracy of SS-RSRP in FR1

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.4B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.1.3 for a corresponding Band for each relevant SSB.



**Table 10.1.4B.1.1-1: SS-RSRP Inter frequency Absolute accuracy in FR1**

| Accuracy         |                   | Conditions                           |   |                      |                      |                     |                     |
|------------------|-------------------|--------------------------------------|---|----------------------|----------------------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range  |                      |                      |                     |                     |
|                  |                   |                                      | NR operating band groups<br>Note 3  | Minimum $I_o$        |                      | Maximum $I_o$       |                     |
| dB               | dB                | dB                                   |   | dBm / $SCS_{SSB}$    |                      | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                                      |   | $SCS_{SSB} = 15$ kHz | $SCS_{SSB} = 30$ kHz |                     |                     |
| $\pm 6$          | $\pm 10.5$        | $\geq 4$                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A  | -121                 | -118                 | N/A                 | -70                 |
|                  |                   |                                      | NR_FDD_FR1_B  | -120.5               | -117.5               | N/A                 | -70                 |
|                  |                   |                                      | NR_TDD_FR1_C  | -120                 | -117                 | N/A                 | -70                 |
|                  |                   |                                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D   | -119.5               | -116.5               | N/A                 | -70                 |
|                  |                   |                                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E   | -119                 | -116                 | N/A                 | -70                 |
|                  |                   |                                      | NR_FDD_FR1_F  | -118.5               | -115.5               | N/A                 | -70                 |
|                  |                   |                                      | NR_FDD_FR1_G  | -118                 | -115                 | N/A                 | -70                 |
|                  |                   |                                      | NR_FDD_FR1_H  | -117.5               | -114.5               | N/A                 | -70                 |
| $\pm 9.5$        | $\pm 12.5$        | $\geq 4$                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | N/A                  | N/A                  | -70                 | -50                 |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: Void  
 NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.5 Inter-frequency RSRP accuracy requirements for FR2

### 10.1.5.1 Inter-frequency SS-RSRP accuracy requirements

#### 10.1.5.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in Table 10.1.5.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.5.1.1-1: SS-RSRP Inter frequency absolute accuracy in FR2**

| Accuracy         |                   | Conditions                 |   |                             |                     |
|------------------|-------------------|----------------------------|---|-----------------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                             |                     |
|                  |                   |                            | Minimum $I_o$   |                             | Maximum $I_o$       |
| dB               | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                             | dBm/ $BW_{Channel}$ |
|                  |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |                     |
| $\pm 6$          | $\pm 9$           | $\geq -4$                  | Same value as SSB_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival |                             | N/A                 |
| $\pm 8$          | $\pm 11$          |                            | N/A   |                             | -70                 |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
 Note 2:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
 Note 3: In the test cases, the SSB  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.

**10.1.5.1.2 Relative SS-RSRP Accuracy**

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell on a frequency in FR2 compared to the SS-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 10.1.5.1.2-1 are valid under the following conditions:

- Conditions defined in 38.101-2 [19] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB\_RP1_{dBm} - SSB\_RP2_{dBm}| \leq 27\text{dB}$
- $|Channel\ 1\_I_o - Channel\ 2\_I_o| \leq 20\text{ dB}$
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.5.1.2-1: SS-RSRP Inter frequency relative accuracy in FR2**

| Accuracy         |                   | Conditions                 |   |                             |                     |
|------------------|-------------------|----------------------------|---|-----------------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                             |                     |
|                  |                   |                            | Minimum $I_o$   |                             | Maximum $I_o$       |
| dB               | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                             | dBm/ $BW_{Channel}$ |
|                  |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |                     |
| $\pm 6$          | $\pm 9$           | $\geq -4$                  | Same value as SSB_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival |                             | -50                 |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
 Note 2:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
 Note 3: In the test cases, the SSB  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.  
 Note 4: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.

### 10.1.5.2 Void

## 10.1.5.3 Inter-frequency CSI-RSRP accuracy requirements

### 10.1.5.3.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell on a frequency in FR2 where the CSI-RS resources to be measured have the different center frequency as the CSI-RS resources indicated for measurement in the serving cell.

The accuracy requirements in Table 10.1.5.3.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.5.3.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.5.3.1-1: CSI-RSRP Inter frequency absolute accuracy in FR2**

| Accuracy  |                   | Conditions                    |  |                                       |                            |
|---|-------------------|-------------------------------|--|---------------------------------------|----------------------------|
| Normal condition  | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_0$ <sup>Note 2</sup> range  |                                       |                            |
|   |                   |                               | Minimum $I_0$  |                                       | Maximum $I_0$              |
| dB  | dB                | dB                            | dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 1</sup>  |                                       | dBm/ $BW_{\text{Channel}}$ |
|   |                   |                               | $SCS_{\text{CSI-RS}} = 60\text{kHz}$   | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |                            |
| $\pm 6$   | $\pm 9$           | $\geq -4$                     | Same value as CSI_RP in Table B.2.13-2, according to UE Power class, operating band and angle of arrival |                                       | -70                        |
| $\pm 8$   | $\pm 11$          |                               | N/A  |                                       | -50                        |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_0$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                               |  |                                       |                            |

### 10.1.5.3.2 Relative CSI-RSRP Accuracy

The relative accuracy of CSI-RSRP in inter frequency case is defined as the CSI-RSRP measured from one cell on a frequency in FR2 compared to the CSI-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 10.1.5.3.2-1 are valid under the following conditions:

- Conditions defined in 38.101-2 [19] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.5.3.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- $|\text{CSI\_RP1}_{\text{dBm}} - \text{CSI\_RP2}_{\text{dBm}}| \leq 27\text{dB}$
- $|\text{Channel 1\_Io} - \text{Channel 2\_Io}| \leq 20\text{ dB}$
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.5.3.2-1: CSI-RSRP Inter frequency relative accuracy in FR2**

| Accuracy   |                   | Conditions                    |  |                                       |
|--|-------------------|-------------------------------|--|---------------------------------------|
| Normal condition   | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range  |                                       |
|  |                   |                               | Minimum $I_o$  | Maximum $I_o$                         |
| dB   | dB                | dB                            | dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 1</sup>  |                                       |
|  |                   |                               | $SCS_{\text{CSI-RS}} = 60\text{kHz}$   | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |
|  |                   |                               | dBm/ $BW_{\text{Channel}}$   |                                       |
| $\pm 6$  | $\pm 9$           | $\geq -4$                     | Same value as CSI_RP in Table B.2.13-2, according to UE Power class, operating band and angle of arrival |                                       |
| <p>Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.</p> <p>Note 2: <math>I_o</math> specified at the Reference point, and assumed to have constant EPRE across the bandwidth.</p> <p>Note 3: In the test cases, the CSI-RS <math>\hat{E}_s/\text{lot}</math> and related parameters may need to be adjusted to ensure <math>\hat{E}_s/\text{lot}</math> at UE baseband is above the value defined in this table.</p> <p>Note 4: The parameter CSI-RS <math>\hat{E}_s/\text{lot}</math> is the minimum CSI-RS <math>\hat{E}_s/\text{lot}</math> of the pair of cells to which the requirement applies.</p> |                   |                               |  |                                       |

## 10.1.5B Inter-frequency RSRP accuracy requirements for FR2 for CA/DC Idle Mode Measurements

### 10.1.5B.1 Inter-frequency SS-RSRP accuracy requirements

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRP.

### 10.1.5B.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in Table 10.1.5B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.1.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.5B.1.1-1: SS-RSRP Inter frequency absolute accuracy in FR2**

| Accuracy   |                   | Conditions                 |   |                             |                     |
|--|-------------------|----------------------------|---|-----------------------------|---------------------|
| Normal condition   | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                             |                     |
|  |                   |                            | Minimum $I_o$   |                             | Maximum $I_o$       |
| dB   | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                             | dBm/ $BW_{Channel}$ |
|  |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |                     |
| $\pm 7.5$  | $\pm 10.5$        | $\geq -4$                  | Same value as SSB_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival |                             | N/A                 |
| $\pm 9.5$  | $\pm 12.5$        |                            | N/A   |                             | -70                 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                            |   |                             |                     |

### 10.1.6 RSRP Measurement Report Mapping

The reporting range of SS-RSRP and CSI-RSRP for L3 reporting is defined from -156 dBm to -31 dBm with 1 dB resolution. The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential SS-RSRP and CSI-RSRP for L1 reporting and L3 reporting is defined from 0 dB to -30 dB with 2 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 10.1.6.1-1: SS-RSRP and CSI-RSRP measurement report mapping**

| Reported value     | Measured quantity value (L3 SS-RSRP and CSI-RSRP)   | Measured quantity value (L1 SS-RSRP and CSI-RSRP) | Unit |
|--------------------|---|---|------|
| RSRP_0             | $\text{RSRP} < -156$  | Not valid   | dBm  |
| RSRP_1             | $-156 \leq \text{RSRP} < -155$  | Not valid   | dBm  |
| RSRP_2             | $-155 \leq \text{RSRP} < -154$  | Not valid   | dBm  |
| RSRP_3             | $-154 \leq \text{RSRP} < -153$  | Not valid   | dBm  |
| RSRP_4             | $-153 \leq \text{RSRP} < -152$  | Not valid   | dBm  |
| RSRP_5             | $-152 \leq \text{RSRP} < -151$  | Not valid   | dBm  |
| RSRP_6             | $-151 \leq \text{RSRP} < -150$  | Not valid   | dBm  |
| RSRP_7             | $-150 \leq \text{RSRP} < -149$  | Not valid   | dBm  |
| RSRP_8             | $-149 \leq \text{RSRP} < -148$  | Not valid   | dBm  |
| RSRP_9             | $-148 \leq \text{RSRP} < -147$  | Not valid   | dBm  |
| RSRP_10            | $-147 \leq \text{RSRP} < -146$  | Not valid   | dBm  |
| RSRP_11            | $-146 \leq \text{RSRP} < -145$  | Not valid   | dBm  |
| RSRP_12            | $-145 \leq \text{RSRP} < -144$  | Not valid   | dBm  |
| RSRP_13            | $-144 \leq \text{RSRP} < -143$  | Not valid   | dBm  |
| RSRP_14            | $-143 \leq \text{RSRP} < -142$  | Not valid   | dBm  |
| RSRP_15            | $-142 \leq \text{RSRP} < -141$  | Not valid   | dBm  |
| RSRP_16            | $-141 \leq \text{RSRP} < -140$  | $\text{RSRP} < -140$                              | dBm  |
| RSRP_17            | $-140 \leq \text{RSRP} < -139$  | $-140 \leq \text{RSRP} < -139$                    | dBm  |
| RSRP_18            | $-139 \leq \text{RSRP} < -138$  | $-139 \leq \text{RSRP} < -138$                    | dBm  |
| ...                | ...   |   | ...  |
| RSRP_111           | $-46 \leq \text{RSRP} < -45$  | $-46 \leq \text{RSRP} < -45$                      | dBm  |
| RSRP_112           | $-45 \leq \text{RSRP} < -44$  | $-45 \leq \text{RSRP} < -44$                      | dBm  |
| RSRP_113           | $-44 \leq \text{RSRP} < -43$  | $-44 \leq \text{RSRP}$                            | dBm  |
| RSRP_114           | $-43 \leq \text{RSRP} < -42$  | Not valid   | dBm  |
| RSRP_115           | $-42 \leq \text{RSRP} < -41$  | Not valid   | dBm  |
| RSRP_116           | $-41 \leq \text{RSRP} < -40$  | Not valid   | dBm  |
| RSRP_117           | $-40 \leq \text{RSRP} < -39$  | Not valid   | dBm  |
| RSRP_118           | $-39 \leq \text{RSRP} < -38$  | Not valid   | dBm  |
| RSRP_119           | $-38 \leq \text{RSRP} < -37$  | Not valid   | dBm  |
| RSRP_120           | $-37 \leq \text{RSRP} < -36$  | Not valid   | dBm  |
| RSRP_121           | $-36 \leq \text{RSRP} < -35$  | Not valid   | dBm  |
| RSRP_122           | $-35 \leq \text{RSRP} < -34$  | Not valid   | dBm  |
| RSRP_123           | $-34 \leq \text{RSRP} < -33$  | Not valid   | dBm  |
| RSRP_124           | $-33 \leq \text{RSRP} < -32$  | Not valid   | dBm  |
| RSRP_125           | $-32 \leq \text{RSRP} < -31$  | Not valid   | dBm  |
| RSRP_126           | $-31 \leq \text{RSRP}$  | Not valid   | dBm  |
| RSRP_127<br>(Note) | Infinity  | Infinity  | dBm  |
| Note:              | The value of RSRP_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [2], but not for the purpose of measurement reporting. |   |      |

**Table 10.1.6.1-2: Differential SS-RSRP and CSI-RSRP measurement (for L1 reporting and L3 reporting) report mapping**

| Reported value | Measured quantity value<br>(difference in measured RSRP<br>from strongest RSRP) | Unit |
|----------------|---|------|
| DIFFRSRP_0     | $0 \geq \Delta \text{RSRP} > -2$  | dB   |
| DIFFRSRP_1     | $-2 \geq \Delta \text{RSRP} > -4$   | dB   |
| DIFFRSRP_2     | $-4 \geq \Delta \text{RSRP} > -6$   | dB   |
| DIFFRSRP_3     | $-6 \geq \Delta \text{RSRP} > -8$   | dB   |
| DIFFRSRP_4     | $-8 \geq \Delta \text{RSRP} > -10$  | dB   |
| DIFFRSRP_5     | $-10 \geq \Delta \text{RSRP} > -12$   | dB   |
| DIFFRSRP_6     | $-12 \geq \Delta \text{RSRP} > -14$   | dB   |
| DIFFRSRP_7     | $-14 \geq \Delta \text{RSRP} > -16$   | dB   |
| DIFFRSRP_8     | $-16 \geq \Delta \text{RSRP} > -18$   | dB   |
| DIFFRSRP_9     | $-18 \geq \Delta \text{RSRP} > -20$   | dB   |
| DIFFRSRP_10    | $-20 \geq \Delta \text{RSRP} > -22$   | dB   |
| DIFFRSRP_11    | $-22 \geq \Delta \text{RSRP} > -24$   | dB   |
| DIFFRSRP_12    | $-24 \geq \Delta \text{RSRP} > -26$   | dB   |
| DIFFRSRP_13    | $-26 \geq \Delta \text{RSRP} > -28$   | dB   |
| DIFFRSRP_14    | $-28 \geq \Delta \text{RSRP} > -30$   | dB   |
| DIFFRSRP_15    | $-30 \geq \Delta \text{RSRP}$   | dB   |

## 10.1.7 Intra-frequency RSRQ accuracy requirements for FR1

### 10.1.7.1 Intra-frequency SS-RSRQ accuracy requirements in FR1

#### 10.1.7.1.1 Absolute SS-RSRQ Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR1. The accuracy requirements in this clause are also applicable when *highSpeedMeasFlag-r16* is configured.

The accuracy requirements in Table 10.1.7.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.7.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR1

| Accuracy         |                   | Conditions    |  |                                |                                |                           |                           |
|------------------|-------------------|---------------|--|--------------------------------|--------------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB<br>Es/lot | Io <sup>Note 1</sup> range                     |                                |                                |                           |                           |
|                  |                   |               | NR operating band groups <sup>Note 3</sup>     | Minimum Io                     |                                | Maximum Io                |                           |
| dB               | dB                | dB            |  | dBm / SCS <sub>SSB</sub>       |                                | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |               |  | SCS <sub>SSB</sub> =<br>15 kHz | SCS <sub>SSB</sub> =<br>30 kHz |                           |                           |
| ±2.5             | ±4                | ≥3            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | N/A                       | -50                       |
|                  |                   |               | NR_TDD_FR1_C                                   | -120                           | -117                           | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_G                                   | -118                           | -115                           | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_H                                   | -117.5                         | -114.5                         | N/A                       | -50                       |
| ±3.5             | ±4                | ≥6            | Note 2   | Note 2                         | Note 2                         | Note 2                    | Note 2                    |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.7.2 Intra-frequency CSI-RSRQ accuracy requirements

### 10.1.7.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in 9.10.2.1 in FR1.

The accuracy requirements in Table 10.1.7.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for associated SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.7.2.1-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

Table 10.1.7.2.1-1: CSI-RSRQ Intra frequency absolute accuracy in FR1



| Accuracy         |                   | Conditions                    |  |                                |                                |        |                           |                           |
|------------------|-------------------|-------------------------------|--|--------------------------------|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 1</sup> range                  |                                |                                |        |                           | Maximum $I_o$             |
|                  |                   |                               | NR operating band groups <sup>Note 3</sup>     | Minimum $I_o$                  |                                |        | dBm/BW <sub>Channel</sub> |                           |
| dB               | dB                | dB                            |  | dBm / SCS <sub>CSI-RS</sub>    |                                |        |                           | dBm/BW <sub>Channel</sub> |
|                  |                   |                               | SCS <sub>CSI-RS</sub> = 15 kHz                 | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |        |                           |                           |
| $\pm 2.5$        | $\pm 4$           | $\geq -3$                     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | -115   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | -114.5 | N/A                       | -50                       |
|                  |                   |                               | NR_TDD_FR1_C                                   | -120                           | -117                           | -114   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | -113.5 | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | -113   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | -112.5 | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_G                                   | -118                           | -115                           | -112   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_H                                   | -117.5                         | -114.5                         | -111.5 | N/A                       | -50                       |
| $\pm 3.5$        | $\pm 4$           | $\geq -6$                     | Note 2   | Note 2                         | Note 2                         | Note 2 | Note 2                    | Note 2                    |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.7B Intra-frequency RSRQ accuracy requirements for FR1 for CA/DC Idle Mode Measurements

### 10.1.7B.1 Intra-frequency SS-RSRQ accuracy requirements in FR1

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRQ.

#### 10.1.7B.1.1 Absolute SS-RSRQ Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to the serving cell in FR1.

The accuracy requirements in Table 10.1.7B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.1.2 for a corresponding Band for each relevant SSB.

Table 10.1.7B.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR1

| Accuracy         |                   | Conditions    |  |                                |        |                           |                           |
|------------------|-------------------|---------------|--|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB<br>Es/lot | Io <sup>Note 1</sup> range                     |                                |        |                           |                           |
|                  |                   |               | NR operating band<br>groups <sup>Note 3</sup>  | Minimum Io                     |        | Maximum Io                |                           |
| dB               | dB                | dB            |  | dBm / SCS <sub>SSB</sub>       |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |               | SCS <sub>SSB</sub> =<br>15 kHz                 | SCS <sub>SSB</sub> =<br>30 kHz |        |                           |                           |
| ±4               | ±5.5              | ≥3            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_B                                   | -120.5                         | -117.5 | N/A                       | -50                       |
|                  |                   |               | NR_TDD_FR1_C                                   | -120                           | -117   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5 | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_F                                   | -118.5                         | -115.5 | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_G                                   | -118                           | -115   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_H                                   | -117.5                         | -114.5 | N/A                       | -50                       |
| ±5               | ±5.5              | ≥4            | Note 2   | Note 2                         | Note 2 | Note 2                    | Note 2                    |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.8 Intra-frequency RSRQ accuracy requirements for FR2

### 10.1.8.1 Intra-frequency SS-RSRQ accuracy requirements in FR2

#### 10.1.8.1.1 Absolute SS-RSRQ Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.8.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.8.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR2

| Accuracy   |                   | Conditions                 |   |                             |
|--|-------------------|----------------------------|---|-----------------------------|
| Normal condition   | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                             |
|  |                   |                            | Minimum $I_o$   |                             |
| dB   | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                             |
|  |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |
| $\pm 2.5$  | $\pm 4$           | $\geq -3$                  | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |                             |
| $\pm 3.5$  | $\pm 4$           | $\geq -6$                  |   |                             |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                            |   |                             |

## 10.1.8.2 Intra-frequency CSI-RSRQ accuracy requirements

### 10.1.8.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in 9.10.2.1 in FR2.

The accuracy requirements in Table 10.1.8.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.8.2.1-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.8.2.1-1: CSI-RSRQ Intra frequency absolute accuracy in FR2

| Accuracy  |                   | Conditions                    |  |                                   |
|---|-------------------|-------------------------------|--|-----------------------------------|
| Normal condition  | Extreme condition | CSI-RS $\bar{E}_s/\text{lot}$ | $I_0$ <sup>Note 2</sup> range  |                                   |
|   |                   |                               | Minimum $I_0$  |                                   |
| dB  | dB                | dB                            | dBm / SCS <sub>CSI-RS</sub> <sup>Note 1</sup>  |                                   |
|   |                   |                               | SCS <sub>CSI-RS</sub> =<br>60kHz   | SCS <sub>CSI-RS</sub> =<br>120kHz |
| $\pm 2.5$   | $\pm 4$           | $\geq -3$                     | Same value as CSI_RP in Table B.2.12-2, according to UE Power class, operating band and angle of arrival |                                   |
| $\pm 3.5$   | $\pm 4$           | $\geq -6$                     |  |                                   |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_0$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS $\bar{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\bar{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                               |  |                                   |

## 10.1.8B Intra-frequency RSRQ accuracy requirements for FR2 for CA/DC Idle Mode Measurements

### 10.1.8B.1 Intra-frequency SS-RSRQ accuracy requirements in FR2

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRQ.

#### 10.1.8B.1.1 Absolute SS-RSRQ Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to the serving cell in FR2.

The accuracy requirements in Table 10.1.8B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.1.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.8B.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR2

| Accuracy   |                   | Conditions                 |   |                             |
|--|-------------------|----------------------------|---|-----------------------------|
| Normal condition   | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                             |
|  |                   |                            | Minimum $I_o$   |                             |
| dB   | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                             |
|  |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |
| $\pm 4$  | $\pm 5.5$         | $\geq -3$                  | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |                             |
| $\pm 5$  | $\pm 5.5$         | $\geq -4$                  |   |                             |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                            |   |                             |

## 10.1.9 Inter-frequency RSRQ accuracy requirements for FR1

### 10.1.9.1 Inter-frequency SS-RSRQ accuracy requirements in FR1

#### 10.1.9.1.1 Absolute Accuracy of SS-RSRQ in FR1

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.9.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.9.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR1

| Accuracy         |                   |            | Conditions                                     |                             |        |                           |                           |
|------------------|-------------------|------------|--|-----------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB Es/lot | Io <sup>Note 1</sup> range                     |                             |        |                           |                           |
|                  |                   |            | NR operating band groups <sup>Note 3</sup>     | Minimum Io                  |        | Maximum Io                |                           |
| dB               | dB                | dB         |  | dBm / SCS <sub>SSB</sub>    |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |            | SCS <sub>SSB</sub> = 15 kHz                    | SCS <sub>SSB</sub> = 30 kHz |        |                           |                           |
| ±2.5             | ±4                | ≥3         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                        | -118   | N/A                       | -50                       |
|                  |                   |            | NR_FDD_FR1_B                                   | -120.5                      | -117.5 | N/A                       | -50                       |
|                  |                   |            | NR_TDD_FR1_C                                   | -120                        | -117   | N/A                       | -50                       |
|                  |                   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                      | -116.5 | N/A                       | -50                       |
|                  |                   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                        | -116   | N/A                       | -50                       |
|                  |                   |            | NR_FDD_FR1_F                                   | -118.5                      | -115.5 | N/A                       | -50                       |
|                  |                   |            | NR_FDD_FR1_G                                   | -118                        | -115   | N/A                       | -50                       |
|                  |                   |            | NR_FDD_FR1_H                                   | -117.5                      | -114.5 | N/A                       | -50                       |
| ±3.5             | ±4                | ≥6         | Note 2   | Note 2                      | Note 2 | Note 2                    | Note 2                    |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
 NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

10.1.9.1.2 Relative Accuracy of SS-RSRQ in FR1

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR1 compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.9.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB\_RP1_{dBm} - SSB\_RP2_{dBm}| \leq 27$  dB
- $|Channel\ 1\_Io - Channel\ 2\_Io| \leq 20$  dB

Table 10.1.9.1.2-1: SS-RSRQ Inter frequency relative accuracy in FR1

| Accuracy         |                   | Conditions                           |  |                                |        |                           |                           |
|------------------|-------------------|--------------------------------------|--|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                             |                                |        |                           |                           |
|                  |                   |                                      | NR operating band groups<br>Note 4             | Minimum $I_o$                  |        | Maximum $I_o$             |                           |
| dB               | dB                | dB                                   |  | dBm / SCS <sub>SSB</sub>       |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                                      | SCS <sub>SSB</sub> =<br>15 kHz                 | SCS <sub>SSB</sub> =<br>30 kHz |        |                           |                           |
| $\pm 3$          | $\pm 4$           | $\geq 3$                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118   | N/A                       | -50                       |
|                  |                   |                                      | NR_FDD_FR1_B                                   | -120.5                         | -117.5 | N/A                       | -50                       |
|                  |                   |                                      | NR_TDD_FR1_C                                   | -120                           | -117   | N/A                       | -50                       |
|                  |                   |                                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5 | N/A                       | -50                       |
|                  |                   |                                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116   | N/A                       | -50                       |
|                  |                   |                                      | NR_FDD_FR1_F                                   | -118.5                         | -115.5 | N/A                       | -50                       |
|                  |                   |                                      | NR_FDD_FR1_G                                   | -118                           | -115   | N/A                       | -50                       |
|                  |                   |                                      | NR_FDD_FR1_H                                   | -117.5                         | -114.5 | N/A                       | -50                       |
| $\pm 4$          | $\pm 4$           | $\geq 6$                             | Note 3   | Note 3                         | Note 3 | Note 3                    | Note 3                    |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.9.2 Inter-frequency CSI-RSRQ accuracy requirements

### 10.1.9.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the inter-frequency measurement defined in 9.10.3.1 in FR1.

The accuracy requirements in Table 10.1.9.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.9.2.1-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
- Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

Table 10.1.9.2.1-1: CSI-RSRQ Inter frequency absolute accuracy in FR1

| Accuracy         |                   | Conditions                    |  |                                |                                |        |                           |                           |
|------------------|-------------------|-------------------------------|--|--------------------------------|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 1</sup> range                  |                                |                                |        |                           | Maximum $I_o$             |
|                  |                   |                               | NR operating band groups <sup>Note 3</sup>     | Minimum $I_o$                  |                                |        | dBm/BW <sub>Channel</sub> |                           |
| dB               | dB                | dB                            |  | dBm / SCS <sub>CSI-RS</sub>    |                                |        |                           | dBm/BW <sub>Channel</sub> |
|                  |                   |                               | SCS <sub>CSI-RS</sub> = 15 kHz                 | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |        |                           |                           |
| $\pm 2.5$        | $\pm 4$           | $\geq -3$                     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | -115   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | -114.5 | N/A                       | -50                       |
|                  |                   |                               | NR_TDD_FR1_C                                   | -120                           | -117                           | -114   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | -113.5 | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | -113   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | -112.5 | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_G                                   | -118                           | -115                           | -112   | N/A                       | -50                       |
|                  |                   |                               | NR_FDD_FR1_H                                   | -117.5                         | -114.5                         | -111.5 | N/A                       | -50                       |
| $\pm 3.5$        | $\pm 4$           | $\geq -6$                     | Note 2   | Note 2                         | Note 2                         | Note 2 | Note 2                    | Note 2                    |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.9.2.2 Relative CSI-RSRQ Accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR1.

The accuracy requirements in Table 10.1.9.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for the associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.9.2.2-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.



Table 10.1.9.2.2-1: CSI-RSRQ Inter frequency relative accuracy in FR1

| Accuracy         |                   | Conditions                              |  |                                |                                |        |                           |                           |
|------------------|-------------------|---|--|--------------------------------|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                             |                                |                                |        |                           | Maximum $I_o$             |
|                  |                   |   | NR operating band groups<br>Note 4             | Minimum $I_o$                  |                                |        | dBm/BW <sub>Channel</sub> |                           |
| dB               | dB                | dB                                      |  | dBm / SCS <sub>CSI-RS</sub>    |                                |        |                           | dBm/BW <sub>Channel</sub> |
|                  |                   |   | SCS <sub>CSI-RS</sub> = 15 kHz                 | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |        |                           |                           |
| ±3               | ±4                | ≥-3                                     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | -115   | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | -114.5 | N/A                       | -50                       |
|                  |                   |   | NR_TDD_FR1_C                                   | -120                           | -117                           | -114   | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | -113.5 | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | -113   | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | -112.5 | N/A                       | -50                       |
|                  |                   |   | NR_FDD_FR1_G                                   | -118                           | -115                           | -112   | N/A                       | -50                       |
| NR_FDD_FR1_H     | -117.5            | -114.5                                  | -111.5   | N/A                            | -50                            |        |                           |                           |
| ±4               | ±4                | ≥-6                                     | Note 3   | Note 3                         | Note 3                         | Note 3 | Note 3                    | Note 3                    |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter CSI-RS  $\hat{E}_s/\text{lot}$  is the minimum CSI-RS  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.9B Inter-frequency RSRQ accuracy requirements for FR1 for CA/DC Idle Mode Measurements

### 10.1.9B.1 Inter-frequency SS-RSRQ accuracy requirements in FR1

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRQ.

#### 10.1.9B.1.1 Absolute Accuracy of SS-RSRQ in FR1

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.9B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.1.3 for a corresponding Band for each relevant SSB.

Table 10.1.9B.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR1

| Accuracy         |                   | Conditions    |  |                                |        |                           |                           |
|------------------|-------------------|---------------|--|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB<br>Es/lot | Io <sup>Note 1</sup> range                     |                                |        |                           |                           |
|                  |                   |               | NR operating band<br>groups <sup>Note 3</sup>  | Minimum Io                     |        | Maximum Io                |                           |
| dB               | dB                | dB            |  | dBm / SCS <sub>SSB</sub>       |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |               | SCS <sub>SSB</sub> =<br>15 kHz                 | SCS <sub>SSB</sub> =<br>30 kHz |        |                           |                           |
| ±4               | ±5.5              | ≥3            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_B                                   | -120.5                         | -117.5 | N/A                       | -50                       |
|                  |                   |               | NR_TDD_FR1_C                                   | -120                           | -117   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5 | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_F                                   | -118.5                         | -115.5 | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_G                                   | -118                           | -115   | N/A                       | -50                       |
|                  |                   |               | NR_FDD_FR1_H                                   | -117.5                         | -114.5 | N/A                       | -50                       |
| ±5               | ±5.5              | ≥-4           | Note 2   | Note 2                         | Note 2 | Note 2                    | Note 2                    |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.10 Inter-frequency RSRQ accuracy requirements for FR2

### 10.1.10.1 Inter-frequency SS-RSRQ accuracy requirements in FR2

#### 10.1.10.1.1 Absolute Accuracy of SS-RSRQ in FR2

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.10.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.10.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR2**

| Accuracy   |                   | Conditions           |   |  |
|--|-------------------|----------------------|---|--|
| Normal condition   | Extreme condition | SSB $\hat{E}s/lot$   | $I_o$ <sup>Note 2</sup> range   |  |
| dB   | dB                |                      | Minimum $I_o$<br>dBm / $SCS_{SSB}$ <sup>Note 1</sup>  |  |
|  |                   | $SCS_{SSB} = 120kHz$ | $SCS_{SSB} = 240kHz$  |  |
| $\pm 2.5$  | $\pm 4$           | $\geq -3$            | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |  |
| $\pm 3.5$  | $\pm 4$           | $\geq -4$            |   |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table. |                   |                      |   |  |

### 10.1.10.1.2 Relative Accuracy of SS-RSRQ in FR2

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR2 compared to the RSRP measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.10.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB\_RP1_{dBm} - SSB\_RP2_{dBm}| \leq 27$  dB
- $|Channel\ 1\_I_o - Channel\ 2\_I_o| \leq 20$  dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.10.1.2-1: SS-RSRQ Inter frequency relative accuracy in FR2**

| Accuracy  |                   | Conditions           |   |  |
|---|-------------------|----------------------|---|--|
| Normal condition  | Extreme condition | SSB $\hat{E}s/lot$   | $I_o$ <sup>Note 2</sup> range   |  |
| dB  | dB                |                      | Minimum $I_o$<br>dBm / $SCS_{SSB}$ <sup>Note 1</sup>  |  |
|   |                   | $SCS_{SSB} = 120kHz$ | $SCS_{SSB} = 240kHz$  |  |
| $\pm 3$   | $\pm 4$           | $\geq -3$            | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |  |
| $\pm 4$   | $\pm 4$           | $\geq -4$            |   |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: The parameter SSB $\hat{E}s/lot$ is the minimum SSB $\hat{E}s/lot$ of the pair of cells to which the requirement applies.<br>Note 4: In the test cases, the SSB $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table. |                   |                      |   |  |

## 10.1.10.2 Inter-frequency CSI-RSRQ accuracy requirements

### 10.1.10.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply the inter-frequency measurement defined in 9.10.3.1 in FR2.

The accuracy requirements in Table 10.1.10.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.10.2.1-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 10.1.10.2.1-1: CSI-RSRQ Inter frequency absolute accuracy in FR2**

| Accuracy  |                   | Conditions                    |   |                                       |
|---|-------------------|-------------------------------|---|---------------------------------------|
| Normal condition  | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_0$ <sup>Note 2</sup> range   |                                       |
|   |                   |                               | Minimum $I_0$   |                                       |
| dB  | dB                | dB                            | dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 1</sup>   |                                       |
|   |                   |                               | $SCS_{\text{CSI-RS}} = 60\text{kHz}$  | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |
| $\pm 2.5$   | $\pm 4$           | $\geq -3$                     | Same value as $CSI\_RP$ in Table B.2.13-2, according to UE Power class, operating band and angle of arrival |                                       |
| $\pm 3.5$   | $\pm 4$           | $\geq -4$                     |   |                                       |
|   |                   |                               | -50   |                                       |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_0$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                               |   |                                       |

### 10.1.10.2.2 Relative CSI-RSRQ Accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR2.

The accuracy requirements in Table 10.1.10.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for the associated SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.10.2.2-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 10.1.10.2.2-1: CSI-RSRQ Inter frequency relative accuracy in FR2**

| Accuracy  |                   | Conditions            |  |                         |
|---|-------------------|-----------------------|--|-------------------------|
| Normal condition  | Extreme condition | CSI-RS $\hat{E}s/lot$ | $Io$ <sup>Note 2</sup> range   |                         |
|   |                   |                       | Minimum $Io$   | Maximum $Io$            |
| dB  | dB                | dB                    | dBm / $SCS_{CSI-RS}$ <sup>Note 1</sup>   |                         |
|   |                   |                       | $SCS_{CSI-RS} = 60kHz$   | $SCS_{CSI-RS} = 120kHz$ |
| $\pm 3$   | $\pm 4$           | $\geq -3$             | Same value as CSI_RP in Table B.2.13-2, according to UE Power class, operating band and angle of arrival |                         |
| $\pm 4$   | $\pm 4$           | $\geq -4$             |  |                         |
| -50   |                   |                       |  |                         |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $Io$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: The parameter CSI-RS $\hat{E}s/lot$ is the minimum CSI-RS $\hat{E}s/lot$ of the pair of cells to which the requirement applies.<br>Note 4: In the test cases, the CSI-RS $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table. |                   |                       |  |                         |

## 10.1.10B Inter-frequency RSRQ accuracy requirements for FR2 for CA/DC Idle Mode Measurements

### 10.1.10B.1 Inter-frequency SS-RSRQ accuracy requirements in FR2

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of SS-RSRQ.

#### 10.1.10B.1.1 Absolute Accuracy of SS-RSRQ in FR2

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.10B.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.1.3 for a corresponding Band for each relevant SSB.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.10B.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR2**

| Accuracy   |                   | Conditions                 |   |                                |  |
|--|-------------------|----------------------------|---|--------------------------------|--|
| Normal condition   | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range   |                                |  |
|  |                   |                            | Minimum $I_o$   |                                | Maximum $I_o$<br>dBm/BW <sub>Channel</sub> |
| dB   | dB                | dB                         | dBm / SCS <sub>SSB</sub> <sup>Note 1</sup>  |                                |  |
|  |                   |                            | SCS <sub>SSB</sub> =<br>120kHz  | SCS <sub>SSB</sub> =<br>240kHz |  |
| $\pm 4$  | $\pm 5.5$         | $\geq -3$                  | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |                                | -50  |
| $\pm 5$  | $\pm 5.5$         | $\geq -4$                  |   |                                |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |                            |   |                                |  |

## 10.1.11 RSRQ report mapping

### 10.1.11.1 SS-RSRQ and CSI-RSRQ measurement report mapping

The reporting range of SS-RSRQ and CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.11.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 10.1.11.1-1: SS-RSRQ and CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value           | Unit |
|----------------|-----------------------------------|------|
| SS-RSRQ_0      | SS-RSRQ < -43                     | dB   |
| SS-RSRQ_1      | $-43 \leq \text{SS-RSRQ} < -42.5$ | dB   |
| SS-RSRQ_2      | $-42.5 \leq \text{SS-RSRQ} < -42$ | dB   |
| SS-RSRQ_3      | $-42 \leq \text{SS-RSRQ} < -41.5$ | dB   |
| SS-RSRQ_4      | $-41.5 \leq \text{SS-RSRQ} < -41$ | dB   |
| ..             | ..                                | ...  |
| SS-RSRQ_122    | $17.5 \leq \text{SS-RSRQ} < 18$   | dB   |
| SS-RSRQ_123    | $18 \leq \text{SS-RSRQ} < 18.5$   | dB   |
| SS-RSRQ_124    | $18.5 \leq \text{SS-RSRQ} < 19$   | dB   |
| SS-RSRQ_125    | $19 \leq \text{SS-RSRQ} < 19.5$   | dB   |
| SS-RSRQ_126    | $19.5 \leq \text{SS-RSRQ} < 20$   | dB   |
| SS-RSRQ_127    | $20 \leq \text{SS-RSRQ}$          | dB   |

## 10.1.12 Intra-frequency SINR accuracy requirements for FR1

### 10.1.12.1 Intra-frequency SS-SINR accuracy requirements in FR1

#### 10.1.12.1.1 Absolute SS-SINR Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.12.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band.

**Table 10.1.12.1.1-1: SS-SINR Intra frequency absolute accuracy in FR1**

| Accuracy         |                   | Conditions                           |  |                              |        |                            |                            |
|------------------|-------------------|--------------------------------------|--|------------------------------|--------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 3 | $I_o$ <sup>Note 1</sup> range                  |                              |        |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 4             | Minimum $I_o$                |        | Maximum $I_o$              |                            |
| dB               | dB                | dB                                   |  | dBm / $SCS_{SSB}$            |        | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      | $SCS_{SSB} = 15 \text{ kHz}$                   | $SCS_{SSB} = 30 \text{ kHz}$ |        |                            |                            |
| $\pm 3.0$        | $\pm 4$           | $\geq 3$                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                         | -118   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_B                                   | -120.5                       | -117.5 | N/A                        | -50                        |
|                  |                   |                                      | NR_TDD_FR1_C                                   | -120                         | -117   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                       | -116.5 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                         | -116   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_F                                   | -118.5                       | -115.5 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_G                                   | -118                         | -115   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_H                                   | -117.5                       | -114.5 | N/A                        | -50                        |
| $\pm 3.5$        | $\pm 4$           | $\geq 6$                             | Note 2   | Note 2                       | Note 2 | Note 2                     | Note 2                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 25$  dB under non-HST scenarios.  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  
NOTE 5: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 5$  dB with  $SCS$  15kHz or 30kHz under NR high speed scenarios.

### 10.1.12.2 Intra-frequency CSI-SINR accuracy requirements in FR1

#### 10.1.12.2.1 Absolute CSI-SINR Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.12.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for intra-frequency measurement is serving cell timing.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.12.2.1-1.

**Table 10.1.12.2.1-1: CSI-SINR Intra frequency absolute accuracy in FR1**

| Accuracy         |                   |                               | Conditions                               |               |        |        |               |                |
|------------------|-------------------|-------------------------------|--|---------------|--------|--------|---------------|----------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_0$ <sup>Note 1</sup> range            |               |        |        |               |                |
|                  |                   |                               | NR operating band groups                 | Minimum $I_0$ |        |        | Maximum $I_0$ |                |
| dB               | dB                | dB                            |  | dBm / SCS     |        |        |               | dBm/BW Channel |
|                  |                   |                               | SCS (kHz)                                |               |        |        |               |                |
|                  |                   |                               | 15                                       | 30            | 60     |        |               |                |
| $\pm 3$          | $\pm 4$           | $\geq 3$                      | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121          | -118   | -115   | N/A           | -70            |
|                  |                   |                               | NR_FDD_FR1_B                             | -120.5        | -117.5 | -114.5 | N/A           | -70            |
|                  |                   |                               | NR_TDD_FR1_C                             | -120          | -117   | -114   | N/A           | -70            |
|                  |                   |                               | NR_FDD_FR1_D, NR_TDD_FR1_D               | -119.5        | -116.5 | -113.5 | N/A           | -70            |
|                  |                   |                               | NR_FDD_FR1_E, NR_TDD_FR1_E               | -119          | -116   | -113   | N/A           | -70            |
|                  |                   |                               | NR_FDD_FR1_F                             | -118.5        | -115.5 | -112.5 | N/A           | -70            |
|                  |                   |                               | NR_FDD_FR1_G                             | -118          | -115   | -112   | N/A           | -70            |
|                  |                   |                               | NR_FDD_FR1_H                             | -117.5        | -114.5 | -111.5 | N/A           | -70            |
| $\pm 3.5$        | $\pm 4$           | $\geq 6$                      | Note 2                                   | Note 2        | Note 2 | Note 2 | N/A           | Note 2         |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
 NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.  
 NOTE 4: The requirements apply for CSI-RS  $\hat{E}_s/\text{lot} \leq X\text{dB}$ .  $X=15$  if timing offset between the reference measurement timing and the target CSI-RS is no larger than  $0.5 \cdot \text{CP}$ , and  $X=4$  if timing offset between the reference measurement timing and the target CSI-RS is larger than  $0.5 \cdot \text{CP}$  but no larger than  $\text{CP}$ .

### 10.1.13 Intra-frequency SINR accuracy requirements for FR2

#### 10.1.13.1 Intra-frequency SS-SINR accuracy requirements in FR2

##### 10.1.13.1.1 Absolute SS-SINR Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.13.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].



Table 10.1.13.1.1-1: SS-SINR Intra frequency absolute accuracy in FR2

| Accuracy  |                   | Conditions         |   |                      |
|---|-------------------|--------------------|---|----------------------|
| Normal condition  | Extreme condition | SSB $\hat{E}s/lot$ | $I_o$ <sup>Note 2</sup> range   |                      |
|   |                   |                    | Minimum $I_o$   |                      |
| dB  | dB                | dB                 | dBm / $SCS_{SSB}$ <sup>Note 1</sup>   |                      |
|   |                   |                    | $SCS_{SSB} = 120kHz$  | $SCS_{SSB} = 240kHz$ |
| $\pm 3$   | $\pm 4$           | $\geq -3$          | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |                      |
| $\pm 3.5$   | $\pm 4$           | $\geq -6$          |   |                      |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table.<br>Note 4: The requirements apply for SSB $\hat{E}s/lot \leq 25$ dB. |                   |                    |   |                      |

## 10.1.13.2 Intra-frequency CSI-SINR accuracy requirements in FR2

### 10.1.13.2.1 Absolute CSI-SINR Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.13.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.12 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for intra-frequency measurement is serving cell timing.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.13.2.1-1.

Table 10.1.13.2.1-1: CSI-SINR Intra frequency absolute accuracy in FR2

| Accuracy  |                   | Conditions                    |  |                                   |
|---|-------------------|-------------------------------|--|-----------------------------------|
| Normal condition  | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 2</sup> range  |                                   |
|   |                   |                               | Minimum $I_o$  |                                   |
| dB  | dB                | dB                            | dBm / SCS <sub>CSI-RS</sub> <sup>Note 1</sup>  |                                   |
|   |                   |                               | SCS <sub>CSI-RS</sub> =<br>60kHz   | SCS <sub>CSI-RS</sub> =<br>120kHz |
| $\pm 3$   | $\pm 4$           | $\geq -3$                     | Same value as CSI_RP in Table B.2.12-2, according to UE Power class, operating band and angle of arrival |                                   |
| $\pm 3.5$   | $\pm 4$           | $\geq -6$                     |  |                                   |
| <p>Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.</p> <p>Note 2: <math>I_o</math> specified at the Reference point, and assumed to have constant EPRE across the bandwidth.</p> <p>Note 3: In the test cases, the CSI-RS <math>\hat{E}_s/\text{lot}</math> and related parameters may need to be adjusted to ensure <math>\hat{E}_s/\text{lot}</math> at UE baseband is above the value defined in this table.</p> <p>Note 4: The requirements apply for CSI-RS <math>\hat{E}_s/\text{lot} \leq X\text{dB}</math>. <math>X=15</math> if timing offset between the reference measurement timing and the target CSI-RS is no larger than <math>0.5 \cdot \text{CP}</math>, and <math>X=4</math> if timing offset between the reference measurement timing and the target CSI-RS is larger than <math>0.5 \cdot \text{CP}</math> but no larger than CP.</p> |                   |                               |  |                                   |

## 10.1.14 Inter-frequency SINR accuracy requirements for FR1

### 10.1.14.1 Inter-frequency SS-SINR accuracy requirements in FR1

#### 10.1.14.1.1 Absolute Accuracy of SS-SINR in FR1

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.14.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.

Table 10.1.14.1.1-1: SS-SINR Inter frequency absolute accuracy in FR1

| Accuracy         |                   | Conditions                           |  |                              |        |                            |                            |
|------------------|-------------------|--------------------------------------|--|------------------------------|--------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 3 | $I_o$ Note 1 range                             |                              |        |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 4             | Minimum $I_o$                |        | Maximum $I_o$              |                            |
| dB               | dB                | dB                                   |  | dBm / $SCS_{SSB}$            |        | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      | $SCS_{SSB} = 15 \text{ kHz}$                   | $SCS_{SSB} = 30 \text{ kHz}$ |        |                            |                            |
| $\pm 3.0$        | $\pm 4$           | $\geq -3$                            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                         | -118   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_B                                   | -120.5                       | -117.5 | N/A                        | -50                        |
|                  |                   |                                      | NR_TDD_FR1_C                                   | -120                         | -117   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                       | -116.5 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                         | -116   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_F                                   | -118.5                       | -115.5 | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_G                                   | -118                         | -115   | N/A                        | -50                        |
|                  |                   |                                      | NR_FDD_FR1_H                                   | -117.5                       | -114.5 | N/A                        | -50                        |
| $\pm 3.5$        | $\pm 4$           | $\geq -6$                            | Note 2   | Note 2                       | Note 2 | Note 2                     | Note 2                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 25$  dB.  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.14.1.2 Relative Accuracy of SS-SINR in FR1

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR1 compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.14.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|\text{SSB\_RP1}_{\text{dBm}} - \text{SSB\_RP2}_{\text{dBm}}| \leq 27 \text{ dB}$
- $|\text{Channel 1 } I_o - \text{Channel 2 } I_o| \leq 20 \text{ dB}$

Table 10.1.14.1.2-1: SS-SINR Inter frequency relative accuracy in FR1

| Accuracy         |                   | Conditions                             |  |                              |        |                           |                           |
|------------------|-------------------|--|--|------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2,4 | $I_0$ Note 1 range                             |                              |        |                           |                           |
|                  |                   |  | NR operating band groups<br>Note 5             | Minimum $I_0$                |        | Maximum $I_0$             |                           |
| dB               | dB                | dB                                     |  | dBm / SCS <sub>SSB</sub>     |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |  | SCS <sub>SSB</sub> = 120 kHz                   | SCS <sub>SSB</sub> = 240 kHz |        |                           |                           |
| $\pm 3.5$        | $\pm 4$           | $\geq -3$                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                         | -118   | N/A                       | -50                       |
|                  |                   |  | NR_FDD_FR1_B                                   | -120.5                       | -117.5 | N/A                       | -50                       |
|                  |                   |  | NR_TDD_FR1_C                                   | -120                         | -117   | N/A                       | -50                       |
|                  |                   |  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                       | -116.5 | N/A                       | -50                       |
|                  |                   |  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                         | -116   | N/A                       | -50                       |
|                  |                   |  | NR_FDD_FR1_F                                   | -118.5                       | -115.5 | N/A                       | -50                       |
|                  |                   |  | NR_FDD_FR1_G                                   | -118                         | -115   | N/A                       | -50                       |
|                  |                   |  | NR_FDD_FR1_H                                   | -117.5                       | -114.5 | N/A                       | -50                       |
| $\pm 4$          | $\pm 4$           | $\geq -6$                              | Note 3   | Note 3                       | Note 3 | Note 3                    | Note 3                    |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq [25]$  dB.  
NOTE 5: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.14.2 Inter-frequency CSI-SINR accuracy requirements in FR1

### 10.1.14.2.1 Absolute Accuracy of CSI-SINR in FR1

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.14.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.14.2.1-1.

Table 10.1.14.2.1-1: CSI-SINR Inter frequency absolute accuracy in FR1

| Accuracy   |                   |                               | Conditions                               |               |        |        |               |                |
|--|-------------------|-------------------------------|--|---------------|--------|--------|---------------|----------------|
| Normal condition   | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_o^{\text{Note 1}}$ range              |               |        |        |               |                |
|  |                   |                               | NR operating band groups                 | Minimum $I_o$ |        |        | Maximum $I_o$ |                |
| dB   | dB                | dB                            |  | dBm / SCS     |        |        |               | dBm/BW Channel |
|  |                   |                               | SCS (kHz)                                |               |        |        |               |                |
|  |                   |                               | 15                                       | 30            | 60     |        |               |                |
| $\pm 3$  | $\pm 4$           | $\geq -3$                     | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121          | -118   | -115   | N/A           | -70            |
|  |                   |                               | NR_FDD_FR1_B                             | -120.5        | -117.5 | -114.5 | N/A           | -70            |
|  |                   |                               | NR_TDD_FR1_C                             | -120          | -117   | -114   | N/A           | -70            |
|  |                   |                               | NR_FDD_FR1_D, NR_TDD_FR1_D               | -119.5        | -116.5 | -113.5 | N/A           | -70            |
|  |                   |                               | NR_FDD_FR1_E, NR_TDD_FR1_E               | -119          | -116   | -113   | N/A           | -70            |
|  |                   |                               | NR_FDD_FR1_F                             | -118.5        | -115.5 | -112.5 | N/A           | -70            |
|  |                   |                               | NR_FDD_FR1_G                             | -118          | -115   | -112   | N/A           | -70            |
|  |                   |                               | NR_FDD_FR1_H                             | -117.5        | -114.5 | -111.5 | N/A           | -70            |
| $\pm 3.5$  | $\pm 4$           | $\geq -6$                     | Note 2                                   | Note 2        | Note 2 | Note 2 | N/A           | Note 2         |
| <p>NOTE 1: <math>I_o</math> is assumed to have constant EPRE across the bandwidth.</p> <p>NOTE 2: The same bands and the same <math>I_o</math> conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.</p> <p>NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.</p> <p>NOTE 4: The requirements apply for CSI-RS <math>\hat{E}_s/\text{lot} \leq X\text{dB}</math>. <math>X=15</math> if timing offset between the reference measurement timing and the target CSI-RS is no larger than <math>0.5 \cdot \text{CP}</math>, and <math>X=4</math> if timing offset between the reference measurement timing and the target CSI-RS is larger than <math>0.5 \cdot \text{CP}</math> but no larger than <math>\text{CP}</math>.</p> |                   |                               |  |               |        |        |               |                |

#### 10.1.14.2.2 Relative Accuracy of CSI-SINR in FR1

The relative accuracy of CSI-SINR in inter frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR1 compared to the CSI-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.14.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band.
- $|\text{CSI\_RP1}_{\text{dBm}} - \text{CSI\_RP2}_{\text{dBm}}| \leq 27$  dB
- $|\text{Channel 1}_{I_o} - \text{Channel 2}_{I_o}| \leq 20$  dB
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than  $\text{CP}$ .

Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.14.2.2-1.

**Table 10.1.14.2.2-1: CSI-SINR Inter frequency relative accuracy in FR1**

| Accuracy         |                   | Conditions                              |  |               |        |                   |                   |                   |
|------------------|-------------------|---|--|---------------|--------|-------------------|-------------------|-------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$<br>Note 3 | $I_o$ <sup>Note 1</sup> range                  |               |        |                   |                   | Maximum $I_o$     |
|                  |                   |   | NR operating band groups                       | Minimum $I_o$ |        |                   | dBm/BW<br>Channel |                   |
| dB               | dB                | dB                                      |  | dBm / SCS     |        |                   |                   | dBm/BW<br>Channel |
|                  |                   |   | SCS (kHz)                                      |               |        | dBm/BW<br>Channel | dBm/BW<br>Channel |                   |
|                  |                   |   | 15   | 30            | 60     |                   |                   |                   |
| ±3.5             | ±4                | ≥-3                                     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121          | -118   | -115              | N/A               | -70               |
|                  |                   |   | NR_FDD_FR1_B                                   | -120.5        | -117.5 | -114.5            | N/A               | -70               |
|                  |                   |   | NR_TDD_FR1_C                                   | -120          | -117   | -114              | N/A               | -70               |
|                  |                   |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5        | -116.5 | -113.5            | N/A               | -70               |
|                  |                   |   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119          | -116   | -113              | N/A               | -70               |
|                  |                   |   | NR_FDD_FR1_F                                   | -118.5        | -115.5 | -112.5            | N/A               | -70               |
|                  |                   |   | NR_FDD_FR1_G                                   | -118          | -115   | -112              | N/A               | -70               |
|                  |                   |   | NR_FDD_FR1_H                                   | -117.5        | -114.5 | -111.5            | N/A               | -70               |
| ±4               | ±4                | ≥-6                                     | Note 2   | Note 2        | Note 2 | Note 2            | N/A               | Note 2            |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
 NOTE 3: The parameter CSI-RS  $\hat{E}_s/\text{lot}$  is the minimum CSI-RS  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
 NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  
 NOTE 5: The requirements apply for CSI-RS  $\hat{E}_s/\text{lot} \leq X\text{dB}$ .  $X=15$  if timing offset between the reference measurement timing and the target CSI-RS is no larger than  $0.5 \cdot CP$ , and  $X=4$  if timing offset between the reference measurement timing and the target CSI-RS is larger than  $0.5 \cdot CP$  but no larger than  $CP$ .

## 10.1.15 Inter-frequency SINR accuracy requirements for FR2

### 10.1.15.1 Inter-frequency SS-SINR accuracy requirements in FR2

#### 10.1.15.1.1 Absolute Accuracy of SS-SINR in FR2

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.15.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.15.1.1-1: SS-SINR Inter frequency absolute accuracy in FR2

| Accuracy  |                   | Conditions           |   |  |
|---|-------------------|----------------------|---|--|
| Normal condition  | Extreme condition | SSB $\hat{E}s/lot$   | $I_o$ <sup>Note 2</sup> range   |  |
| dB  | dB                |                      | Minimum $I_o$<br>dBm / $SCS_{SSB}$ <sup>Note 1</sup>  |  |
|   |                   | $SCS_{SSB} = 120kHz$ | $SCS_{SSB} = 240kHz$  |  |
| $\pm 3$   | $\pm 4$           | $\geq -3$            | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |  |
| $\pm 3.5$   | $\pm 4$           | $\geq -4$            |   |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the SSB $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table.<br>Note 4: The requirements apply for SSB $\hat{E}s/lot \leq 25$ dB. |                   |                      |   |  |

## 10.1.15.1.2 Relative Accuracy of SS-SINR in FR2

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR2 compared to the SS-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.15.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB\_RP1_{dBm} - SSB\_RP2_{dBm}| \leq 27$  dB
- $|Channel\ 1\_I_o - Channel\ 2\_I_o| \leq 20$  dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.15.1.2-1: SS-SINR Inter frequency relative accuracy in FR2

| Accuracy   |                   | Conditions           |   |  |
|--|-------------------|----------------------|---|--|
| Normal condition   | Extreme condition | SSB $\hat{E}s/lot$   | $I_o$ <sup>Note 2</sup> range   |  |
| dB   | dB                |                      | Minimum $I_o$<br>dBm / $SCS_{SSB}$ <sup>Note 1</sup>  |  |
|  |                   | $SCS_{SSB} = 120kHz$ | $SCS_{SSB} = 240kHz$  |  |
| $\pm 3.5$  | $\pm 4$           | $\geq -3$            | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival |  |
| $\pm 4$  | $\pm 4$           | $\geq -6$            |   |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: The parameter SSB $\hat{E}s/lot$ is the minimum SSB $\hat{E}s/lot$ of the pair of cells to which the requirement applies.<br>Note 4: In the test cases, the SSB $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table.<br>Note 5: The requirements apply for SSB $\hat{E}s/lot \leq 25$ dB. |                   |                      |   |  |

## 10.1.15.2 Inter-frequency CSI-SINR accuracy requirements in FR2

### 10.1.15.2.1 Absolute Accuracy of CSI-SINR in FR2

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.15.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.15.2.1-1.

**Table 10.1.15.2.1-1: CSI-SINR Inter frequency absolute accuracy in FR2**

| Accuracy  |                   | Conditions            |  |                         |
|---|-------------------|-----------------------|--|-------------------------|
| Normal condition  | Extreme condition | CSI-RS $\hat{E}s/lot$ | $I_o$ <sup>Note 2</sup> range  |                         |
| dB  | dB                |                       | dBm / $SCS_{CSI-RS}$ <sup>Note 1</sup>   |                         |
|   |                   |                       | Minimum $I_o$  | Maximum $I_o$           |
|   |                   |                       | $SCS_{CSI-RS} = 60kHz$   | $SCS_{CSI-RS} = 120kHz$ |
| $\pm 3$   | $\pm 4$           | $\geq -3$             | Same value as CSI_RP in Table B.2.13-2, according to UE Power class, operating band and angle of arrival |                         |
| 3.5   | $\pm 4$           | $\geq -4$             |  |                         |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table.<br>Note 4: The requirements apply for CSI-RS $\hat{E}s/lot \leq X$ dB. $X=15$ if timing offset between the reference measurement timing and the target CSI-RS is no larger than $0.5 \cdot CP$ , and $X=4$ if timing offset between the reference measurement timing and the target CSI-RS is larger than $0.5 \cdot CP$ but no larger than CP. |                   |                       |  |                         |

### 10.1.15.2.2 Relative Accuracy of CSI-SINR in FR2

The relative accuracy of CSI-SINR in inter frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR2 compared to the CSI-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.15.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.y for a corresponding Band.
- $|CSI\_RP1_{dBm} - CSI\_RP2_{dBm}| \leq 27$  dB
- $|Channel\ 1_{I_o} - Channel\ 2_{I_o}| \leq 20$  dB



- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.15.2.2-1.

**Table 10.1.15.2.2-1: CSI-SINR Inter frequency relative accuracy in FR2**

| Accuracy   |                   | Conditions                    |  |                                       |  |
|--|-------------------|-------------------------------|--|---------------------------------------|--|
| Normal condition   | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_0$ <sup>Note 2</sup> range  |                                       | Maximum $I_0$<br>dBm/BW <sub>Channel</sub> |
|  |                   |                               | Minimum $I_0$<br>dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 1</sup>   |                                       |  |
| dB   | dB                | dB                            | $SCS_{\text{CSI-RS}} = 60\text{kHz}$   | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |  |
| $\pm 3.5$  | $\pm 4$           | $\geq -3$                     | Same value as CSI_RP in Table B.2.13-2, according to UE Power class, operating band and angle of arrival |                                       | -50  |
| $\pm 4$  | $\pm 4$           | $\geq -6$                     |  |                                       |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: $I_0$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table.<br>Note 4: The requirements apply for CSI-RS $\hat{E}_s/\text{lot} \leq X\text{dB}$ . $X=15$ if timing offset between the reference measurement timing and the target CSI-RS is no larger than $0.5 \cdot CP$ , and $X=4$ if timing offset between the reference measurement timing and the target CSI-RS is larger than $0.5 \cdot CP$ but no larger than CP. |                   |                               |  |                                       |  |

### 10.1.16 SINR report mapping

#### 10.1.16.1 SS-SINR and CSI-SINR measurement report mapping

The reporting range of SS-SINR and CSI-SINR for L3 reporting and L1 reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.16.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential SS-SINR and CSI-SINR for L1 reporting and L3 reporting is defined from -15 dB to 0 dB with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.16.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 10.1.16.1-1: SS-SINR and CSI-SINR measurement report mapping**

| Reported value | Measured quantity value (L3 SS-SINR and L3 CSI-SINR) | Measured quantity value (L1 SS-SINR and L1 CSI-SINR) | Unit |
|----------------|--|--|------|
| SINR_0         | $\text{SINR} < -23$                                  | $\text{SINR} < -23$                                  | dB   |
| SINR_1         | $-23 \leq \text{SINR} < -22.5$                       | $-23 \leq \text{SINR} < -22.5$                       | dB   |
| SINR_2         | $-22.5 \leq \text{SINR} < -22$                       | $-22.5 \leq \text{SINR} < -22$                       | dB   |
| SINR_3         | $-22 \leq \text{SINR} < -21.5$                       | $-22 \leq \text{SINR} < -21.5$                       | dB   |
| SINR_4         | $-21.5 \leq \text{SINR} < -21$                       | $-21.5 \leq \text{SINR} < -21$                       | dB   |
| ..             | ..   | ..   | ...  |
| SINR_123       | $38 \leq \text{SINR} < 38.5$                         | $38 \leq \text{SINR} < 38.5$                         | dB   |
| SINR_124       | $38.5 \leq \text{SINR} < 39$                         | $38.5 \leq \text{SINR} < 39$                         | dB   |
| SINR_125       | $39 \leq \text{SINR} < 39.5$                         | $39 \leq \text{SINR} < 39.5$                         | dB   |
| SINR_126       | $39.5 \leq \text{SINR} < 40$                         | $39.5 \leq \text{SINR} < 40$                         | dB   |
| SINR_127       | $40 \leq \text{SINR}$                                | $40 \leq \text{SINR}$                                | dB   |

**Table 10.1.16.1-2: Differential SS-SINR and CSI-SINR measurement (for L1 reporting and L3 reporting) report mapping**

| Reported value | Measured quantity value (difference in measured SINR from largest SINR) | Unit |
|----------------|---|------|
| DIFFSINR_0     | $0 \geq \Delta \text{SINR} > -1$  | dB   |
| DIFFSINR_1     | $-1 \geq \Delta \text{SINR} > -2$                                       | dB   |
| DIFFSINR_2     | $-2 \geq \Delta \text{SINR} > -3$                                       | dB   |
| DIFFSINR_3     | $-3 \geq \Delta \text{SINR} > -4$                                       | dB   |
| DIFFSINR_4     | $-4 \geq \Delta \text{SINR} > -5$                                       | dB   |
| DIFFSINR_5     | $-5 \geq \Delta \text{SINR} > -6$                                       | dB   |
| DIFFSINR_6     | $-6 \geq \Delta \text{SINR} > -7$                                       | dB   |
| DIFFSINR_7     | $-7 \geq \Delta \text{SINR} > -8$                                       | dB   |
| DIFFSINR_8     | $-8 \geq \Delta \text{SINR} > -9$                                       | dB   |
| DIFFSINR_9     | $-9 \geq \Delta \text{SINR} > -10$                                      | dB   |
| DIFFSINR_10    | $-10 \geq \Delta \text{SINR} > -11$                                     | dB   |
| DIFFSINR_11    | $-11 \geq \Delta \text{SINR} > -12$                                     | dB   |
| DIFFSINR_12    | $-12 \geq \Delta \text{SINR} > -13$                                     | dB   |
| DIFFSINR_13    | $-13 \geq \Delta \text{SINR} > -14$                                     | dB   |
| DIFFSINR_14    | $-14 \geq \Delta \text{SINR} > -15$                                     | dB   |
| DIFFSINR_15    | $-15 \geq \Delta \text{SINR}$   | dB   |

## 10.1.17 Power Headroom

### 10.1.17.1 Power Headroom Report

#### 10.1.17.1.1 Power Headroom Report Mapping

The power headroom reporting range is from -32 ...+38 dB. Table 10.1.17.1-1 defines the report mapping.

**Table 10.1.17.1-1: Power headroom report mapping**

| Reported value    | Measured quantity value (dB) |
|-------------------|------------------------------|
| POWER_HEADROOM_0  | PH < -32                     |
| POWER_HEADROOM_1  | -32 ≤ PH < -31               |
| POWER_HEADROOM_2  | -31 ≤ PH < -30               |
| POWER_HEADROOM_3  | -30 ≤ PH < -29               |
| ...               | ...                          |
| POWER_HEADROOM_53 | 20 ≤ PH < 21                 |
| POWER_HEADROOM_54 | 21 ≤ PH < 22                 |
| POWER_HEADROOM_55 | 22 ≤ PH < 24                 |
| POWER_HEADROOM_56 | 24 ≤ PH < 26                 |
| POWER_HEADROOM_57 | 26 ≤ PH < 28                 |
| POWER_HEADROOM_58 | 28 ≤ PH < 30                 |
| POWER_HEADROOM_59 | 30 ≤ PH < 32                 |
| POWER_HEADROOM_60 | 32 ≤ PH < 34                 |
| POWER_HEADROOM_61 | 34 ≤ PH < 36                 |
| POWER_HEADROOM_62 | 36 ≤ PH < 38                 |
| POWER_HEADROOM_63 | PH ≥ 38                      |

## 10.1.18 P<sub>C<sub>MAX,c,f</sub></sub>

The UE is required to report the UE configured maximum output power (P<sub>C<sub>MAX,c,f</sub></sub>) together with the power headroom. This clause defines the requirements for the P<sub>C<sub>MAX,c,f</sub></sub> reporting.

### 10.1.18.1 Report Mapping

The P<sub>C<sub>MAX,c,f</sub></sub> reporting range is defined from -29 dBm to 33 dBm with 1 dB resolution. Table 10.1.18.1-1 defines the reporting mapping.

**Table 10.1.18.1-1 Mapping of P<sub>C<sub>MAX,c,f</sub></sub>**

| Reported value | Measured quantity value                      | Unit |
|----------------|--|------|
| PCMAX_C_00     | P <sub>C<sub>MAX,c,f</sub></sub> < -29       | dBm  |
| PCMAX_C_01     | -29 ≤ P <sub>C<sub>MAX,c,f</sub></sub> < -28 | dBm  |
| PCMAX_C_02     | -28 ≤ P <sub>C<sub>MAX,c,f</sub></sub> < -27 | dBm  |
| ...            | ...  | ...  |
| PCMAX_C_61     | 31 ≤ P <sub>C<sub>MAX,c,f</sub></sub> < 32   | dBm  |
| PCMAX_C_62     | 32 ≤ P <sub>C<sub>MAX,c,f</sub></sub> < 33   | dBm  |
| PCMAX_C_63     | 33 ≤ P <sub>C<sub>MAX,c,f</sub></sub>        | dBm  |

## 10.1.19 L1-RSRP accuracy requirements for FR1

### 10.1.19.1 SSB based L1-RSRP accuracy requirements

#### 10.1.19.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.19.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.

**Table 10.1.19.1.1-1: SSB based L1-RSRP absolute accuracy in FR1**

| Accuracy         |                   | Conditions |  |                             |        |                           |                           |
|------------------|-------------------|------------|--|-----------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB Es/lot | Io <sup>Note 1</sup> range   |                             |        |                           |                           |
|                  |                   |            | NR operating band groups <sup>Note 2</sup>   | Minimum Io                  |        | Maximum Io                |                           |
| dB               | dB                | dB         |  | dBm / SCS <sub>SSB</sub>    |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |            | SCS <sub>SSB</sub> = 15 kHz  | SCS <sub>SSB</sub> = 30 kHz |        |                           |                           |
| ±5.0             | ±9.5              | ≥3         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A   | -121                        | -118   | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_B   | -120.5                      | -117.5 | N/A                       | -70                       |
|                  |                   |            | NR_TDD_FR1_C   | -120                        | -117   | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D  | -119.5                      | -116.5 | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E  | -119                        | -116   | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_F   | -118.5                      | -115.5 | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_G   | -118                        | -115   | N/A                       | -70                       |
|                  |                   |            | NR_FDD_FR1_H   | -117.5                      | -114.5 | N/A                       | -70                       |
| ±8.5             | ±11.5             | ≥3         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H, | N/A                         | N/A    | -70                       | -50                       |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

**10.1.19.1.2 Relative Accuracy**

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 10.1.19.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.

Table 10.1.19.1.2-1: SSB based L1-RSRP relative accuracy in FR1

| Accuracy         |                   | Conditions                           |  |                              |                              |                     |                     |
|------------------|-------------------|--------------------------------------|--|------------------------------|------------------------------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                             |                              |                              |                     |                     |
|                  |                   |                                      | NR operating band groups<br>Note 4             | Minimum $I_o$                |                              | Maximum $I_o$       |                     |
| dB               | dB                | dB                                   |  | dBm / $SCS_{SSB}$            |                              | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                                      |  | $SCS_{SSB} = 15 \text{ kHz}$ | $SCS_{SSB} = 30 \text{ kHz}$ |                     |                     |
| $\pm 3$          | $\pm 4$           | $\geq 3$                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                         | -118                         | N/A                 | -50                 |
|                  |                   |                                      | NR_FDD_FR1_B                                   | -120.5                       | -117.5                       | N/A                 | -50                 |
|                  |                   |                                      | NR_TDD_FR1_C                                   | -120                         | -117                         | N/A                 | -50                 |
|                  |                   |                                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                       | -116.5                       | N/A                 | -50                 |
|                  |                   |                                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                         | -116                         | N/A                 | -50                 |
|                  |                   |                                      | NR_FDD_FR1_F                                   | -118.5                       | -115.5                       | N/A                 | -50                 |
|                  |                   |                                      | NR_FDD_FR1_G                                   | -118                         | -115                         | N/A                 | -50                 |
|                  |                   |                                      | NR_FDD_FR1_H                                   | -117.5                       | -114.5                       | N/A                 | -50                 |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of SSBs to which the requirement applies.  
NOTE 3: Void  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.19.2 CSI-RS based L1-RSRP accuracy requirements

### 10.1.19.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.19.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.19.2.1-1.

Table 10.1.19.2.1-1: CSI-RS based L1-RSRP absolute accuracy in FR1

| Accuracy         |                   | Conditions                    |  |                                |                                |        |                           |                           |
|------------------|-------------------|-------------------------------|--|--------------------------------|--------------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{\epsilon}$ s/lot | $I_o$ <sup>Note 1</sup> range  |                                |                                |        |                           |                           |
|                  |                   |                               | NR operating band groups <sup>Note 2</sup>   | Minimum $I_o$                  |                                |        | Maximum $I_o$             |                           |
| dB               | dB                | dB                            |  | dBm / SCS <sub>CSI-RS</sub>    |                                |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                               | SCS <sub>CSI-RS</sub> = 15 kHz   | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |        |                           |                           |
| ±5.0             | ±9.5              | ≥3                            | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A   | -121                           | -118                           | -115   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_B   | -120.5                         | -117.5                         | -114.5 | N/A                       | -70                       |
|                  |                   |                               | NR_TDD_FR1_C   | -120                           | -117                           | -114   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_D, NR_TDD_FR1_D   | -119.5                         | -116.5                         | -113.5 | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_E, NR_TDD_FR1_E   | -119                           | -116                           | -113   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_F   | -118.5                         | -115.5                         | -112.5 | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_G   | -118                           | -115                           | -112   | N/A                       | -70                       |
|                  |                   |                               | NR_FDD_FR1_H   | -117.5                         | -114.5                         | -111.5 | N/A                       | -70                       |
| ±8.5             | ±11.5             | ≥3                            | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H | N/A                            | N/A                            | N/A    | -70                       | -50                       |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

10.1.19.2.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.19.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.19.2.2-1.

Table 10.1.19.2.2-1: CSI-RS based L1-RSRP relative accuracy in FR1

| Accuracy         |                   | Conditions                              |  |                                |                                |        |               |                            |
|------------------|-------------------|---|--|--------------------------------|--------------------------------|--------|---------------|----------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$<br>Note 2 | $I_0$ Note 1 range                             |                                |                                |        |               |                            |
|                  |                   |   | NR operating band groups<br>Note 4             | Minimum $I_0$                  |                                |        | Maximum $I_0$ |                            |
| dB               | dB                | dB                                      |  | dBm / $SCS_{\text{CSI-RS}}$    |                                |        |               | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |   | $SCS_{\text{CSI-RS}} = 15$ kHz                 | $SCS_{\text{CSI-RS}} = 30$ kHz | $SCS_{\text{CSI-RS}} = 60$ kHz |        |               |                            |
| $\pm 3$          | $\pm 4$           | $\geq -3$                               | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | -115   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | -114.5 | N/A           | -50                        |
|                  |                   |   | NR_TDD_FR1_C                                   | -120                           | -117                           | -114   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | -113.5 | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | -113   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | -112.5 | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_G                                   | -118                           | -115                           | -112   | N/A           | -50                        |
|                  |                   |   | NR_FDD_FR1_H                                   | -117.5                         | -114.5                         | -111.5 | N/A           | -50                        |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter CSI-RS  $\hat{E}_s/\text{lot}$  is the minimum CSI-RS  $\hat{E}_s/\text{lot}$  of the pair of CSI-RS resources to which the requirement applies.  
NOTE 3: Void  
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.20 L1-RSRP accuracy requirements for FR2

### 10.1.20.1 SSB based L1-RSRP accuracy requirements

#### 10.1.20.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.20.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.20.1.1-1: SSB based L1-RSRP absolute accuracy in FR2**

| Accuracy         |                   | Conditions                 |   |                             |                     |
|------------------|-------------------|----------------------------|---|-----------------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 1</sup> range   |                             |                     |
|                  |                   |                            | Minimum $I_o$   |                             | Maximum $I_o$       |
| dB               | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 2</sup>   |                             | dBm/ $BW_{Channel}$ |
|                  |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |                     |
| $\pm 6.5$        | $\pm 9.5$         | $\geq -3$                  | Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival |                             | -70                 |
| $\pm 8.5$        | $\pm 11.5$        | $\geq -3$                  | N/A   |                             | -50                 |

NOTE 1:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
NOTE 3: In the test cases, the SSB  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.

### 10.1.20.1.2 Relative Accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 10.1.20.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.20.1.2-1: SSB based L1-RSRP relative accuracy in FR2**

| Accuracy         |                   | Conditions                 |   |                             |                     |
|------------------|-------------------|----------------------------|---|-----------------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 1</sup> range   |                             |                     |
|                  |                   |                            | Minimum $I_o$   |                             | Maximum $I_o$       |
| dB               | dB                | dB                         | dBm / $SCS_{SSB}$ <sup>Note 3</sup>   |                             | dBm/ $BW_{Channel}$ |
|                  |                   |                            | $SCS_{SSB} = 120\text{kHz}$   | $SCS_{SSB} = 240\text{kHz}$ |                     |
| $\pm 6.5$        | $\pm 9.5$         | $\geq -3$                  | Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival |                             | -50                 |

NOTE 1:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of SSBs to which the requirement applies.  
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
NOTE 4: In the test cases, the SSB  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.



## 10.1.20.2 CSI-RS based L1-RSRP accuracy requirements

### 10.1.20.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.20.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.20.2.1-1.

**Table 10.1.20.2.1-1: CSI-RS based L1-RSRP absolute accuracy in FR2**

| Accuracy         |                   | Conditions                    |  |                                       |                            |
|------------------|-------------------|-------------------------------|--|---------------------------------------|----------------------------|
| Normal condition | Extreme condition | CSI-RS $\hat{E}_s/\text{lot}$ | $I_0$ <sup>Note 1</sup> range  |                                       |                            |
|                  |                   |                               | Minimum $I_0$  |                                       | Maximum $I_0$              |
| dB               | dB                | dB                            | dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 2</sup>  |                                       | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                               | $SCS_{\text{CSI-RS}} = 60\text{kHz}$   | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |                            |
| $\pm 6.5$        | $\pm 9.5$         | $\geq -3$                     | Same value as CSI-RS_RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival |                                       | -70                        |
| $\pm 8.5$        | $\pm 11.5$        | $\geq -3$                     | N/A  |                                       | -50                        |

NOTE 1:  $I_0$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
NOTE 3: In the test cases, the CSI-RS  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.

### 10.1.20.2.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.20.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.20.2.2-1.

**Table 10.1.20.2.2-1: CSI-RS based L1-RSRP relative accuracy in FR2**

| Accuracy  |                   | Conditions            |  |                         |
|---|-------------------|-----------------------|--|-------------------------|
| Normal condition  | Extreme condition | CSI-RS $\hat{E}s/lot$ | $I_o$ <sup>Note 1</sup> range  |                         |
|   |                   |                       | Minimum $I_o$  | Maximum $I_o$           |
| dB  | dB                | dB                    | dBm / $SCS_{CSI-RS}$   |                         |
|   |                   |                       | $SCS_{CSI-RS} = 60kHz$   | $SCS_{CSI-RS} = 120kHz$ |
| $\pm 6.5$   | $\pm 9.5$         | $\geq -3$             | Same value as CSI-RS RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival |                         |
| NOTE 1: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter CSI-RS $\hat{E}s/lot$ is the minimum CSI-RS $\hat{E}s/lot$ of the pair of CSI-RS resources to which the requirement applies.<br>NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>NOTE 4: In the test cases, the CSI-RS $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table. |                   |                       |  |                         |

### 10.1.21 SFTD accuracy requirements

#### 10.1.21.1 SFTD accuracy requirements for NE-DC

The SFN and frame timing difference (SFTD) is measured between PCell and E-UTRAN PSCell under NE-DC.

The accuracy requirements in Table 10.1.21.1-4 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- $I_o$  range defined in Table 10.1.21.1-1.

**Table 10.1.21.1-1: PCell  $I_o$  range conditions in FR1**

| Parameter  | $I_o$ <sup>Note 1</sup> range                 |                                    |                      |                                      |
|--|---|------------------------------------|----------------------|--------------------------------------|
|  | NR operating band groups <sup>Note 4, 5</sup> | Minimum $I_o$ <sup>Note 2, 3</sup> |                      | Maximum $I_o$<br>dBm/ $BW_{Channel}$ |
|  |   | dBm/ $SCS_{SSB}$                   |                      |                                      |
|  |   | $SCS_{SSB} = 15$ kHz               | $SCS_{SSB} = 30$ kHz |                                      |
| <b>Conditions</b>  | NR_FDD_FR1_A, NR_TDD_FR1_A                    | -121                               | -118                 | -50                                  |
|  | NR_FDD_FR1_B                                  | -120.5                             | -117.5               | -50                                  |
|  | NR_TDD_FR1_C                                  | -120                               | -117                 | -50                                  |
|  | NR_FDD_FR1_D, NR_TDD_FR1_D                    | -119.5                             | -116.5               | -50                                  |
|  | NR_FDD_FR1_E, NR_TDD_FR1_E                    | -119                               | -116                 | -50                                  |
|  | NR_FDD_FR1_F                                  | -118.5                             | -115.5               | -50                                  |
|  | NR_FDD_FR1_G                                  | -118                               | -115                 | -50                                  |
|  | NR_FDD_FR1_H                                  | -117.5                             | -114.5               | -50                                  |
| NOTE 1: $I_o$ is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [20], depending on E-UTRA – NR band combination.<br>NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [20], if applicable depending on E-UTRA – NR band combination.<br>NOTE 4: NR operating band groups are as defined in clause 3.5.<br>NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [20] are applicable. |   |                                    |                      |                                      |

For FR2 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- $I_o$  range defined in Table 10.1.21.1-2.

**Table 10.1.21.1-2: PCell  $I_o$  range conditions in FR2**

| Parameter   | $I_o$ <sup>Note 1</sup> range  |  |                     |
|---|--|--|---------------------|
|   | Minimum $I_o$ <sup>Note 2, 3</sup>   |  | Maximum $I_o$       |
|   | dBm/ $SCS_{SSB}$   |  |                     |
|   | $SCS_{SSB} = 15$ kHz   | $SCS_{SSB} = 30$ kHz   | dBm/ $BW_{Channel}$ |
| Conditions  | Same value as $SSB\_RP$ in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | Same value as $SSB\_RP$ in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | -50                 |
| NOTE 1: $I_o$ is assumed to have constant EPRE across the bandwidth and specified at the Reference point.   |  |  |                     |
| NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. |  |  |                     |
| NOTE 3: In the test cases, the SSB $\hat{E}_s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}_s/lot$ at UE baseband is above the value defined in this table.    |  |  |                     |

For E-UTRA PSCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [25] Clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$  according to Annex B.3.5 in TS 36.101 [25] for a corresponding Band.
- $I_o$  range defined in Table 10.1.21.1-3.

**Table 10.1.21.1-3: E-UTRA PSCell  $I_o$  range conditions**

| Parameter   | $I_o$ <sup>Note 1</sup> range                  |                             |                     |
|---|--|-----------------------------|---------------------|
|   | E-UTRA operating band groups <sup>Note 3</sup> | Minimum $I_o$               | Maximum $I_o$       |
| Conditions  |  | dBm/15kHz <sup>Note 2</sup> | dBm/ $BW_{Channel}$ |
|   | FDD_A, TDD_A                                   | -121                        | -50                 |
|   | FDD_C, TDD_C                                   | -120                        | -50                 |
|   | FDD_D  | -119.5                      | -50                 |
|   | FDD_E, TDD_E                                   | -119                        | -50                 |
|   | FDD_F  | -118.5                      | -50                 |
|   | FDD_G  | -118                        | -50                 |
|   | FDD_H  | -117.5                      | -50                 |
|   | FDD_N  | -114.5                      | -50                 |
| NOTE 1: When in dBm/15kHz, the minimum $I_o$ condition is expressed as the average $I_o$ per RE over all REs in that symbol. $I_o$ may be different in different symbols within a subframe. |  |                             |                     |
| NOTE 2: The condition level is increased by $\Delta > 0$ , when applicable, as described in clauses B.4.2 and B.4.3 in TS36.133 [15].   |  |                             |                     |
| NOTE 3: E-UTRA operating band groups are as defined in clause 3.5 in TS 36.133 [15].  |  |                             |                     |

Table 10.1.21.1-4: SFTD measurement accuracy

| Accuracy  | Conditions                               |                 |
|---|--|-----------------|
|   | $\hat{E}_s/\text{lot}$ <sup>Note 2</sup> | Frequency range |
| $T_s$ <sup>Note 1</sup>   | <b>dB</b>                                |                 |
| $40 \cdot 64 \cdot T_c$   | $\geq -3$                                | FR1             |
| $40 \cdot 64 \cdot T_c$   |  | FR2             |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [6].  |  |                 |
| NOTE 2: The parameter $\hat{E}_s/\text{lot}$ is the minimum $\hat{E}_s/\text{lot}$ of the pair of cells to which the requirement applies. |  |                 |

### 10.1.21.2 SFTD accuracy requirements for NR-DC

The SFN and frame timing difference (SFTD) is measured between PCell in FR1 and PSCell in FR2 under NR dual connectivity.

The accuracy requirements in Table 10.1.21.2-3 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- $I_o$  range defined in Table 10.1.21.2-1.

Table 10.1.21.2-1: PCell  $I_o$  range conditions in FR1

| Parameter  | $I_o$ <sup>Note 1</sup> range              |                             |                             |  |
|--|--|-----------------------------|-----------------------------|--|
|  | NR operating band groups <sup>Note 2</sup> | Minimum $I_o$               |                             | Maximum $I_o$<br>dBm/BW <sub>Channel</sub> |
|  |  | dBm/ SCS <sub>SSB</sub>     |                             |  |
|  |  | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |  |
| <b>Conditions</b>  | NR_FDD_FR1_A, NR_TDD_FR1_A                 | -121                        | -118                        | -50  |
|  | NR_FDD_FR1_B                               | -120.5                      | -117.5                      | -50  |
|  | NR_TDD_FR1_C                               | -120                        | -117                        | -50  |
|  | NR_FDD_FR1_D, NR_TDD_FR1_D                 | -119.5                      | -116.5                      | -50  |
|  | NR_FDD_FR1_E, NR_TDD_FR1_E                 | -119                        | -116                        | -50  |
|  | NR_FDD_FR1_F                               | -118.5                      | -115.5                      | -50  |
|  | NR_FDD_FR1_G                               | -118                        | -115                        | -50  |
|  | NR_FDD_FR1_H                               | -117.5                      | -114.5                      | -50  |
| NOTE 1: $I_o$ is assumed to have constant EPRE across the bandwidth. |  |                             |                             |  |
| NOTE 2: NR operating band groups are as defined in clause 3.5.2.     |  |                             |                             |  |

For FR2 PSCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- $I_o$  range defined in Table 10.1.21.2-2.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.21.2-2: PCell  $I_o$  range conditions in FR2

| Parameter   | $I_o$ <sup>Note 1</sup> range   |   |  |
|---|---|---|--|
|   | Minimum $I_o$ <sup>Note 2, 3</sup>  |   | Maximum $I_o$<br>dBm/BW <sub>Channel</sub> |
|   | dBm/ SCS <sub>SSB</sub>   |   |  |
|   | SCS <sub>SSB</sub> = 15 kHz   | SCS <sub>SSB</sub> = 30 kHz   |  |
| Conditions  | Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | -50  |
| NOTE 1: $I_o$ is assumed to have constant EPRE across the bandwidth and specified at the Reference point.   |   |   |  |
| NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. |   |   |  |
| NOTE 3: In the test cases, the SSB $\hat{E}_s/I_o$ and related parameters may need to be adjusted to ensure $\hat{E}_s/I_o$ at UE baseband is above the value defined in this table.    |   |   |  |

Table 10.1.21.2-3: SFTD measurement accuracy

| Accuracy  | Conditions                        |                     |
|---|-----------------------------------|---------------------|
|   | $\hat{E}_s/I_o$ <sup>Note 2</sup> | Frequency range     |
| $T_s$ <sup>Note 1</sup>   | dB                                |                     |
| $40 \cdot 64 \cdot T_c$   | $\geq -3$                         | Between FR1 and FR2 |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [6].  |                                   |                     |
| NOTE 2: The parameter $\hat{E}_s/I_o$ is the minimum $\hat{E}_s/I_o$ of the pair of cells to which the requirement applies. |                                   |                     |

### 10.1.21.3 Inter frequency SFTD accuracy requirements

The SFN and frame timing difference (SFTD) is measured between PCell and inter-frequency neighbour cell.

The accuracy requirements in Table 10.1.21.3-3 are applicable under the following conditions:

For FR1 PCell, inter frequency neighbour cell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- $I_o$  range defined in Table 10.1.21.3-1.

Table 10.1.21.3-1: PCell, inter frequency neighbour cell  $I_o$  range conditions in FR1

| Parameter  | $I_o$ <sup>Note 1</sup> range              |                             |                             |  |
|--|--|-----------------------------|-----------------------------|--|
|  | NR operating band groups <sup>Note 2</sup> | Minimum $I_o$               |                             | Maximum $I_o$<br>dBm/BW <sub>Channel</sub> |
|  |  | dBm/ SCS <sub>SSB</sub>     |                             |  |
|  |  | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |  |
| Conditions   | NR_FDD_FR1_A, NR_TDD_FR1_A                 | -121                        | -118                        | -50  |
|  | NR_FDD_FR1_B                               | -120.5                      | -117.5                      | -50  |
|  | NR_TDD_FR1_C                               | -120                        | -117                        | -50  |
|  | NR_FDD_FR1_D, NR_TDD_FR1_D                 | -119.5                      | -116.5                      | -50  |
|  | NR_FDD_FR1_E, NR_TDD_FR1_E                 | -119                        | -116                        | -50  |
|  | NR_FDD_FR1_F                               | -118.5                      | -115.5                      | -50  |
|  | NR_FDD_FR1_G                               | -118                        | -115                        | -50  |
|  | NR_FDD_FR1_H                               | -117.5                      | -114.5                      | -50  |
| NOTE 1: $I_o$ is assumed to have constant EPRE across the bandwidth. |  |                             |                             |  |
| NOTE 2: NR operating band groups are as defined in clause 3.5.2.     |  |                             |                             |  |

For FR2 PCell, inter frequency neighbour cell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- $I_o$  range defined in Table 10.1.21.3-2.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.21.3-2: PCell, inter frequency neighbour cell  $I_0$  range conditions in FR2**

| Parameter   | $I_0$ <sup>Note 1</sup> range  |  |                     |
|---|--|--|---------------------|
|   | Minimum $I_0$ <sup>Note 2, 3</sup>   |  | Maximum $I_0$       |
|   | dBm/ $SCS_{SSB}$   |  |                     |
|   | $SCS_{SSB} = 15$ kHz   | $SCS_{SSB} = 30$ kHz   | dBm/ $BW_{Channel}$ |
| Conditions  | Same value as $SSB\_RP$ in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | Same value as $SSB\_RP$ in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | -50                 |
| NOTE 1: $I_0$ is assumed to have constant EPRE across the bandwidth and specified at the Reference point.   |  |  |                     |
| NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. |  |  |                     |
| NOTE 3: In the test cases, the SSB $\hat{E}_s/I_0$ and related parameters may need to be adjusted to ensure $\hat{E}_s/I_0$ at UE baseband is above the value defined in this table.    |  |  |                     |

**Table 10.1.21.3-3: Inter frequency SFTD measurement accuracy**

| Accuracy  | Conditions                        |                 |
|---|-----------------------------------|-----------------|
|   | $\hat{E}_s/I_0$ <sup>Note 2</sup> | Frequency range |
| $T_S$ <sup>Note 1</sup>   | dB                                |                 |
| $40 \cdot 64 \cdot T_C$   | $\geq -3$                         | FR1, FR2        |
| NOTE 1: $T_C$ is the basic timing unit defined in TS 38.211 [6].  |                                   |                 |
| NOTE 2: The parameter $\hat{E}_s/I_0$ is the minimum $\hat{E}_s/I_0$ of the pair of cells to which the requirement applies. |                                   |                 |

## 10.1.22 CLI measurement accuracy requirements

### 10.1.22.1 SRS-RSRP

#### 10.1.22.1.1 SRS-RSRP Accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 10.1.22.1.1-1 for FR1 and Table 10.1.22.1.1-2 for FR2, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z for a corresponding Band for each relevant SRS resource configured for measurement.
- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than  $T_{error\_SRS\_RSRP}$ , where
  - $T_{error\_SRS\_RSRP} = T_C \times N_{TA\_offset} + 4.67\mu s$  for FR1
  - $T_{error\_SRS\_RSRP} = T_C \times N_{TA\_offset} + 3.67\mu s$  for FR2
  - $N_{TA\_offset}$  is defined in Table 7.1.2-2
  - $T_C$  is 0.509ns
- The number of SRS ports in the SRS resource configured for measurement is 1,
- The number of symbols in the SRS resource configured for measurement is 1,
- The number of repetitions in the SRS resource configured for measurement is 1,

- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,
- The bandwidth of the SRS resource is 48 PRBs.
- One of the following conditions is met
  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.
  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

**Table 10.1.22.1.1-1: SRS-RSRP absolute accuracy in FR1**

| Accuracy                 |      |      |                          |     |       | Conditions    |   |                                       |                                       |                   |                   |            |
|--------------------------|------|------|--------------------------|-----|-------|---------------|---|---------------------------------------|---------------------------------------|-------------------|-------------------|------------|
| Normal condition         |      |      | Extreme condition        |     |       | SRS<br>Es/lot | Io <sup>Note 1</sup> range                                      |                                       |                                       |                   |                   | Maximum Io |
|                          |      |      |                          |     |       |               | NR operating band groups <sup>Note 2</sup>                      | Minimum Io                            |                                       |                   |                   |            |
| dB                       |      |      |                          |     |       | dB            | dBm / SCS <sub>SRS</sub>  |                                       |                                       | dBm/BW<br>Channel | dBm/BW<br>Channel |            |
| SCS <sub>SRS</sub> (kHz) |      |      | SCS <sub>SRS</sub> (kHz) |     |       |               | SCS <sub>s</sub><br>RS =<br>15<br>kHz                           | SCS <sub>s</sub><br>RS =<br>30<br>kHz | SCS <sub>s</sub><br>RS =<br>60<br>kHz |                   |                   |            |
| 15                       | 30   | 60   | 15                       | 30  | 60    |               |   |                                       |                                       |                   |                   |            |
| ±3                       | ±3.5 | ±5   | ±7.5                     | ±8  | ±9.5  | ≥1            | NR_TDD_FR1_A,   | -120                                  | -117                                  | -114              | N/A               | -70        |
|                          |      |      |                          |     |       |               | NR_TDD_FR1_C  | -119                                  | -116                                  | -113              | N/A               | -70        |
|                          |      |      |                          |     |       |               | NR_TDD_FR1_D  | -118.5                                | -115.5                                | -112.5            | N/A               | -70        |
|                          |      |      |                          |     |       |               | NR_TDD_FR1_E  | -118                                  | -115                                  | -112              | N/A               | -70        |
| ±6.5                     | ±7   | ±8.5 | ±9.5                     | ±10 | ±11.5 | ≥1            | NR_TDD_FR1_A,<br>NR_TDD_FR1_C,<br>NR_TDD_FR1_D,<br>NR_TDD_FR1_E | N/A                                   | N/A                                   | N/A               | -70               | -50        |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 10.1.22.1.1-2: SRS-RSRP absolute accuracy in FR2

| Accuracy  |       |                          |       | Conditions    |   |                         |                           |                           |
|---|-------|--------------------------|-------|---------------|---|-------------------------|---------------------------|---------------------------|
| Normal condition  |       | Extreme condition        |       | SRS<br>Ês/lot | I <sub>o</sub> <sup>Note 1</sup> range  |                         |                           |                           |
|   |       |                          |       |               | Minimum I <sub>o</sub>  |                         | Maximum I <sub>o</sub>    |                           |
| dB  |       |                          |       | dB            | dBm / SCS <sub>SRS</sub><br><sup>Note 2</sup>   |                         | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
| SCS <sub>SRS</sub> (kHz)  |       | SCS <sub>SRS</sub> (kHz) |       |               | SCS <sub>SRS</sub><br>=   | SCS <sub>SRS</sub><br>= |                           |                           |
| 60  | 120   | 60                       | 120   |               | 60kHz   | 120kHz                  |                           |                           |
| ±6  | ±8.5  | ±9                       | ±11.5 | ≥1            | Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival |                         | N/A                       | -70                       |
| ±9  | ±11.5 | ±11                      | ±13.5 | ≥1            | N/A   |                         | -70                       | -50                       |
| NOTE 1: I <sub>o</sub> specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  |       |                          |       |               |   |                         |                           |                           |
| NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. |       |                          |       |               |   |                         |                           |                           |
| NOTE 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.                      |       |                          |       |               |   |                         |                           |                           |

### 10.1.22.1.2 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 10.1.22.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.22.1.2-1: SRS-RSRP measurement report mapping

| Reported value | Measured quantity value   | Unit |
|----------------|---|------|
| SRS-RSRP_0     | SRS-RSRP < -140   | dBm  |
| SRS-RSRP_1     | -140 ≤ SRS-RSRP < -139  | dBm  |
| SRS-RSRP_2     | -139 ≤ SRS-RSRP < -138  | dBm  |
| SRS-RSRP_3     | -138 ≤ SRS-RSRP < -137  | dBm  |
| SRS-RSRP_4     | -137 ≤ SRS-RSRP < -136  | dBm  |
| ..             | ..  | ...  |
| SRS-RSRP_95    | -46 ≤ SRS-RSRP < -45  | dBm  |
| SRS-RSRP_96    | -45 ≤ SRS-RSRP < -44  | dBm  |
| SRS-RSRP_97    | -44 ≤ SRS-RSRP  | dBm  |
| SRS-RSRP_98    | Infinity  |      |
| Note:          | 'Infinity' means that UE cannot detect SRS due to too strong signal to measure. |      |

### 10.1.22.2 CLI-RSSI

#### 10.1.22.2.1 CLI-RSSI Accuracy

The CLI-RSSI measurement reported by the UE shall fulfil the accuracy requirements defined in Table 10.1.22.2.1-1 for FR1 and Table 10.1.22.2.1-2 for FR2, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.



**Table 10.1.22.2.1-1: CLI-RSSI absolute accuracy in FR1**

| Accuracy         |                   | Conditions                                 |            |                             |                             |            |                           |
|------------------|-------------------|--|------------|-----------------------------|-----------------------------|------------|---------------------------|
| Normal condition | Extreme condition | Io <sup>Note 1</sup> range                 |            |                             |                             |            |                           |
|                  |                   | NR operating band groups <sup>Note 2</sup> | Minimum Io |                             |                             | Maximum Io |                           |
| dB               | dB                |  |            | dBm / SCS <sub>SRS</sub>    |                             |            | dBm/BW <sub>Channel</sub> |
|                  |                   | SCS <sub>SRS</sub> = 15 kHz                |            | SCS <sub>SRS</sub> = 30 kHz | SCS <sub>SRS</sub> = 60 kHz |            |                           |
| ±3.5             | ±6.5              | NR_TDD_FR1_A,                              | -120       | -117                        | -114                        | N/A        | -70                       |
|                  |                   | NR_TDD_FR1_C                               | -119       | -116                        | -113                        | N/A        | -70                       |
|                  |                   | NR_TDD_FR1_D                               | -118.5     | -115.5                      | -112.5                      | N/A        | -70                       |
|                  |                   | NR_TDD_FR1_E                               | -118       | -115                        | -112                        | N/A        | -70                       |
| ±5.5             | ±8.5              | Note 3                                     | Note 3     | Note 3                      | Note 3                      | -70        | -50                       |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.  
 NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

**Table 10.1.22.2.1-2: CLI-RSSI absolute accuracy in FR2**

| Accuracy         |                   | Conditions  |                             |                           |                           |
|------------------|-------------------|---|-----------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | Io <sup>Note 1</sup> range  |                             |                           |                           |
|                  |                   | Minimum Io  |                             | Maximum Io                |                           |
| dB               | dB                | dBm / SCS <sub>SRS</sub> <sup>Note 2</sup>  |                             | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   | SCS <sub>SRS</sub> = 60kHz  | SCS <sub>SRS</sub> = 120kHz |                           |                           |
| ±5               | ±8                | Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival |                             | N/A                       | -70                       |
| ±7               | ±10               | Note 4  |                             | -70                       | -50                       |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
 NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
 NOTE 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.  
 NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

10.1.22.2.2 CLI-RSSI report mapping

The reporting range of CLI-RSSI is defined from -100 dBm to -25 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 10.1.22.2.2-1. The range in the signalling may be larger than the guaranteed accuracy range. UE shall scale the measured CLI-RSSI to report a nominal RSSI equivalent to 6RB measurement with 15kHz SCS.

**Table 10.1.22.2.2-1: CLI-RSSI measurement report mapping**

| Reported value | Measured quantity value | Unit |
|----------------|-------------------------|------|
| CLI-RSSI_00    | CLI-RSSI < -100         | dBm  |
| CLI-RSSI_01    | -100 ≤ CLI-RSSI < -99   | dBm  |
| CLI-RSSI_02    | -99 ≤ CLI-RSSI < -98    | dBm  |
| ...            | ...                     | ...  |
| CLI-RSSI_74    | -27 ≤ CLI-RSSI < -26    | dBm  |
| CLI-RSSI_75    | -26 ≤ CLI-RSSI < -25    | dBm  |
| CLI-RSSI_76    | -25 ≤ CLI-RSSI          | dBm  |

### 10.1.24.3.1 Absolute PRS-RSRP Measurement Report Mapping

The reporting range of absolute PRS-RSRP measurement is defined from -156 dBm to -31 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.24.3.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 10.1.24.3.1-1: Measurement report mapping for PRS-RSRP**

| Reported value | Measured quantity value | Unit |
|----------------|-------------------------|------|
| PRS_RSRP_0     | PRS-RSRP<-156           | dBm  |
| PRS_RSRP_1     | -156≤PRS-RSRP<-155      | dBm  |
| PRS_RSRP_2     | -155≤PRS-RSRP<-154      | dBm  |
| PRS_RSRP_3     | -154≤PRS-RSRP<-153      | dBm  |
| PRS_RSRP_4     | -153≤PRS-RSRP<-152      | dBm  |
| PRS_RSRP_5     | -152≤PRS-RSRP<-151      | dBm  |
| PRS_RSRP_6     | -151≤PRS-RSRP<-150      | dBm  |
| PRS_RSRP_7     | -150≤PRS-RSRP<-149      | dBm  |
| PRS_RSRP_8     | -149≤PRS-RSRP<-148      | dBm  |
| PRS_RSRP_9     | -148≤PRS-RSRP<-147      | dBm  |
| PRS_RSRP_10    | -147≤PRS-RSRP<-146      | dBm  |
| PRS_RSRP_11    | -146≤PRS-RSRP<-145      | dBm  |
| PRS_RSRP_12    | -145≤PRS-RSRP<-144      | dBm  |
| PRS_RSRP_13    | -144≤PRS-RSRP<-143      | dBm  |
| PRS_RSRP_14    | -143≤PRS-RSRP<-142      | dBm  |
| PRS_RSRP_15    | -142≤PRS-RSRP<-141      | dBm  |
| PRS_RSRP_16    | -141≤PRS-RSRP<-140      | dBm  |
| PRS_RSRP_17    | -140≤PRS-RSRP<-139      | dBm  |
| PRS_RSRP_18    | -139≤PRS-RSRP<-138      | dBm  |
| ...            | ...                     | ...  |
| PRS_RSRP_111   | -46≤PRS-RSRP<-45        | dBm  |
| PRS_RSRP_112   | -45≤PRS-RSRP<-44        | dBm  |
| PRS_RSRP_113   | -44≤PRS-RSRP<-43        | dBm  |
| PRS_RSRP_114   | -43≤PRS-RSRP<-42        | dBm  |
| PRS_RSRP_115   | -42≤PRS-RSRP<-41        | dBm  |
| PRS_RSRP_116   | -41≤PRS-RSRP<-40        | dBm  |
| PRS_RSRP_117   | -40≤PRS-RSRP<-39        | dBm  |
| PRS_RSRP_118   | -39≤PRS-RSRP<-38        | dBm  |
| PRS_RSRP_119   | -38≤PRS-RSRP<-37        | dBm  |
| PRS_RSRP_120   | -37≤PRS-RSRP<-36        | dBm  |
| PRS_RSRP_121   | -36≤PRS-RSRP<-35        | dBm  |
| PRS_RSRP_122   | -35≤PRS-RSRP<-34        | dBm  |
| PRS_RSRP_123   | -34≤PRS-RSRP<-33        | dBm  |
| PRS_RSRP_124   | -33≤PRS-RSRP<-32        | dBm  |
| PRS_RSRP_125   | -32≤PRS-RSRP<-31        | dBm  |
| PRS_RSRP_126   | -31≤PRS-RSRP            | dBm  |

### 10.1.24.3.2 Differential Report Mapping for PRS-RSRP Measurement

The reporting range of differential PRS-RSRP is defined from -30 dB to 0 dB with 1 dB resolution when *nr-DL-AoD-RequestLocationInformation* message is received.

The mapping of measured quantity is defined in Table 10.1.24.3.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential PRS-RSRP is defined from -30 dB to 30 dB with 1 dB resolution when *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* is received.

The mapping of measured quantity is defined in Table 10.1.24.3.2-2. The range in the signalling may be larger than the guaranteed accuracy range or the range supported by the UE receiver for differential RSRP measured on different PRS resources in frequency domain at the same time.

**Table 10.1.24.3.2-1: Measurement report mapping for differential PRS-RSRP**

| Reported value | Measured quantity value             | Unit |
|----------------|-------------------------------------|------|
| DIFFRSRP_0     | $-30 \geq \Delta \text{RSRP}$       | dB   |
| DIFFRSRP_1     | $-29 \geq \Delta \text{RSRP} > -30$ | dB   |
| DIFFRSRP_2     | $-28 \geq \Delta \text{RSRP} > -29$ | dB   |
| DIFFRSRP_3     | $-27 \geq \Delta \text{RSRP} > -28$ | dB   |
| DIFFRSRP_4     | $-26 \geq \Delta \text{RSRP} > -27$ | dB   |
| DIFFRSRP_5     | $-25 \geq \Delta \text{RSRP} > -26$ | dB   |
| DIFFRSRP_6     | $-24 \geq \Delta \text{RSRP} > -25$ | dB   |
| DIFFRSRP_7     | $-23 \geq \Delta \text{RSRP} > -24$ | dB   |
| DIFFRSRP_8     | $-22 \geq \Delta \text{RSRP} > -23$ | dB   |
| DIFFRSRP_9     | $-21 \geq \Delta \text{RSRP} > -22$ | dB   |
| DIFFRSRP_10    | $-20 \geq \Delta \text{RSRP} > -21$ | dB   |
| DIFFRSRP_11    | $-19 \geq \Delta \text{RSRP} > -20$ | dB   |
| DIFFRSRP_12    | $-18 \geq \Delta \text{RSRP} > -19$ | dB   |
| DIFFRSRP_13    | $-17 \geq \Delta \text{RSRP} > -18$ | dB   |
| DIFFRSRP_14    | $-16 \geq \Delta \text{RSRP} > -17$ | dB   |
| DIFFRSRP_15    | $-15 \geq \Delta \text{RSRP} > -16$ | dB   |
| DIFFRSRP_16    | $-14 \geq \Delta \text{RSRP} > -15$ | dB   |
| DIFFRSRP_17    | $-13 \geq \Delta \text{RSRP} > -14$ | dB   |
| DIFFRSRP_18    | $-12 \geq \Delta \text{RSRP} > -13$ | dB   |
| DIFFRSRP_19    | $-11 \geq \Delta \text{RSRP} > -12$ | dB   |
| DIFFRSRP_20    | $-10 \geq \Delta \text{RSRP} > -11$ | dB   |
| DIFFRSRP_21    | $-9 \geq \Delta \text{RSRP} > -10$  | dB   |
| DIFFRSRP_22    | $-8 \geq \Delta \text{RSRP} > -9$   | dB   |
| DIFFRSRP_23    | $-7 \geq \Delta \text{RSRP} > -8$   | dB   |
| DIFFRSRP_24    | $-6 \geq \Delta \text{RSRP} > -7$   | dB   |
| DIFFRSRP_25    | $-5 \geq \Delta \text{RSRP} > -6$   | dB   |
| DIFFRSRP_26    | $-4 \geq \Delta \text{RSRP} > -5$   | dB   |
| DIFFRSRP_27    | $-3 \geq \Delta \text{RSRP} > -4$   | dB   |
| DIFFRSRP_28    | $-2 \geq \Delta \text{RSRP} > -3$   | dB   |
| DIFFRSRP_29    | $-1 \geq \Delta \text{RSRP} > -2$   | dB   |
| DIFFRSRP_30    | $0 \geq \Delta \text{RSRP} > -1$    | dB   |

Table 10.1.24.3.2-2: Measurement report mapping for differential PRS-RSRP

| Reported value | Measured quantity value             | Unit |
|----------------|-------------------------------------|------|
| DIFFRSRP_0     | $-30 \geq \Delta \text{RSRP}$       | dB   |
| DIFFRSRP_1     | $-29 \geq \Delta \text{RSRP} > -30$ | dB   |
| DIFFRSRP_2     | $-28 \geq \Delta \text{RSRP} > -29$ | dB   |
| DIFFRSRP_3     | $-27 \geq \Delta \text{RSRP} > -28$ | dB   |
| DIFFRSRP_4     | $-26 \geq \Delta \text{RSRP} > -27$ | dB   |
| DIFFRSRP_5     | $-25 \geq \Delta \text{RSRP} > -26$ | dB   |
| DIFFRSRP_6     | $-24 \geq \Delta \text{RSRP} > -25$ | dB   |
| DIFFRSRP_7     | $-23 \geq \Delta \text{RSRP} > -24$ | dB   |
| DIFFRSRP_8     | $-22 \geq \Delta \text{RSRP} > -23$ | dB   |
| DIFFRSRP_9     | $-21 \geq \Delta \text{RSRP} > -22$ | dB   |
| DIFFRSRP_10    | $-20 \geq \Delta \text{RSRP} > -21$ | dB   |
| DIFFRSRP_11    | $-19 \geq \Delta \text{RSRP} > -20$ | dB   |
| DIFFRSRP_12    | $-18 \geq \Delta \text{RSRP} > -19$ | dB   |
| DIFFRSRP_13    | $-17 \geq \Delta \text{RSRP} > -18$ | dB   |
| DIFFRSRP_14    | $-16 \geq \Delta \text{RSRP} > -17$ | dB   |
| ...            | ...                                 | ...  |
| DIFFRSRP_25    | $-5 \geq \Delta \text{RSRP} > -6$   | dB   |
| DIFFRSRP_26    | $-4 \geq \Delta \text{RSRP} > -5$   | dB   |
| DIFFRSRP_27    | $-3 \geq \Delta \text{RSRP} > -4$   | dB   |
| DIFFRSRP_28    | $-2 \geq \Delta \text{RSRP} > -3$   | dB   |
| DIFFRSRP_29    | $-1 \geq \Delta \text{RSRP} > -2$   | dB   |
| DIFFRSRP_30    | $0 \geq \Delta \text{RSRP} > -1$    | dB   |
| DIFFRSRP_31    | $1 \geq \Delta \text{RSRP} > 0$     | dB   |
| DIFFRSRP_32    | $2 \geq \Delta \text{RSRP} > 1$     | dB   |
| DIFFRSRP_33    | $3 \geq \Delta \text{RSRP} > 2$     | dB   |
| DIFFRSRP_34    | $4 \geq \Delta \text{RSRP} > 3$     | dB   |
| DIFFRSRP_35    | $5 \geq \Delta \text{RSRP} > 4$     | dB   |
| DIFFRSRP_36    | $6 \geq \Delta \text{RSRP} > 5$     | dB   |
| ...            | ...                                 | ...  |
| DIFFRSRP_47    | $17 \geq \Delta \text{RSRP} > 16$   | dB   |
| DIFFRSRP_48    | $18 \geq \Delta \text{RSRP} > 17$   | dB   |
| DIFFRSRP_49    | $19 \geq \Delta \text{RSRP} > 18$   | dB   |
| DIFFRSRP_50    | $20 \geq \Delta \text{RSRP} > 19$   | dB   |
| DIFFRSRP_51    | $21 \geq \Delta \text{RSRP} > 20$   | dB   |
| DIFFRSRP_52    | $22 \geq \Delta \text{RSRP} > 21$   | dB   |
| DIFFRSRP_53    | $23 \geq \Delta \text{RSRP} > 22$   | dB   |
| DIFFRSRP_54    | $24 \geq \Delta \text{RSRP} > 23$   | dB   |
| DIFFRSRP_55    | $25 \geq \Delta \text{RSRP} > 24$   | dB   |
| DIFFRSRP_56    | $26 \geq \Delta \text{RSRP} > 25$   | dB   |
| DIFFRSRP_57    | $27 \geq \Delta \text{RSRP} > 26$   | dB   |
| DIFFRSRP_58    | $28 \geq \Delta \text{RSRP} > 27$   | dB   |
| DIFFRSRP_59    | $29 \geq \Delta \text{RSRP} > 28$   | dB   |
| DIFFRSRP_60    | $30 \geq \Delta \text{RSRP} > 29$   | dB   |
| DIFFRSRP_61    | $\Delta \text{RSRP} > 30$           | dB   |

## 10.1.23 RSTD Measurements

### 10.1.23.1 Introduction

The requirements in Clause 10.1.23 shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more DL RSTD measurements defined in TS 38.215 [4].

### 10.1.23.2 Measurement Accuracy Requirements

The accuracy requirements for RSTD measurement shall be within  $\pm(X+Y) T_c$ .

X is defined in Table 10.1.23.2-1 for AWGN channel and Table 10.1.23.2-3 for fading channel for FR1, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

X is defined in Table 10.1.23.2-2 for AWGN channel and Table 10.1.23.2-4 for fading channel for FR2, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

Note: The requirements for fading channel in this clause are derived based on TDL-A (30 ns delay spread, 5Hz) and TDL-C (60 ns delay spread, 300 Hz) channel models for FR1 and FR2 respectively.

When UE measures RSTD on PRS resources belonging to different PFLs, then the RSTD accuracy is defined as the accuracy corresponding to the largest accuracy value among different PFLs.

When UE measures RSTD on PRS resources belonging to same PFL,  $Y=32 T_c$ , provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than 160 ms.

When UE measures RSTD on PRS resources belonging different PFLs,  $Y=[256] T_c$ , provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than [1280] ms.

[Editor notes: The margins for measurements on different PFLs shall be considered in the group delay margin]

Editor’s Note: FFS whether and how to form the accuracy numbers considering enhanced requirements in future releases, e.g. capturing margin values in separate tables.

**Table 10.1.23.2-1: RSTD absolute accuracy in FR1 for AWGN channel**

| Accuracy                   | Conditions  |         |                         |  |  |            |                           |
|----------------------------|---|---------|-------------------------|--|--|------------|---------------------------|
|                            | PRS $\hat{\epsilon}_s/\text{lot}$   | PRS SCS | PRS bandwidth<br>Note 1 | PRS resource repetition<br>( $T_{\text{rep}}^{\text{PRS}} * L_{\text{PRS}} / K_{\text{comb}}^{\text{PRS}}$ )<br>Note 2 | Io <sup>Note 3</sup> range                     |            |                           |
|                            |   |         |                         |  | NR operating band groups<br>Note 4             | Minimum Io | Maximum Io                |
| $T_c$ Note 5               | dB  | kHz     | RB                      |  |  | dBm/SCS    | dBm/BW <sub>channel</sub> |
| [252] + $\Delta$<br>Note 7 | (PRS $\hat{\epsilon}_s/\text{lot}$ ) <sub>ref</sub> $\geq$ -6dB<br><br>(PRS $\hat{\epsilon}_s/\text{lot}$ ) <sub>i</sub> $\geq$ -13dB | 15      | $\geq$ [24]             | $\geq$ [4]   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121       | -50                       |
|                            |   |         |                         |  | NR_FDD_FR1_B                                   | -120.5     | -50                       |
|                            |   |         |                         |  | NR_TDD_FR1_C                                   | -120       | -50                       |
|                            |   |         |                         |  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5     | -50                       |
|                            |   |         |                         |  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119       | -50                       |
|                            |   |         |                         |  | NR_FDD_FR1_F                                   | -118.5     | -50                       |
|                            |   |         |                         |  | NR_FDD_FR1_G                                   | -118       | -50                       |
|                            |   |         |                         |  | NR_FDD_FR1_H                                   | -117.5     | -50                       |

|           |                               |         |              |              |  |        |        |
|-----------|-------------------------------|---------|--------------|--------------|--|--------|--------|
| [170] + Δ |                               |         | ≥ [52]       | ≥ [1]        | Note 6   | Note 6 | Note 6 |
| [78] + Δ  |                               |         | ≥ [104]      | ≥ [1]        | Note 6   | Note 6 | Note 6 |
| [147] + Δ |                               | 30      | ≥ [24]       | ≥ [4]        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -118   | -50    |
|           |                               |         |              |              | NR_FDD_FR1_B                                   | -117.5 | -50    |
|           |                               |         |              |              | NR_TDD_FR1_C                                   | -117   | -50    |
|           |                               |         |              |              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -116.5 | -50    |
|           |                               |         |              |              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -116   | -50    |
|           |                               |         |              |              | NR_FDD_FR1_F                                   | -115.5 | -50    |
|           |                               |         |              |              | NR_FDD_FR1_G                                   | -115   | -50    |
|           |                               |         |              | NR_FDD_FR1_H | -114.5   | -50    |        |
| [84] + Δ  |                               |         | ≥ [48]       | ≥ [1]        | Note 6   | Note 6 | Note 6 |
| [40] + Δ  |                               |         | ≥ [132]      | ≥ [1]        | Note 6   | Note 6 | Note 6 |
| [86] + Δ  |                               | 60      | ≥ [24]       | ≥ [4]        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -115   | -50    |
|           |                               |         |              |              | NR_FDD_FR1_B                                   | -114.5 | -50    |
|           |                               |         |              |              | NR_TDD_FR1_C                                   | -114   | -50    |
|           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |         |              |              | -113.5   | -50    |        |
|           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |         |              |              | -113   | -50    |        |
|           | NR_FDD_FR1_F                  |         |              |              | -113.5   | -50    |        |
|           | NR_FDD_FR1_G                  |         |              |              | -113   | -50    |        |
|           |                               |         | NR_FDD_FR1_H | -111.5       | -50  |        |        |
| [40] + Δ  |                               | ≥ [64]  | ≥ [1]        | Note 6       | Note 6   | Note 6 |        |
| [22] + Δ  |                               | ≥ [132] | ≥ [1]        | Note 6       | Note 6   | Note 6 |        |

NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource *i*.

NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource *i*.  $T_{rep}^{PRS}$ ,  $L_{PRS}$ ,  $K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor*, *dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.

NOTE 3:  $I_0$  is assumed to have constant EPRE across the bandwidth.

NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

NOTE 5:  $T_c$  is the basic timing unit defined in TS 38.211 [6].

NOTE 6: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.

NOTE 7:  $\Delta = \text{TBD}$ .

**Table 10.1.23.2-2: RSTD absolute accuracy in FR2 for AWGN channel**

| Accuracy                   | Conditions  |         |                         |   |   |                           |
|----------------------------|---|---------|-------------------------|---|---|---------------------------|
|                            | PRS $\hat{E}_s/\text{lot}$                                | PRS SCS | PRS bandwidth<br>Note 1 | PRS resource repetition<br>( $T_{rep}^{PRS} * L_{PRS} / K_{comb}^{PRS}$ )<br>Note 2 | $I_0$ Note 3 range  |                           |
|                            |   |         |                         |   | Minimum $I_0$   | Maximum $I_0$             |
| $T_c$ Note 4               | dB  | kHz     | RB                      |   | dBm/SCS   | dBm/BW <sub>Channel</sub> |
| $[107] + \Delta$<br>Note 6 | (PRS $\hat{E}_s/\text{lot}$ ) <sub>ref</sub> $\geq -6$ dB | 60      | $\geq [24]$             | $\geq [4]$  | Same value as PRS_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50                       |
| $[56] + \Delta$            |   |         | $\geq [64]$             | $\geq [1]$  | Note 5  | Note 5                    |
| $[27] + \Delta$            |   |         | $\geq [132]$            | $\geq [1]$  | Note 5  | Note 5                    |
| $[56] + \Delta$            | (PRS $\hat{E}_s/\text{lot}$ ) <sub>i</sub> $\geq -13$ dB  | 120     | $\geq [32]$             | $\geq [4]$  | Same value as PRS_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50                       |
| $[29] + \Delta$            |   |         | $\geq [64]$             | $\geq [1]$  | Note 5  | Note 5                    |
| $[18] + \Delta$            |   |         | $\geq [128]$            | $\geq [1]$  | Note 5  | Note 5                    |

NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource *i*.

NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource *i*.  $T_{rep}^{PRS}$ ,  $L_{PRS}$ ,  $K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor*, *dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.

NOTE 3:  $I_0$  is assumed to have constant EPRE across the bandwidth.

NOTE 4:  $T_c$  is the basic timing unit defined in TS 38.211 [6].

NOTE 5: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.

NOTE 6:  $\Delta = \text{TBD}$ .

**Table 10.1.23.2-3: RSTD absolute accuracy in FR1 for fading channel**

| Accuracy                   | Conditions  |         |                         |   |  |                           |               |
|----------------------------|---|---------|-------------------------|---|--|---------------------------|---------------|
|                            | PRS $\hat{E}_s/\text{lot}$  | PRS SCS | PRS bandwidth<br>Note 1 | PRS resource repetition<br>( $T_{rep}^{PRS} * L_{PRS} / K_{comb}^{PRS}$ )<br>Note 2 | $I_0$ Note 3 range                             |                           |               |
|                            |   |         |                         |   | NR operating band groups<br>Note 4             | Minimum $I_0$             | Maximum $I_0$ |
| $T_c$ Note 5               | dB  | kHz     | RB                      |   | dBm/SCS  | dBm/BW <sub>Channel</sub> |               |
| $[367] + \Delta$<br>Note 7 | (PRS $\hat{E}_s/\text{lot}$ ) <sub>ref</sub> $\geq -6$ dB<br><br>(PRS $\hat{E}_s/\text{lot}$ ) <sub>i</sub> $\geq -13$ dB | 15      | $\geq [24]$             | $\geq [4]$  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                      | -50           |
|                            |   |         |                         |   | NR_FDD_FR1_B                                   | -120.5                    | -50           |
|                            |   |         |                         |   | NR_TDD_FR1_C                                   | -120                      | -50           |
|                            |   |         |                         |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                    | -50           |

|           |  |    |         |       |  |        |        |
|-----------|--|----|---------|-------|--|--------|--------|
|           |  |    |         |       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119   | -50    |
|           |  |    |         |       | NR_FDD_FR1_F                                   | -118.5 | -50    |
|           |  |    |         |       | NR_FDD_FR1_G                                   | -118   | -50    |
|           |  |    |         |       | NR_FDD_FR1_H                                   | -117.5 | -50    |
| [212] + Δ |  |    | ≥ [52]  | ≥ [1] | Note 6   | Note 6 | Note 6 |
| [122] + Δ |  |    | ≥ [104] | ≥ [1] | Note 6   | Note 6 | Note 6 |
| [190] + Δ |  | 30 | ≥ [24]  | ≥ [4] | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -118   | -50    |
|           |  |    |         |       | NR_FDD_FR1_B                                   | -117.5 | -50    |
|           |  |    |         |       | NR_TDD_FR1_C                                   | -117   | -50    |
|           |  |    |         |       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -116.5 | -50    |
|           |  |    |         |       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -116   | -50    |
|           |  |    |         |       | NR_FDD_FR1_F                                   | -115.5 | -50    |
|           |  |    |         |       | NR_FDD_FR1_G                                   | -115   | -50    |
|           |  |    |         |       | NR_FDD_FR1_H                                   | -114.5 | -50    |
| [145] + Δ |  |    | ≥ [48]  | ≥ [1] | Note 6   | Note 6 | Note 6 |
| [44] + Δ  |  |    | ≥ [132] | ≥ [1] | Note 6   | Note 6 | Note 6 |
| [183] + Δ |  | 60 | ≥ [24]  | ≥ [4] | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -115   | -50    |
|           |  |    |         |       | NR_FDD_FR1_B                                   | -114.5 | -50    |
|           |  |    |         |       | NR_TDD_FR1_C                                   | -114   | -50    |
|           |  |    |         |       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -113.5 | -50    |
|           |  |    |         |       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -113   | -50    |
|           |  |    |         |       | NR_FDD_FR1_F                                   | -113.5 | -50    |
|           |  |    |         |       | NR_FDD_FR1_G                                   | -113   | -50    |
|           |  |    |         |       | NR_FDD_FR1_H                                   | -111.5 | -50    |
| [43] + Δ  |  |    | ≥ [64]  | ≥ [1] | Note 6   | Note 6 | Note 6 |
| [33] + Δ  |  |    | ≥ [132] | ≥ [1] | Note 6   | Note 6 | Note 6 |



NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource *i*.  
 NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource *i*.  $T_{rep}^{PRS}$ ,  $L_{PRS}$ ,  $K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor*, *dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  
 NOTE 3:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  
 NOTE 5:  $T_c$  is the basic timing unit defined in TS 38.211 [6].  
 NOTE 6: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  
 NOTE 7:  $\Delta = \text{TBD}$ .

**Table 10.1.23.2-4: RSTD absolute accuracy in FR2 for fading channel**

| Accuracy                   | Conditions  |         |                         |   |   |                           |
|----------------------------|---|---------|-------------------------|---|---|---------------------------|
|                            | PRS $\hat{E}_s/\text{lot}$                                | PRS SCS | PRS bandwidth<br>Note 1 | PRS resource repetition<br>( $T_{rep}^{PRS} * L_{PRS} / K_{comb}^{PRS}$ )<br>Note 2 | $I_0$ Note 3 range  |                           |
| $T_c$ Note 4               | dB  | kHz     | RB                      |   | dBm/SCS   | dBm/BW <sub>Channel</sub> |
| $[155] + \Delta$<br>Note 6 | (PRS $\hat{E}_s/\text{lot}$ ) <sub>ref</sub> $\geq -6$ dB | 60      | $\geq [24]$             | $\geq [4]$  | Same value as PRS_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50                       |
| $[96] + \Delta$            |   |         | $\geq [64]$             | $\geq [1]$  | Note 5  | Note 5                    |
| $[62] + \Delta$            |   |         | $\geq [132]$            | $\geq [1]$  | Note 5  | Note 5                    |
| $[80] + \Delta$            | (PRS $\hat{E}_s/\text{lot}$ ) <sub>i</sub> $\geq -13$ dB  | 120     | $\geq [32]$             | $\geq [4]$  | Same value as PRS_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50                       |
| $[70] + \Delta$            |   |         | $\geq [64]$             | $\geq [1]$  | Note 5  | Note 5                    |
| $[48] + \Delta$            |   |         | $\geq [128]$            | $\geq [1]$  | Note 5  | Note 5                    |

NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource *i*.  
 NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource *i*.  $T_{rep}^{PRS}$ ,  $L_{PRS}$ ,  $K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor*, *dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  
 NOTE 3:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 4:  $T_c$  is the basic timing unit defined in TS 38.211 [6].  
 NOTE 5: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  
 NOTE 6:  $\Delta = \text{TBD}$ .

### 10.1.23.3 Report mapping

#### 10.1.23.3.1 Absolute DL RSTD Measurement Reporting

The reporting range for the DL RSTD measurement is defined from  $-985024 \times T_c$  to  $985024 \times T_c$  with the resolution step of  $2^k \times T_c$ , where

$T_c$  is defined in TS 38.211 [6],

$$k_{min} \leq k \leq k_{max}$$

$k_{min} = [2]$  and  $k_{max} = 5$ , when configured PRS resource of at least one of the reference cell and neighbor cell measured for the RSTD measurement is in FR1,

$k_{min} = 0$  and  $k_{max} = 5$ , when configured PRS resource of both the reference cell and neighbor cell measured for the RSTD measurement are in FR2,

$k \geq \text{timingReportingGranularityFactor}$  [34] configured by LMF via LPP for the RSTD measurement.

The measurement report mapping for different  $k$  values are specified in Tables 10.1.23.3.1-1 – 10.1.23.3.1-6.

**Table 10.1.23.3.1-1: Report mapping for  $k=0$**

| Reported Quantity Value,<br>RSTD_i | Measured Quantity Value,<br>RSTD | Unit           |
|------------------------------------|----------------------------------|----------------|
| RSTD_000000                        | RSTD < -985024                   | T <sub>c</sub> |
| RSTD_000001                        | -985024 ≤ RSTD < -985023         | T <sub>c</sub> |
| RSTD_000002                        | -985023 ≤ RSTD < -985022         | T <sub>c</sub> |
| ...                                | ...                              | ...            |
| RSTD_0985024                       | -1 ≤ RSTD < 0                    | T <sub>c</sub> |
| RSTD_0985025                       | 0 ≤ RSTD < 1                     | T <sub>c</sub> |
| ...                                | ...                              | ...            |
| RSTD_1970047                       | 985022 ≤ RSTD < 985023           | T <sub>c</sub> |
| RSTD_1970048                       | 985023 ≤ RSTD < 985024           | T <sub>c</sub> |
| RSTD_1970049                       | 985024 ≤ RSTD                    | T <sub>c</sub> |

**Table 10.1.23.3.1-2: Report mapping for  $k=1$**

| Reported Quantity Value,<br>RSTD_i | Measured Quantity Value,<br>RSTD | Unit           |
|------------------------------------|----------------------------------|----------------|
| RSTD_000000                        | RSTD < -985024                   | T <sub>c</sub> |
| RSTD_000001                        | -985024 ≤ RSTD < -985022         | T <sub>c</sub> |
| RSTD_000002                        | -985022 ≤ RSTD < -985020         | T <sub>c</sub> |
| ...                                | ...                              | ...            |
| RSTD_492512                        | -2 ≤ RSTD < 0                    | T <sub>c</sub> |
| RSTD_492513                        | 0 ≤ RSTD < 2                     | T <sub>c</sub> |
| ...                                | ...                              | ...            |
| RSTD_985023                        | 985020 ≤ RSTD < 985022           | T <sub>c</sub> |
| RSTD_985024                        | 985022 ≤ RSTD < 985024           | T <sub>c</sub> |
| RSTD_985025                        | 985024 ≤ RSTD                    | T <sub>c</sub> |

**Table 10.1.23.3.1-3: Report mapping for  $k=2$**

| Reported Quantity Value,<br>RSTD_i | Measured Quantity Value,<br>RSTD | Unit           |
|------------------------------------|----------------------------------|----------------|
| RSTD_000000                        | RSTD < -985024                   | T <sub>c</sub> |
| RSTD_000001                        | -985024 ≤ RSTD < -985020         | T <sub>c</sub> |
| RSTD_000002                        | -985020 ≤ RSTD < -985016         | T <sub>c</sub> |
| ...                                | ...                              | ...            |
| RSTD_246256                        | -4 ≤ RSTD < 0                    | T <sub>c</sub> |
| RSTD_246257                        | 0 ≤ RSTD < 4                     | T <sub>c</sub> |
| ...                                | ...                              | ...            |
| RSTD_492511                        | 985016 ≤ RSTD < 985020           | T <sub>c</sub> |
| RSTD_492512                        | 985020 ≤ RSTD < 985024           | T <sub>c</sub> |
| RSTD_492513                        | 985024 ≤ RSTD                    | T <sub>c</sub> |

Table 10.1.23.3.1-4: Report mapping for  $k=3$ 

| Reported Quantity Value<br>RSTD_i | Measured Quantity Value,<br>RSTD | Unit  |
|-----------------------------------|----------------------------------|-------|
| RSTD_000000                       | $RSTD < -985024$                 | $T_c$ |
| RSTD_000001                       | $-985024 \leq RSTD < -985016$    | $T_c$ |
| RSTD_000002                       | $-985016 \leq RSTD < -985008$    | $T_c$ |
| ...                               | ...                              | ...   |
| RSTD_123128                       | $-8 \leq RSTD < 0$               | $T_c$ |
| RSTD_123129                       | $0 \leq RSTD < 8$                | $T_c$ |
| ...                               | ...                              | ...   |
| RSTD_246255                       | $985008 \leq RSTD < 985016$      | $T_c$ |
| RSTD_246256                       | $985016 \leq RSTD < 985024$      | $T_c$ |
| RSTD_246257                       | $985024 \leq RSTD$               | $T_c$ |

Table 10.1.23.3.1-5: Report mapping for  $k=4$ 

| Reported Quantity Value,<br>RSTD_i | Measured Quantity Value,<br>RSTD | Unit  |
|------------------------------------|----------------------------------|-------|
| RSTD_000000                        | $RSTD < -985024$                 | $T_c$ |
| RSTD_000001                        | $-985024 \leq RSTD < -985008$    | $T_c$ |
| RSTD_000002                        | $-985008 \leq RSTD < -984992$    | $T_c$ |
| ...                                | ...                              | ...   |
| RSTD_061564                        | $-16 \leq RSTD < 0$              | $T_c$ |
| RSTD_061565                        | $0 \leq RSTD < 16$               | $T_c$ |
| ...                                | ...                              | ...   |
| RSTD_123127                        | $984992 \leq RSTD < 985008$      | $T_c$ |
| RSTD_123128                        | $985008 \leq RSTD < 985024$      | $T_c$ |
| RSTD_123129                        | $985024 \leq RSTD$               | $T_c$ |

Table 10.1.23.3.1-6: Report mapping for  $k=5$ 

| Reported Quantity Value,<br>RSTD_i | Measured Quantity Value,<br>RSTD | Unit  |
|------------------------------------|----------------------------------|-------|
| RSTD_000000                        | $RSTD < -985024$                 | $T_c$ |
| RSTD_000001                        | $-985024 \leq RSTD < -984992$    | $T_c$ |
| RSTD_000002                        | $-984992 \leq RSTD < -984960$    | $T_c$ |
| ...                                | ...                              | ...   |
| RSTD_30782                         | $-32 \leq RSTD < 0$              | $T_c$ |
| RSTD_30783                         | $0 \leq RSTD < 32$               | $T_c$ |
| ...                                | ...                              | ...   |
| RSTD_61563                         | $984960 \leq RSTD < 984992$      | $T_c$ |
| RSTD_61564                         | $984992 \leq RSTD < 985024$      | $T_c$ |
| RSTD_61565                         | $985024 \leq RSTD$               | $T_c$ |

### 10.1.23.3.2 Differential Reporting for DL RSTD Measurement

A first DL RSTD measurement is reported by means of differential reporting, i.e. as  $\Delta RSTD$ , relative to a second DL RSTD measurement (RSTD2), provided that:

- the absolute measured quantity value of the second DL RSTD measurement (RSTD2) is not larger than the absolute measured quantity value of the first DL RSTD measurement (RSTD1), i.e.,  $\Delta RSTD = RSTD1 - RSTD2 \geq 0$ , and
- the absolute value of the second DL RSTD measurement (RSTD2) is reported together with  $\Delta RSTD$  for the first DL RSTD measurement.

The reporting range for differential reporting  $\Delta RSTD$  of the first DL RSTD measurement is defined from 0 up to  $8191 \times T_c$  with the resolution step of  $2^k \times T_c$ , where

$T_c$  is defined in TS 38.211 [6],

$$k_{min} \leq k \leq k_{max},$$

$k_{min}=2$  and  $k_{max}=5$ , when configured PRS resource of at least one of the reference cell and neighbor cell measured for the first RSTD measurement or second RSTD measurement is in FR1,

$k_{min}=0$  and  $k_{max}=5$ , when configured PRS resource of both the reference cell and neighbor cell measured for both of the first RSTD measurement and the second RSTD measurement are in FR2,

$k \geq \text{timingReportingGranularityFactor}$  [34] configured by LMF via LPP for the RSTD measurement.

The measurement report mapping for different  $k$  values are specified in Tables 10.1.23.3.2-1 – 10.1.23.3.2-6.

**Table 10.1.23.3.2-1: Report mapping for  $k=0$**

| Reported Quantity Value,<br>DIFFRSTD <sub>i</sub> | $\Delta\text{RSTD} = \text{RSTD1} - \text{RSTD2}$ | Unit  |
|---|---|-------|
| DIFFRSTD_0000                                     | $0 \leq \Delta\text{RSTD} < 1$                    | $T_c$ |
| DIFFRSTD_0001                                     | $1 \leq \Delta\text{RSTD} < 2$                    | $T_c$ |
| DIFFRSTD_0002                                     | $2 \leq \Delta\text{RSTD} < 3$                    | $T_c$ |
| ...   | ...   | ...   |
| DIFFRSTD_8189                                     | $8189 \leq \Delta\text{RSTD} < 8190$              | $T_c$ |
| DIFFRSTD_8190                                     | $8190 \leq \Delta\text{RSTD} < 8191$              | $T_c$ |
| DIFFRSTD_8191                                     | $8191 \leq \Delta\text{RSTD}$                     | $T_c$ |

**Table 10.1.23.3.2-2: Report mapping for  $k=1$**

| Reported Quantity Value,<br>DIFFRSTD <sub>i</sub> | $\Delta\text{RSTD} = \text{RSTD1} - \text{RSTD2}$ | Unit  |
|---|---|-------|
| DIFFRSTD_0000                                     | $0 \leq \Delta\text{RSTD} < 2$                    | $T_c$ |
| DIFFRSTD_0001                                     | $2 \leq \Delta\text{RSTD} < 4$                    | $T_c$ |
| DIFFRSTD_0002                                     | $4 \leq \Delta\text{RSTD} < 6$                    | $T_c$ |
| ...   | ...   | ...   |
| DIFFRSTD_4093                                     | $8186 \leq \Delta\text{RSTD} < 8188$              | $T_c$ |
| DIFFRSTD_4094                                     | $8188 \leq \Delta\text{RSTD} < 8190$              | $T_c$ |
| DIFFRSTD_4095                                     | $8190 \leq \Delta\text{RSTD}$                     | $T_c$ |

**Table 10.1.23.3.2-3: Report mapping for  $k=2$**

| Reported Quantity Value,<br>DIFFRSTD <sub>i</sub> | $\Delta\text{RSTD} = \text{RSTD1} - \text{RSTD2}$ | Unit  |
|---|---|-------|
| DIFFRSTD_0000                                     | $0 \leq \Delta\text{RSTD} < 4$                    | $T_c$ |
| DIFFRSTD_0001                                     | $4 \leq \Delta\text{RSTD} < 8$                    | $T_c$ |
| DIFFRSTD_0002                                     | $8 \leq \Delta\text{RSTD} < 12$                   | $T_c$ |
| ...   | ...   | ...   |
| DIFFRSTD_2045                                     | $8180 \leq \Delta\text{RSTD} < 8184$              | $T_c$ |
| DIFFRSTD_2046                                     | $8184 \leq \Delta\text{RSTD} < 8188$              | $T_c$ |
| DIFFRSTD_2047                                     | $8188 \leq \Delta\text{RSTD}$                     | $T_c$ |

**Table 10.1.23.3.2-4: Report mapping for  $k=3$** 

| Reported Quantity Value,<br>DIFFRSTD <sub>i</sub> | $\Delta\text{RSTD} = \text{RSTD1} - \text{RSTD2}$ | Unit  |
|---|---|-------|
| DIFFRSTD_0000                                     | $0 \leq \Delta\text{RSTD} < 8$                    | $T_c$ |
| DIFFRSTD_0001                                     | $8 \leq \Delta\text{RSTD} < 16$                   | $T_c$ |
| DIFFRSTD_0002                                     | $16 \leq \Delta\text{RSTD} < 24$                  | $T_c$ |
| ...   | ...   | ...   |
| DIFFRSTD_1021                                     | $8168 \leq \Delta\text{RSTD} < 8176$              | $T_c$ |
| DIFFRSTD_1022                                     | $8176 \leq \Delta\text{RSTD} < 8184$              | $T_c$ |
| DIFFRSTD_1023                                     | $8184 \leq \Delta\text{RSTD}$                     | $T_c$ |

**Table 10.1.23.3.2-5: Report mapping for  $k=4$** 

| Reported Quantity Value,<br>DIFFRSTD <sub>i</sub> | $\Delta\text{RSTD} = \text{RSTD1} - \text{RSTD2}$ | Unit  |
|---|---|-------|
| DIFFRSTD_000                                      | $0 \leq \Delta\text{RSTD} < 16$                   | $T_c$ |
| DIFFRSTD_001                                      | $16 \leq \Delta\text{RSTD} < 32$                  | $T_c$ |
| DIFFRSTD_002                                      | $32 \leq \Delta\text{RSTD} < 48$                  | $T_c$ |
| ...   | ...   | ...   |
| DIFFRSTD_509                                      | $8144 \leq \Delta\text{RSTD} < 8160$              | $T_c$ |
| DIFFRSTD_510                                      | $8160 \leq \Delta\text{RSTD} < 8176$              | $T_c$ |
| DIFFRSTD_511                                      | $8176 \leq \Delta\text{RSTD}$                     | $T_c$ |

**Table 10.1.23.3.2-6: Report mapping for  $k=5$** 

| Reported Quantity Value,<br>DIFFRSTD <sub>i</sub> | $\Delta\text{RSTD} = \text{RSTD1} - \text{RSTD2}$ | Unit  |
|---|---|-------|
| DIFFRSTD_000                                      | $0 \leq \Delta\text{RSTD} < 32$                   | $T_c$ |
| DIFFRSTD_001                                      | $32 \leq \Delta\text{RSTD} < 64$                  | $T_c$ |
| DIFFRSTD_002                                      | $64 \leq \Delta\text{RSTD} < 96$                  | $T_c$ |
| ...   | ...   | ...   |
| DIFFRSTD_253                                      | $8096 \leq \Delta\text{RSTD} < 8128$              | $T_c$ |
| DIFFRSTD_254                                      | $8128 \leq \Delta\text{RSTD} < 8160$              | $T_c$ |
| DIFFRSTD_255                                      | $8160 \leq \Delta\text{RSTD}$                     | $T_c$ |

### 10.1.23.3.3 Additional Path Report Mapping for DL RSTD

The reporting range for the additional path reporting for an RSTD measurement is defined up to the range from  $-8175 \times T_c$  to  $8175 \times T_c$  with the resolution step of  $2^k \times T_c$ , where

$T_c$  is defined in TS 38.211 [6],

$$k_{min} \leq k \leq k_{max},$$

$k_{min}=2$  and  $k_{max}=5$ , when configured PRS resource of at least one of the reference cell and neighbor cell measured for the RSTD measurement is in FR1,

$k_{min}=0$  and  $k_{max}=5$ , when configured PRS resource of both the reference cell and neighbor cell measured for the RSTD measurement are in FR2,

$k \geq \text{timingReportingGranularityFactor}$  [34] configured by LMF via LPP for the RSTD measurement.

The UE can report the timing of up to two additional paths with respect to the path timing determining the RSTD measurement.

The report mappings for different  $k$  values are specified in Tables 10.1.23.3.3-1 – 10.1.23.3.3-6.

**Table 10.1.23.3.3-1: Report mapping for  $k=0$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_00000                         | $\Delta\text{path} < -8175$                     | $T_c$ |
| path_00001                         | $-8175 \leq \Delta\text{path} < -8174$          | $T_c$ |
| path_00002                         | $-8174 \leq \Delta\text{path} < -8173$          | $T_c$ |
| ...                                | ...   | ...   |
| path_08175                         | $-1 \leq \Delta\text{path} < 0$                 | $T_c$ |
| path_08176                         | $0 \leq \Delta\text{path} < 1$                  | $T_c$ |
| ...                                | ...   | ...   |
| path_16349                         | $8173 \leq \Delta\text{path} < 8174$            | $T_c$ |
| path_16350                         | $8174 \leq \Delta\text{path} < 8175$            | $T_c$ |
| path_16351                         | $8175 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.23.3.3-2: Report mapping for  $k=1$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_0000                          | $\Delta\text{path} < -8175$                     | $T_c$ |
| path_0001                          | $-8175 \leq \Delta\text{path} < -8173$          | $T_c$ |
| path_0002                          | $-8173 \leq \Delta\text{path} < -8171$          | $T_c$ |
| ...                                | ...   | ...   |
| path_4088                          | $-1 \leq \Delta\text{path} < 1$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_8174                          | $8171 \leq \Delta\text{path} < 8173$            | $T_c$ |
| path_8175                          | $8173 \leq \Delta\text{path} < 8175$            | $T_c$ |
| path_8176                          | $8175 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.23.3.3-3: Report mapping for  $k=2$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_0000                          | $\Delta\text{path} < -8174$                     | $T_c$ |
| path_0001                          | $-8174 \leq \Delta\text{path} < -8170$          | $T_c$ |
| path_0002                          | $-8170 \leq \Delta\text{path} < -8166$          | $T_c$ |
| ...                                | ...   | ...   |
| path_2044                          | $-2 \leq \Delta\text{path} < 2$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_4086                          | $8166 \leq \Delta\text{path} < 8170$            | $T_c$ |
| path_4087                          | $8170 \leq \Delta\text{path} < 8174$            | $T_c$ |
| path_4088                          | $8174 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.23.3.3-4: Report mapping for  $k=3$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_0000                          | $\Delta\text{path} < -8172$                     | $T_c$ |
| path_0001                          | $-8172 \leq \Delta\text{path} < -8164$          | $T_c$ |
| path_0002                          | $-8164 \leq \Delta\text{path} < -8156$          | $T_c$ |
| ...                                | ...   | ...   |
| path_1022                          | $-4 \leq \Delta\text{path} < 4$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_2042                          | $8156 \leq \Delta\text{path} < 8164$            | $T_c$ |
| path_2043                          | $8164 \leq \Delta\text{path} < 8172$            | $T_c$ |
| path_2044                          | $8172 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.23.3.3-5: Report mapping for  $k=4$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_0000                          | $\Delta\text{path} < -8168$                     | $T_c$ |
| path_0001                          | $-8168 \leq \Delta\text{path} < -8152$          | $T_c$ |
| path_0002                          | $-8152 \leq \Delta\text{path} < -8136$          | $T_c$ |
| ...                                | ...   | ...   |
| path_511                           | $-8 \leq \Delta\text{path} < 8$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_1020                          | $8136 \leq \Delta\text{path} < 8152$            | $T_c$ |
| path_1021                          | $8152 \leq \Delta\text{path} < 8168$            | $T_c$ |
| path_1022                          | $8168 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.23.3.3-6: Report mapping for  $k=5$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_000                           | $\Delta\text{path} < -8160$                     | $T_c$ |
| path_001                           | $-8160 \leq \Delta\text{path} < -8128$          | $T_c$ |
| path_002                           | $-8128 \leq \Delta\text{path} < -8096$          | $T_c$ |
| ...                                | ...   | ...   |
| path_256                           | $0 \leq \Delta\text{path} < 32$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_509                           | $8096 \leq \Delta\text{path} < 8128$            | $T_c$ |
| path_510                           | $8128 \leq \Delta\text{path} < 8160$            | $T_c$ |
| path_511                           | $8160 \leq \Delta\text{path}$                   | $T_c$ |

## 10.1.24 PRS-RSRP Measurements

### 10.1.24.1 Introduction

The requirements in Clause 10.1.24 shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* or *nr-DL-AoD-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more DL PRS-RSRP measurements defined in TS 38.215 [4].

### 10.1.24.2 Measurement Accuracy Requirements

#### 10.1.24.2.1 Absolute PRS RSRP accuracy

The absolute accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.1-1 are valid under the following conditions:

Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2<sub>dBm</sub> according to Annex B.2.14 for a corresponding Band

The absolute accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.1-2 are valid under the following conditions:

Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2<sub>dBm</sub> according to Annex B.2.14 for a corresponding Band

Table 10.1.24.2.1-1: PRS-RSRP absolute accuracy for FR1

| Accuracy         |                   | Conditions                 |                             |   |  |   |                                 |                                 |                           |
|------------------|-------------------|----------------------------|-----------------------------|---|--|---|---------------------------------|---------------------------------|---------------------------|
| Normal condition | Extreme condition | PRS $\hat{E}_s/\text{lot}$ | PRS BW                      | Repetition factor $(T_{\text{rep}}^{\text{PRS}} * L_{\text{PRS}}/K_{\text{comb}}^{\text{PRS}})$ | NR operating band groups <small>Note 8</small> | $I_o$ <small>Note 7</small> range                               |                                 |                                 | Maximum $I_o$             |
|                  |                   |                            |                             |   |  | Minimum $I_o$ <small>Note 1</small><br>dBm / $SCS_{\text{PRS}}$ |                                 |                                 |                           |
| dB               | dB                | dB                         | PRB                         | -   |  | dBm / $SCS_{\text{PRS}}$  |                                 |                                 | dBm/BW <sub>channel</sub> |
|                  |                   |                            |                             |   |  | dBm/15k Hz <small>Note 6</small>                                | dBm/30kHz <small>Note 6</small> | dBm/60kHz <small>Note 6</small> |                           |
| $\pm 3.5$        | $\pm 8$           | $\geq -3\text{dB}$         | $\geq 24$                   | All   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -127  | -124                            | -121                            | -50                       |
|                  |                   |                            |                             |   | NR_FDD_FR1_B                                   | -126.5  | -123.5                          | -120.5                          | -50                       |
|                  |                   |                            |                             |   | NR_TDD_FR1_C                                   | -126  | -123                            | -120                            | -50                       |
|                  |                   |                            |                             |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -125.5  | -122.5                          | -119.5                          | -50                       |
|                  |                   |                            |                             |   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -125  | -122                            | -119                            | -50                       |
|                  |                   |                            |                             |   | NR_FDD_FR1_F                                   | -124.5  | -121.5                          | -118.5                          | -50                       |
|                  |                   |                            |                             |   | NR_FDD_FR1_G                                   | -124  | -121                            | -118                            | -50                       |
|                  |                   |                            |                             |   | NR_FDD_FR1_H                                   | -123.5  | -120.5                          | -117.5                          | -50                       |
|                  |                   |                            |                             |   | Note 4   |   |                                 |                                 |                           |
| Note 4           |                   |                            |                             |   |  |   |                                 |                                 |                           |
| $\pm 8.5$        | $\pm 13$          | $\geq -13\text{dB}$        | $24 \leq \text{BW} \leq 52$ | All   | Note 4   |   |                                 |                                 |                           |
| $\pm 6$          | $\pm 10.5$        |                            | $52 < \text{BW} \leq 104$   | All   | Note 4   |   |                                 |                                 |                           |
| $\pm 4.5$        | $\pm 9$           |                            | $\text{BW} > 104$           | All   | Note 4   |   |                                 |                                 |                           |

NOTE 1: This minimum  $I_o$  condition is expressed as the average  $I_o$  per RE over all REs in an OFDM symbol.  
 NOTE 2: Void.  
 NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  
 NOTE 4: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth  $\geq [24]$  RB.  
 NOTE 5: The serving cell, the reference cell, and the measured neighbour cell  $i$  are on the same carrier frequency.  
 NOTE 6: The condition level is increased by  $\Delta > 0$ , when applicable, as described in Sections B.3.2 and B.3.3.  
 NOTE 7: The  $I_o$  is defined in PRS positioning subframes. The same  $I_o$  range applies to PRS and non-PRS symbols.  $I_o$  levels are different in PRS and non-PRS symbols within the same subframe.  
 NOTE 8: NR operating band groups are as defined in Section 3.5.2.



**Table 10.1.24.2.1-2: PRS-RSRP absolute accuracy for FR2**

| Accuracy         |                   | Conditions                 |                      |  |  |                                    |                           |
|------------------|-------------------|----------------------------|----------------------|--|--|------------------------------------|---------------------------|
| Normal condition | Extreme condition | PRS $\bar{E}_s/\text{lot}$ | PRS BW               | Repetition factor<br>( $T_{\text{rep}}^{\text{PRS}} * L_{\text{PRS}} / K_{\text{comb}}^{\text{PRS}}$ ) | $I_o$ <sup>Note 7</sup> range  |                                    |                           |
|                  |                   |                            |                      |  | Minimum $I_o$ <sup>Note 1</sup><br>dBm / $SCS_{\text{PRS}}$  | Maximum $I_o$                      |                           |
| dB               | dB                | dB                         | PRB                  | -  | dBm / $SCS_{\text{PRS}}$   |                                    | dBm/BW <sub>Channel</sub> |
|                  |                   |                            |                      |  | dBm/120kHz<br><small>Note 6</small>  | dBm/60kHz<br><small>Note 6</small> |                           |
| $\pm 5$          | $\pm 8$           | $\geq -3\text{dB}$         | $\geq 24$            | All  | Same value as PRP in Table B.2.14 -2, according to UE Power class, operating band and angle of arrival |                                    | -50                       |
|                  |                   |                            |                      |  | Note 4   |                                    |                           |
|                  |                   |                            |                      |  | Note 4   |                                    |                           |
| $\pm 8.5$        | $\pm 11.5$        | $\geq -13\text{dB}$        | $24 \leq BW \leq 64$ | All  | Note 4   |                                    |                           |
| $\pm 6$          | $\pm 9$           |                            | $BW > 64$            | All  | Note 4   |                                    |                           |

NOTE 1: This minimum  $I_o$  condition is expressed as the average  $I_o$  per RE over all REs in an OFDM symbol.  
 NOTE 2: Void.  
 NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  
 NOTE 4: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth  $\geq [24]$  RB.  
 NOTE 5: The serving cell, the reference cell, and the measured neighbour cell  $i$  are on the same carrier frequency.  
 NOTE 6: The condition level is increased by  $\Delta > 0$ , when applicable, as described in Sections B.3.2 and B.3.3.  
 NOTE 7: The  $I_o$  is defined in PRS positioning subframes. The same  $I_o$  range applies to PRS and non-PRS symbols.  $I_o$  levels are different in PRS and non-PRS symbols within the same subframe.  
 NOTE 8: NR operating band groups are as defined in Section 3.5.2.

**10.1.24.2.2 Relative PRS RSRP accuracy**

The relative accuracy of PRS-RSRP is defined as accuracy of the difference between two PRS-RSRP measurements.

The relative PRS-RSRP accuracy requirements apply for the cases when PRS-RSRP is measured from PRS resources in the same PRS resource set in FR1 or FR2, and measured with same Rx beam in case of FR2.

The accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.2-1 are valid under the following conditions:

Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

PRP  $1,2_{\text{dBm}}$  according to Annex B.2.14 for a corresponding Band

The accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.2-2 are valid under the following conditions:

Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

PRP  $1,2_{\text{dBm}}$  according to Annex B.2.14 for a corresponding Band

Table 10.1.24.2.2-1: PRS-RSRP relative accuracy for FR1

| Accuracy         |                   | Conditions                 |               |   |  |  |                                  |                     |                           |
|------------------|-------------------|----------------------------|---------------|---|--|--|----------------------------------|---------------------|---------------------------|
| Normal condition | Extreme condition | PRS $\hat{E}_s/\text{lot}$ | PRS BW        | Repetition factor $(T_{\text{rep}}^{\text{PRS}} * L_{\text{PRS}} / K_{\text{comb}}^{\text{PRS}})$ | NR operating band groups<br>Note 8       | Io <sup>Note 7</sup> range                               |                                  |                     | Maximum Io                |
|                  |                   |                            |               |   |  | Minimum Io <sup>Note 1</sup><br>dBm / SCS <sub>PRS</sub> |                                  |                     |                           |
| dB               | dB                | dB                         | PRB           | -   |  | dBm / SCS <sub>PRS</sub>                                 |                                  |                     | dBm/BW <sub>channel</sub> |
|                  |                   |                            |               |   |  | dBm/15kHz<br>z <sup>Note 6</sup>                         | dBm/30kHz<br>z <sup>Note 6</sup> | dBm/60kHz<br>Note 6 |                           |
| ±3.5             | ±5.0              | ≥-3dB                      | ≥24           | All   | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -127   | -124                             | -121                | -50                       |
|                  |                   |                            |               |   | NR_FDD_FR1_B                             | -126.5   | -123.5                           | -120.5              | -50                       |
|                  |                   |                            |               |   | NR_TDD_FR1_C                             | -126   | -123                             | -120                | -50                       |
|                  |                   |                            |               |   | NR_FDD_FR1_D, NR_TDD_FR1_D               | -125.5   | -122.5                           | -119.5              | -50                       |
|                  |                   |                            |               |   | NR_FDD_FR1_E, NR_TDD_FR1_E               | -125   | -122                             | -119                | -50                       |
|                  |                   |                            |               |   | NR_FDD_FR1_F                             | -124.5   | -121.5                           | -118.5              | -50                       |
|                  |                   |                            |               |   | NR_FDD_FR1_G                             | -124   | -121                             | -118                | -50                       |
|                  |                   |                            |               |   | NR_FDD_FR1_H                             | -123.5   | -120.5                           | -117.5              | -50                       |
|                  |                   |                            |               |   | Note 4                                   |  |                                  |                     |                           |
| Note 4           |                   |                            |               |   |  |  |                                  |                     |                           |
| ±9.5             | ±11.0             | ≥-13dB                     | 24 ≤ BW ≤ 52  | All   | Note 4                                   |  |                                  |                     |                           |
| ±6.5             | ±8.0              |                            | 52 < BW ≤ 104 | All   | Note 4                                   |  |                                  |                     |                           |
| ±5.0             | ±6.5              |                            | BW > 104      | All   | Note 4                                   |  |                                  |                     |                           |

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  
 NOTE 2: Void.  
 NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  
 NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ [24] RB.  
 NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  
 NOTE 6: The condition level is increased by Δ>0, when applicable, as described in Sections B.3.2 and B.3.3.  
 NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  
 NOTE 8: NR operating band groups are as defined in Section 3.5.2.

Table 10.1.24.2.2-2: PRS-RSRP relative accuracy for FR2

| Accuracy         |                   | Conditions                 |                             |  |   |                                    |                           |
|------------------|-------------------|----------------------------|-----------------------------|--|---|------------------------------------|---------------------------|
| Normal condition | Extreme condition | PRS $\hat{E}_s/\text{lot}$ | PRS BW                      | Repetition factor<br>( $T_{\text{rep}}^{\text{PRS}} * L_{\text{PRS}} / K_{\text{comb}}^{\text{PRS}}$ ) | Io <sup>Note 7</sup> range  |                                    |                           |
|                  |                   |                            |                             |  | Minimum Io <sup>Note 1</sup><br>dBm / SCS <sub>PRS</sub>  |                                    | Maximum Io                |
| dB               | dB                | dB                         | PRB                         | -  | dBm / SCS <sub>PRS</sub>  |                                    | dBm/BW <sub>Channel</sub> |
|                  |                   |                            |                             |  | dBm/120kHz<br><small>Note 6</small>   | dBm/60kHz<br><small>Note 6</small> |                           |
| $\pm 5.0$        | $\pm 8.0$         | $\geq -3\text{dB}$         | $\geq [24]$                 | All  | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival |                                    | -50                       |
|                  |                   |                            |                             |  | Note 4  |                                    |                           |
|                  |                   |                            |                             |  | Note 4  |                                    |                           |
| $\pm 10$         | $\pm 13$          | $\geq -13\text{dB}$        | $24 \leq \text{BW} \leq 64$ | All  | Note 4  |                                    |                           |
| $\pm 7.5$        | $\pm 10.5$        |                            | $\text{BW} > 64$            | All  | Note 4  |                                    |                           |

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  
 NOTE 2: Void.  
 NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  
 NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth  $\geq [24]$  RB.  
 NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  
 NOTE 6: The condition level is increased by  $\Delta > 0$ , when applicable, as described in Sections B.3.2 and B.3.3.  
 NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  
 NOTE 8: NR operating band groups are as defined in Section 3.5.2.

### 10.1.24.3 Report mapping

#### 10.1.24.3.1 Absolute PRS-RSRP Measurement Report Mapping

The reporting range of absolute PRS-RSRP measurement is defined from -156 dBm to -31 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.24.3.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.24.3.1-1: Measurement report mapping for PRS-RSRP

| Reported value | Measured quantity value | Unit |
|----------------|-------------------------|------|
| PRS_RSRP_0     | PRS-RSRP<-156           | dBm  |
| PRS_RSRP_1     | -156≤PRS-RSRP<-155      | dBm  |
| PRS_RSRP_2     | -155≤PRS-RSRP<-154      | dBm  |
| PRS_RSRP_3     | -154≤PRS-RSRP<-153      | dBm  |
| PRS_RSRP_4     | -153≤PRS-RSRP<-152      | dBm  |
| PRS_RSRP_5     | -152≤PRS-RSRP<-151      | dBm  |
| PRS_RSRP_6     | -151≤PRS-RSRP<-150      | dBm  |
| PRS_RSRP_7     | -150≤PRS-RSRP<-149      | dBm  |
| PRS_RSRP_8     | -149≤PRS-RSRP<-148      | dBm  |
| PRS_RSRP_9     | -148≤PRS-RSRP<-147      | dBm  |
| PRS_RSRP_10    | -147≤PRS-RSRP<-146      | dBm  |
| PRS_RSRP_11    | -146≤PRS-RSRP<-145      | dBm  |
| PRS_RSRP_12    | -145≤PRS-RSRP<-144      | dBm  |
| PRS_RSRP_13    | -144≤PRS-RSRP<-143      | dBm  |
| PRS_RSRP_14    | -143≤PRS-RSRP<-142      | dBm  |
| PRS_RSRP_15    | -142≤PRS-RSRP<-141      | dBm  |
| PRS_RSRP_16    | -141≤PRS-RSRP<-140      | dBm  |
| PRS_RSRP_17    | -140≤PRS-RSRP<-139      | dBm  |
| PRS_RSRP_18    | -139≤PRS-RSRP<-138      | dBm  |
| ...            | ...                     | ...  |
| PRS_RSRP_111   | -46≤PRS-RSRP<-45        | dBm  |
| PRS_RSRP_112   | -45≤PRS-RSRP<-44        | dBm  |
| PRS_RSRP_113   | -44≤PRS-RSRP<-43        | dBm  |
| PRS_RSRP_114   | -43≤PRS-RSRP<-42        | dBm  |
| PRS_RSRP_115   | -42≤PRS-RSRP<-41        | dBm  |
| PRS_RSRP_116   | -41≤PRS-RSRP<-40        | dBm  |
| PRS_RSRP_117   | -40≤PRS-RSRP<-39        | dBm  |
| PRS_RSRP_118   | -39≤PRS-RSRP<-38        | dBm  |
| PRS_RSRP_119   | -38≤PRS-RSRP<-37        | dBm  |
| PRS_RSRP_120   | -37≤PRS-RSRP<-36        | dBm  |
| PRS_RSRP_121   | -36≤PRS-RSRP<-35        | dBm  |
| PRS_RSRP_122   | -35≤PRS-RSRP<-34        | dBm  |
| PRS_RSRP_123   | -34≤PRS-RSRP<-33        | dBm  |
| PRS_RSRP_124   | -33≤PRS-RSRP<-32        | dBm  |
| PRS_RSRP_125   | -32≤PRS-RSRP<-31        | dBm  |
| PRS_RSRP_126   | -31≤PRS-RSRP            | dBm  |

### 10.1.24.3.2 Differential Report Mapping for PRS-RSRP Measurement

The reporting range of differential PRS-RSRP is defined from -30 dB to 0 dB with 1 dB resolution when *nr-DL-AoD-RequestLocationInformation* message is received.

The mapping of measured quantity is defined in Table 10.1.24.3.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential PRS-RSRP is defined from -30 dB to 30 dB with 1 dB resolution when *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* is received.

The mapping of measured quantity is defined in Table 10.1.24.3.2-2. The range in the signalling may be larger than the guaranteed accuracy range or the range supported by the UE receiver for differential RSRP measured on different PRS resources in frequency domain at the same time.

Table 10.1.24.3.2-1: Measurement report mapping for differential PRS-RSRP

| Reported value | Measured quantity value             | Unit |
|----------------|-------------------------------------|------|
| DIFFRSRP_0     | $-30 \geq \Delta \text{RSRP}$       | dB   |
| DIFFRSRP_1     | $-29 \geq \Delta \text{RSRP} > -30$ | dB   |
| DIFFRSRP_2     | $-28 \geq \Delta \text{RSRP} > -29$ | dB   |
| DIFFRSRP_3     | $-27 \geq \Delta \text{RSRP} > -28$ | dB   |
| DIFFRSRP_4     | $-26 \geq \Delta \text{RSRP} > -27$ | dB   |
| DIFFRSRP_5     | $-25 \geq \Delta \text{RSRP} > -26$ | dB   |
| DIFFRSRP_6     | $-24 \geq \Delta \text{RSRP} > -25$ | dB   |
| DIFFRSRP_7     | $-23 \geq \Delta \text{RSRP} > -24$ | dB   |
| DIFFRSRP_8     | $-22 \geq \Delta \text{RSRP} > -23$ | dB   |
| DIFFRSRP_9     | $-21 \geq \Delta \text{RSRP} > -22$ | dB   |
| DIFFRSRP_10    | $-20 \geq \Delta \text{RSRP} > -21$ | dB   |
| DIFFRSRP_11    | $-19 \geq \Delta \text{RSRP} > -20$ | dB   |
| DIFFRSRP_12    | $-18 \geq \Delta \text{RSRP} > -19$ | dB   |
| DIFFRSRP_13    | $-17 \geq \Delta \text{RSRP} > -18$ | dB   |
| DIFFRSRP_14    | $-16 \geq \Delta \text{RSRP} > -17$ | dB   |
| DIFFRSRP_15    | $-15 \geq \Delta \text{RSRP} > -16$ | dB   |
| DIFFRSRP_16    | $-14 \geq \Delta \text{RSRP} > -15$ | dB   |
| DIFFRSRP_17    | $-13 \geq \Delta \text{RSRP} > -14$ | dB   |
| DIFFRSRP_18    | $-12 \geq \Delta \text{RSRP} > -13$ | dB   |
| DIFFRSRP_19    | $-11 \geq \Delta \text{RSRP} > -12$ | dB   |
| DIFFRSRP_20    | $-10 \geq \Delta \text{RSRP} > -11$ | dB   |
| DIFFRSRP_21    | $-9 \geq \Delta \text{RSRP} > -10$  | dB   |
| DIFFRSRP_22    | $-8 \geq \Delta \text{RSRP} > -9$   | dB   |
| DIFFRSRP_23    | $-7 \geq \Delta \text{RSRP} > -8$   | dB   |
| DIFFRSRP_24    | $-6 \geq \Delta \text{RSRP} > -7$   | dB   |
| DIFFRSRP_25    | $-5 \geq \Delta \text{RSRP} > -6$   | dB   |
| DIFFRSRP_26    | $-4 \geq \Delta \text{RSRP} > -5$   | dB   |
| DIFFRSRP_27    | $-3 \geq \Delta \text{RSRP} > -4$   | dB   |
| DIFFRSRP_28    | $-2 \geq \Delta \text{RSRP} > -3$   | dB   |
| DIFFRSRP_29    | $-1 \geq \Delta \text{RSRP} > -2$   | dB   |
| DIFFRSRP_30    | $0 \geq \Delta \text{RSRP} > -1$    | dB   |

Table 10.1.24.3.2-2: Measurement report mapping for differential PRS-RSRP

| Reported value | Measured quantity value             | Unit |
|----------------|-------------------------------------|------|
| DIFFRSRP_0     | $-30 \geq \Delta \text{RSRP}$       | dB   |
| DIFFRSRP_1     | $-29 \geq \Delta \text{RSRP} > -30$ | dB   |
| DIFFRSRP_2     | $-28 \geq \Delta \text{RSRP} > -29$ | dB   |
| DIFFRSRP_3     | $-27 \geq \Delta \text{RSRP} > -28$ | dB   |
| DIFFRSRP_4     | $-26 \geq \Delta \text{RSRP} > -27$ | dB   |
| DIFFRSRP_5     | $-25 \geq \Delta \text{RSRP} > -26$ | dB   |
| DIFFRSRP_6     | $-24 \geq \Delta \text{RSRP} > -25$ | dB   |
| DIFFRSRP_7     | $-23 \geq \Delta \text{RSRP} > -24$ | dB   |
| DIFFRSRP_8     | $-22 \geq \Delta \text{RSRP} > -23$ | dB   |
| DIFFRSRP_9     | $-21 \geq \Delta \text{RSRP} > -22$ | dB   |
| DIFFRSRP_10    | $-20 \geq \Delta \text{RSRP} > -21$ | dB   |
| DIFFRSRP_11    | $-19 \geq \Delta \text{RSRP} > -20$ | dB   |
| DIFFRSRP_12    | $-18 \geq \Delta \text{RSRP} > -19$ | dB   |
| DIFFRSRP_13    | $-17 \geq \Delta \text{RSRP} > -18$ | dB   |
| DIFFRSRP_14    | $-16 \geq \Delta \text{RSRP} > -17$ | dB   |
| ...            | ...                                 | ...  |
| DIFFRSRP_25    | $-5 \geq \Delta \text{RSRP} > -6$   | dB   |
| DIFFRSRP_26    | $-4 \geq \Delta \text{RSRP} > -5$   | dB   |
| DIFFRSRP_27    | $-3 \geq \Delta \text{RSRP} > -4$   | dB   |
| DIFFRSRP_28    | $-2 \geq \Delta \text{RSRP} > -3$   | dB   |
| DIFFRSRP_29    | $-1 \geq \Delta \text{RSRP} > -2$   | dB   |
| DIFFRSRP_30    | $0 \geq \Delta \text{RSRP} > -1$    | dB   |
| DIFFRSRP_31    | $1 \geq \Delta \text{RSRP} > 0$     | dB   |
| DIFFRSRP_32    | $2 \geq \Delta \text{RSRP} > 1$     | dB   |
| DIFFRSRP_33    | $3 \geq \Delta \text{RSRP} > 2$     | dB   |
| DIFFRSRP_34    | $4 \geq \Delta \text{RSRP} > 3$     | dB   |
| DIFFRSRP_35    | $5 \geq \Delta \text{RSRP} > 4$     | dB   |
| DIFFRSRP_36    | $6 \geq \Delta \text{RSRP} > 5$     | dB   |
| ...            | ...                                 | ...  |
| DIFFRSRP_47    | $17 \geq \Delta \text{RSRP} > 16$   | dB   |
| DIFFRSRP_48    | $18 \geq \Delta \text{RSRP} > 17$   | dB   |
| DIFFRSRP_49    | $19 \geq \Delta \text{RSRP} > 18$   | dB   |
| DIFFRSRP_50    | $20 \geq \Delta \text{RSRP} > 19$   | dB   |
| DIFFRSRP_51    | $21 \geq \Delta \text{RSRP} > 20$   | dB   |
| DIFFRSRP_52    | $22 \geq \Delta \text{RSRP} > 21$   | dB   |
| DIFFRSRP_53    | $23 \geq \Delta \text{RSRP} > 22$   | dB   |
| DIFFRSRP_54    | $24 \geq \Delta \text{RSRP} > 23$   | dB   |
| DIFFRSRP_55    | $25 \geq \Delta \text{RSRP} > 24$   | dB   |
| DIFFRSRP_56    | $26 \geq \Delta \text{RSRP} > 25$   | dB   |
| DIFFRSRP_57    | $27 \geq \Delta \text{RSRP} > 26$   | dB   |
| DIFFRSRP_58    | $28 \geq \Delta \text{RSRP} > 27$   | dB   |
| DIFFRSRP_59    | $29 \geq \Delta \text{RSRP} > 28$   | dB   |
| DIFFRSRP_60    | $30 \geq \Delta \text{RSRP} > 29$   | dB   |
| DIFFRSRP_61    | $\Delta \text{RSRP} > 30$           | dB   |

## 10.1.25 UE Rx-Tx Time Difference Measurements

### 10.1.25.1 Introduction

The requirements in Clause 10.1.25 shall apply, provided the UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more UE Rx-Tx time difference measurements defined in TS 38.215 [4].

### 10.1.25.2 Measurement Accuracy Requirements

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall not apply, if:

$N_{TA\_offset}$  defined in Table 7.1.2-2 changes during the UE Rx-Tx measurement period or

if the uplink transmission timing changes during the UE Rx-Tx measurement period due to the network-configured Timing Advance.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one DL PRS resource of each of the TRPs in the assistance data.

If the uplink transmission timing changes during the UE Rx-Tx measurement period due to the autonomous timing adjustment defined in clause 7.1.2 then:

- UE Rx-Tx measurement accuracy requirements shall apply for a cell, which is also the downlink reference cell (defined in section 7.1.1) for SRS transmission even if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.
- UE Rx-Tx measurement accuracy requirements shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1.1) for SRS transmission, if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment. The UE may restart the UE Rx-Tx measurement in this case.

The UE shall continue and complete a UE Rx-Tx measurement while meeting UE Rx-Tx measurement accuracy requirements defined in this clause when a serving cell change occurs during the UE Rx-Tx measurement provided that the serving cell change does not impact the SRS configuration for the UE Rx-Tx measurement.

Note: The requirements for fading channel in this clause are derived based on TDL-A (30 ns delay spread, 5Hz) and TDL-C (60 ns delay spread, 300 Hz) channel models for FR1 and FR2 respectively.

*Editor's note: In accuracy tables  $\delta$  is margin and is FFS*

The accuracy requirements in Table 10.1.25.2-1 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

$PRP|_{dBm}$  according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

**Table 10.1.25.2-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN**

| Accuracy          | Conditions          |                       |         |  |  |                          |               |
|-------------------|---------------------|-----------------------|---------|--|--|--------------------------|---------------|
|                   | PRS $\hat{E}_s/lot$ | Minimum PRS bandwidth | PRS SCS | PRS resource repetition ( $T_{rep}^{PRS} * L_{PRS}/K_{comb}^{PRS}$ Note 3) | NR operating band groups <sup>Note 2</sup>     | $I_o^{Note 4}$ range     |               |
|                   |                     |                       |         |  |  | Minimum $I_o^{Note 1}$   | Maximum $I_o$ |
| $T_c^{Note 5}$    | dB                  | RB                    | kHz     |  |  | dBm / SCS <sub>PRS</sub> | dBm/BW        |
| $\pm [78+\delta]$ | -3                  | $\geq[24]$            | 15      | $\geq[4]$  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                     | -50           |
|                   |                     |                       |         |  | NR_FDD_FR1_B                                   | -120.5                   |               |
|                   |                     |                       |         |  | NR_TDD_FR1_C                                   | -120                     |               |
|                   |                     |                       |         |  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                   |               |
|                   |                     |                       |         |  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                     |               |
|                   |                     |                       |         |  | NR_FDD_FR1_F                                   | -118.5                   |               |
|                   |                     |                       |         |  | NR_FDD_FR1_G                                   | -118                     |               |
|                   |                     |                       |         |  | NR_FDD_FR1_H                                   | -117.5                   |               |

|               |       |              |    |            |  |        |        |        |
|---------------|-------|--------------|----|------------|--|--------|--------|--------|
| $\pm [59+80]$ |       | $\geq [52]$  |    | $\geq [1]$ | Note 6   | Note 6 | Note 6 |        |
| $\pm [30+56]$ |       | $> [104]$    |    | $\geq [1]$ | Note 6   | Note 6 | Note 6 |        |
| $\pm [57+80]$ |       | $\geq [24]$  | 30 | $\geq [4]$ | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -118   | -50    |        |
|               |       |              |    |            | NR_FDD_FR1_B                                   | -117.5 |        |        |
|               |       |              |    |            | NR_TDD_FR1_C                                   | -117   |        |        |
|               |       |              |    |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -116.5 |        |        |
|               |       |              |    |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -116   |        |        |
|               |       |              |    |            | NR_FDD_FR1_F                                   | -115.5 |        |        |
|               |       |              |    |            | NR_FDD_FR1_G                                   | -115   |        |        |
|               |       | $\geq [48]$  |    | $\geq [1]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [30+56]$ |       | $\geq [132]$ |    | $\geq [1]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [15+24]$ |       | $\geq [24]$  | 60 | $\geq [4]$ | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -115   | -50    |        |
| $\pm [29+56]$ |       | $\geq [24]$  |    |            | NR_FDD_FR1_B                                   | -114.5 |        |        |
|               |       |              |    |            | NR_TDD_FR1_C                                   | -114   |        |        |
|               |       |              |    |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -113.5 |        |        |
|               |       |              |    |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -113   |        |        |
|               |       |              |    |            | NR_FDD_FR1_F                                   | -113.5 |        |        |
|               |       |              |    |            | NR_FDD_FR1_G                                   | -113   |        |        |
|               |       | $\geq [64]$  |    | $\geq [1]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [15+24]$ |       | $\geq [132]$ |    | $\geq [1]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [7+24]$  |       | $\geq [24]$  | 15 | $\geq [4]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [101+8]$ | $-13$ | $\geq [52]$  |    |            | $\geq [1]$                                     | NOTE 6 | NOTE 6 | NOTE 6 |
|               |       | $> [104]$    |    |            | $\geq [1]$                                     | NOTE 6 | NOTE 6 | NOTE 6 |
| $\pm [37+56]$ |       | $\geq [24]$  | 30 | $\geq [4]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [58+80]$ |       | $\geq [48]$  |    | $\geq [1]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [39+56]$ |       | $\geq [132]$ |    | $\geq [1]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [16+24]$ |       | $\geq [24]$  | 60 | $\geq [4]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |
| $\pm [36+56]$ |       | $\geq [64]$  |    |            | $\geq [1]$                                     | NOTE 6 | NOTE 6 | NOTE 6 |
| $\pm [16+24]$ |       | $\geq [132]$ |    |            | $\geq [1]$                                     | NOTE 6 | NOTE 6 | NOTE 6 |
| $\pm [8+24]$  |       | $\geq [132]$ |    | $\geq [1]$ | NOTE 6   | NOTE 6 | NOTE 6 |        |

NOTE 1: This minimum lo condition is expressed as the average lo per RE over all REs in an OFDM symbol.  
 NOTE 2: NR operating band groups are as defined in Section 3.5.  
 NOTE 3:  $T_{rep}^{PRS}$ ,  $L_{PRS}$ ,  $K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor*, *dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34].  
 NOTE 4: The lo is defined in PRS slots. The same lo range applies to PRS and non-PRS symbols. lo levels are different in PRS and non-PRS symbols within the same slot.  
 NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  
 NOTE 6: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.

The accuracy requirements in Table 10.1.25.2-2 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

PRP<sub>dBm</sub> according to Annex B.2.14 for a corresponding Band.

Fading propagation condition.

**Table 10.1.25.2-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading**

| Accuracy | Conditions |  |  |  | lo <sup>Note 4</sup> range |
|----------|------------|--|--|--|----------------------------|
|          |            |  |  |  |                            |



|                         | PRS<br>Es/lot | Minimum<br>PRS<br>bandwidth | PRS<br>SCS | PRS resource<br>repetition ( $T_{rep}^{PRS} *$<br>$L_{PRS}/K_{comb}^{PRS}$ Note 3) | NR operating band<br>groups <sup>Note 2</sup>  | Minimum<br>Io <sup>Note 1</sup> | Maximum<br>Io |
|-------------------------|---------------|-----------------------------|------------|--|--|---------------------------------|---------------|
| $T_c$ <sup>Note 5</sup> | dB            | RB                          | kHz        |  |  | dBm /<br>SCS <sub>PRS</sub>     | dBm/BW        |
| $\pm [137+8]$           | -3            | $\geq[24]$                  | 15         | $\geq[4]$  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                            | -50           |
|                         |               |                             |            |  | NR_FDD_FR1_B                                   | -120.5                          |               |
|                         |               |                             |            |  | NR_TDD_FR1_C                                   | -120                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                          |               |
|                         |               |                             |            |  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_F                                   | -118.5                          |               |
|                         |               |                             |            |  | NR_FDD_FR1_G                                   | -118                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_H                                   | -117.5                          |               |
| $\pm [96+80]$           |               | $\geq[52]$                  |            | $\geq[1]$  | NOTE 6   | NOTE 6                          | NOTE 6        |
| $\pm [62+56]$           |               | $>[104]$                    |            | $\geq[1]$  | NOTE 6   | NOTE 6                          | NOTE 6        |
| $\pm [87+80]$           |               | $\geq[24]$                  | 30         | $\geq[4]$  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -118                            | -50           |
|                         |               |                             |            |  | NR_FDD_FR1_B                                   | -117.5                          |               |
|                         |               |                             |            |  | NR_TDD_FR1_C                                   | -117                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -116.5                          |               |
|                         |               |                             |            |  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -116                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_F                                   | -115.5                          |               |
|                         |               |                             |            |  | NR_FDD_FR1_G                                   | -115                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_H                                   | -114.5                          |               |
| $\pm [68+56]$           |               | $\geq[48]$                  |            | $\geq[1]$  | NOTE 6   | NOTE 6                          | NOTE 6        |
| $\pm [44+24]$           |               | $\geq[132]$                 |            | $\geq[1]$  | NOTE 6   | NOTE 6                          | NOTE 6        |
| $\pm [59+56]$           |               | $\geq[24]$                  | 60         | $\geq[4]$  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -115                            | -50           |
|                         |               |                             |            |  | NR_FDD_FR1_B                                   | -114.5                          |               |
|                         |               |                             |            |  | NR_TDD_FR1_C                                   | -114                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -113.5                          |               |
|                         |               |                             |            |  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -113                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_F                                   | -113.5                          |               |
|                         |               |                             |            |  | NR_FDD_FR1_G                                   | -113                            |               |
|                         |               |                             |            |  | NR_FDD_FR1_H                                   | -111.5                          |               |

|            |     |         |    |      |        |        |        |        |
|------------|-----|---------|----|------|--------|--------|--------|--------|
| ± [42+24]  | -13 | ≥ [64]  | 15 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [36+24]  |     | ≥ [132] |    | 15   | ≥[1]   | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [180+δ]  |     | ≥[24]   |    |      | ≥[4]   | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [98+80]  |     | ≥[52]   | 30 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [68+56]  |     | >[104]  |    | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [87+80]  |     | ≥[24]   | 60 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [85+56]  |     | ≥[48]   |    | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [44+24]  |     | ≥[132]  | 60 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [139+56] |     | ≥[24]   |    | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [46+24]  |     | ≥ [64]  |    | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |        |
| ± [30+24]  |     | ≥ [132] |    | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |        |

NOTE 1: This minimum lo condition is expressed as the average lo per RE over all REs in an OFDM symbol.  
 NOTE 2: NR operating band groups are as defined in Section 3.5.  
 NOTE 3:  $T_{rep}^{PRS}$ ,  $L_{PRS}$ ,  $K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor*, *dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34].  
 NOTE 4: The lo is defined in PRS slots. The same lo range applies to PRS and non-PRS symbols. lo levels are different in PRS and non-PRS symbols within the same slot.  
 NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  
 NOTE 6: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.

The accuracy requirements in Table 10.1.25.2-3 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP<sub>dBm</sub> according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

**Table 10.1.25.2-3: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN**

| Accuracy | Conditions    |                             |            |   |                                 |               |
|----------|---------------|-----------------------------|------------|---|---------------------------------|---------------|
|          | PRS<br>Ês/lot | Minimum<br>PRS<br>bandwidth | PRS<br>SCS | PRS resource<br>repetition<br>( $T_{rep}^{PRS} * L_{PRS} /$<br>$K_{comb}^{PRS}$ Note 3) | lo <sup>Note 4</sup> range      |               |
|          |               |                             |            |   | Minimum<br>lo <sup>Note 1</sup> | Maximum<br>lo |
|          |               |                             |            |   |                                 |               |

| $T_c$ <sup>Note 5</sup> | dB           | RB           | kHz        |            | dBm / SCS <sub>PRS</sub>  | dBm/BW <sub>Channel</sub> |        |
|-------------------------|--------------|--------------|------------|------------|---|---------------------------|--------|
| $\pm [22+76]$           | -3           | $\geq [24]$  | 60         | $\geq [4]$ | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50                       |        |
| $\pm [15+32]$           |              | $\geq [64]$  |            | $\geq [1]$ | NOTE 6  | NOTE 6                    |        |
| $\pm [7+24]$            |              | $\geq [132]$ |            | $\geq [1]$ | NOTE 6  | NOTE 6                    |        |
| $\pm [12+32]$           | -13          | $\geq [32]$  | 120        | $\geq [1]$ | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50                       |        |
| $\pm [7+24]$            |              | $\geq [64]$  |            | $\geq [1]$ | NOTE 6  | NOTE 6                    |        |
| $\pm [4+20]$            |              | $\geq [128]$ |            | $\geq [1]$ | NOTE 6  | NOTE 6                    |        |
| $\pm [35+76]$           |              | $\geq [24]$  |            | 60         | $\geq [1]$  | NOTE 6                    | NOTE 6 |
| $\pm [15+32]$           |              | $\geq [64]$  |            |            | $\geq [1]$  | NOTE 6                    | NOTE 6 |
| $\pm [7+24]$            | $\geq [132]$ | $\geq [1]$   | NOTE 6     |            | NOTE 6  |                           |        |
| $\pm [14+32]$           | 120          | $\geq [32]$  | $\geq [1]$ | NOTE 6     | NOTE 6  |                           |        |
| $\pm [9+24]$            |              | $\geq [64]$  | $\geq [1]$ | NOTE 6     | NOTE 6  |                           |        |
| $\pm [4+20]$            |              | $\geq [128]$ | $\geq [1]$ | NOTE 6     | NOTE 6  |                           |        |

NOTE 1: This minimum  $I_o$  condition is expressed as the average  $I_o$  per RE over all REs in an OFDM symbol.  
 NOTE 2: NR operating band groups are as defined in Section 3.5.  
 NOTE 3:  $T_{rep}^{PRS}, L_{PRS}, K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].  
 NOTE 4: The  $I_o$  is defined in PRS slots. The same  $I_o$  range applies to PRS and non-PRS symbols.  $I_o$  levels are different in PRS and non-PRS symbols within the same slot.  
 NOTE 5:  $T_c$  is the basic timing unit defined in TS 38.211 [6].  
 NOTE 6: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.

The accuracy requirements in Table 10.1.25.2-4 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP<sub>dBm</sub> according to Annex B.2.14 for a corresponding Band.

Fading propagation condition.

**Table 10.1.25.2-4: UE Rx-Tx time difference measurement accuracy in FR2 in fading**

| Accuracy | Conditions    |                             |            |  |                                    |                  |
|----------|---------------|-----------------------------|------------|--|------------------------------------|------------------|
|          | PRS<br>Ês/lot | Minimum<br>PRS<br>bandwidth | PRS<br>SCS | PRS resource<br>repetition<br>( $T_{rep}^{PRS} * L_{PRS} / K_{comb}^{PRS}$ Note 3) | $I_o$ <sup>Note 4</sup> range      |                  |
|          |               |                             |            |  | Minimum<br>$I_o$ <sup>Note 1</sup> | Maximum<br>$I_o$ |
|          |               |                             |            |  |                                    |                  |

| $T_c$ <sup>Note 5</sup> | dB  | RB          | kHz |           | dBm / SCS <sub>PRS</sub>  | dBm/BW <sub>Channel</sub> |
|-------------------------|-----|-------------|-----|-----------|---|---------------------------|
| $\pm [75+76]$           | -3  | $\geq[24]$  | 60  | $\geq[4]$ | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50                       |
| $\pm [72+32]$           |     | $\geq[64]$  |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [57+24]$           |     | $\geq[132]$ |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [61+32]$           |     | $\geq[32]$  | 120 | $\geq[1]$ | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50                       |
| $\pm [64+24]$           |     | $\geq[64]$  |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [55+20]$           |     | $\geq[128]$ |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [92+76]$           | -13 | $\geq[24]$  | 60  | $\geq[4]$ | NOTE 6  | NOTE 6                    |
| $\pm [70+32]$           |     | $\geq[64]$  |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [57+24]$           |     | $\geq[132]$ |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [60+32]$           |     | $\geq[32]$  | 120 | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [66+24]$           |     | $\geq[64]$  |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |
| $\pm [62+20]$           |     | $\geq[128]$ |     | $\geq[1]$ | NOTE 6  | NOTE 6                    |

NOTE 1: This minimum lo condition is expressed as the average lo per RE over all REs in an OFDM symbol.  
 NOTE 2: NR operating band groups are as defined in Section 3.5.  
 NOTE 3:  $T_{rep}^{PRS}, L_{PRS}, K_{comb}^{PRS}$  are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].  
 NOTE 4: The lo is defined in PRS slots. The same lo range applies to PRS and non-PRS symbols. lo levels are different in PRS and non-PRS symbols within the same slot.  
 NOTE 5:  $T_c$  is the basic timing unit defined in TS 38.211 [6].  
 NOTE 6: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.

### 10.1.25.3 Report mapping

#### 10.1.25.3.1 Absolute UE Rx-Tx Measurement Report Mapping

The reporting range for the absolute UE Rx-Tx time difference measurement ( $T_{UE\ Rx-Tx}$ ) is defined from  $-985024 \times T_c$  to  $985024 \times T_c$  with the resolution step of  $2^k \times T_c$ , where:

$T_c$  is defined in TS 38.211 [6],

$$k_{min} \leq k \leq k_{max},$$

$k_{min}=2$  and  $k_{max}=5$ , when at least one of the PRS and the SRS resources configured for  $T_{UE\ Rx-Tx}$  is in FR1,

$k_{min}=0$  and  $k_{max}=5$ , when both PRS and SRS resources configured for  $T_{UE\ Rx-Tx}$  are in FR2,

$k \geq \text{timingReportingGranularityFactor}$  [34] configured by LMF via LPP for the UE Rx-Tx time difference measurement.

The  $T_{UE\ Rx-Tx}$  report mapping for  $k = 0, 1, 2, 3, 4$ , and  $5$  are specified in Tables 10.1.25.3.1-1, 10.1.25.3.1-2, 10.1.25.3.1-3, 10.1.25.3.1-4, 10.1.25.3.1-5, and 10.1.25.3.1-6, respectively.

**Table 10.1.25.3.1-1: Absolute UE Rx-Tx time difference measurement report mapping for  $k=0$**

| Reported Quantity Value       | Measured Quantity Value                | Unit  |
|-------------------------------|--|-------|
| RX-TX_TIME_DIFFERENCE_0000    | $T_{UE\ Rx-Tx} < -985024$              | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001    | $-985024 \leq T_{UE\ Rx-Tx} < -985023$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002    | $-985023 \leq T_{UE\ Rx-Tx} < -985022$ | $T_c$ |
| ...                           | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_985024  | $-1 \leq T_{UE\ Rx-Tx} < 0$            | $T_c$ |
| RX-TX_TIME_DIFFERENCE_985025  | $0 \leq T_{UE\ Rx-Tx} < 1$             | $T_c$ |
| ...                           | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_1970047 | $985022 \leq T_{UE\ Rx-Tx} < 985023$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_1970048 | $985023 \leq T_{UE\ Rx-Tx} < 985024$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_1970049 | $985024 \leq T_{UE\ Rx-Tx}$            | $T_c$ |

**Table 10.1.25.3.1-2: Absolute UE Rx-Tx time difference measurement report mapping for  $k=1$** 

| Reported Quantity Value      | Measured Quantity Value                | Unit  |
|------------------------------|--|-------|
| RX-TX_TIME_DIFFERENCE_0000   | $T_{UE\ Rx-Tx} < -985024$              | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001   | $-985024 \leq T_{UE\ Rx-Tx} < -985022$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002   | $-985022 \leq T_{UE\ Rx-Tx} < -985020$ | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_492512 | $-2 \leq T_{UE\ Rx-Tx} < 0$            | $T_c$ |
| RX-TX_TIME_DIFFERENCE_492513 | $0 \leq T_{UE\ Rx-Tx} < 2$             | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_985023 | $985020 \leq T_{UE\ Rx-Tx} < 985022$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_985024 | $985022 \leq T_{UE\ Rx-Tx} < 985024$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_985025 | $985024 \leq T_{UE\ Rx-Tx}$            | $T_c$ |

**Table 10.1.25.3.1-3: Absolute UE Rx-Tx time difference measurement report mapping for  $k=2$** 

| Reported Quantity Value      | Measured Quantity Value                | Unit  |
|------------------------------|--|-------|
| RX-TX_TIME_DIFFERENCE_0000   | $T_{UE\ Rx-Tx} < -985024$              | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001   | $-985024 \leq T_{UE\ Rx-Tx} < -985020$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002   | $-985020 \leq T_{UE\ Rx-Tx} < -985016$ | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_246256 | $-4 \leq T_{UE\ Rx-Tx} < 0$            | $T_c$ |
| RX-TX_TIME_DIFFERENCE_246257 | $0 \leq T_{UE\ Rx-Tx} < 4$             | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_492511 | $985016 \leq T_{UE\ Rx-Tx} < 985020$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_492512 | $985020 \leq T_{UE\ Rx-Tx} < 985024$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_492513 | $985024 \leq T_{UE\ Rx-Tx}$            | $T_c$ |

**Table 10.1.25.3.1-4: Absolute UE Rx-Tx time difference measurement report mapping for  $k=3$** 

| Reported Quantity Value      | Measured Quantity Value                | Unit  |
|------------------------------|--|-------|
| RX-TX_TIME_DIFFERENCE_0000   | $T_{UE\ Rx-Tx} < -985024$              | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001   | $-985024 \leq T_{UE\ Rx-Tx} < -985016$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002   | $-985016 \leq T_{UE\ Rx-Tx} < -985008$ | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_123128 | $-8 \leq T_{UE\ Rx-Tx} < 0$            | $T_c$ |
| RX-TX_TIME_DIFFERENCE_123129 | $0 \leq T_{UE\ Rx-Tx} < 8$             | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_246255 | $985008 \leq T_{UE\ Rx-Tx} < 985016$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_246256 | $985016 \leq T_{UE\ Rx-Tx} < 985024$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_246257 | $985024 \leq T_{UE\ Rx-Tx}$            | $T_c$ |

**Table 10.1.25.3.1-5: Absolute UE Rx-Tx time difference measurement report mapping for  $k=4$** 

| Reported Quantity Value      | Measured Quantity Value                | Unit  |
|------------------------------|--|-------|
| RX-TX_TIME_DIFFERENCE_0000   | $T_{UE\ Rx-Tx} < -985024$              | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001   | $-985024 \leq T_{UE\ Rx-Tx} < -985008$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002   | $-985008 \leq T_{UE\ Rx-Tx} < -984992$ | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_61564  | $-16 \leq T_{UE\ Rx-Tx} < 0$           | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61565  | $0 \leq T_{UE\ Rx-Tx} < 16$            | $T_c$ |
| ...                          | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_123127 | $984992 \leq T_{UE\ Rx-Tx} < 985008$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_123128 | $985008 \leq T_{UE\ Rx-Tx} < 985024$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_123129 | $985024 \leq T_{UE\ Rx-Tx}$            | $T_c$ |

**Table 10.1.25.3.1-6: Absolute UE Rx-Tx time difference measurement report mapping for  $k=5$** 

| Reported Quantity Value     | Measured Quantity Value                | Unit  |
|-----------------------------|--|-------|
| RX-TX_TIME_DIFFERENCE_0000  | $T_{UE\ Rx-Tx} < -985024$              | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001  | $-985024 \leq T_{UE\ Rx-Tx} < -984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002  | $-984992 \leq T_{UE\ Rx-Tx} < -984960$ | $T_c$ |
| ...                         | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_30782 | $-32 \leq T_{UE\ Rx-Tx} < 0$           | $T_c$ |
| RX-TX_TIME_DIFFERENCE_30783 | $0 \leq T_{UE\ Rx-Tx} < 32$            | $T_c$ |
| ...                         | ...                                    | ...   |
| RX-TX_TIME_DIFFERENCE_61563 | $984960 \leq T_{UE\ Rx-Tx} < 984992$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61564 | $984992 \leq T_{UE\ Rx-Tx} < 985024$   | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61565 | $985024 \leq T_{UE\ Rx-Tx}$            | $T_c$ |

### 10.1.25.3.2 Differential UE Rx-Tx Measurement Report Mapping

The reporting range for differential UE Rx-Tx time difference measurement ( $\Delta T_{UE\ Rx-Tx}$ ) is defined from 0 up to  $8191 \times T_c$  where:

$\Delta T_{UE\ Rx-Tx} = T_{UE\ Rx-Tx1} - T_{UE\ Rx-Tx2}$ ; where:

$T_{UE\ Rx-Tx1} > T_{UE\ Rx-Tx2}$ ,

$T_{UE\ Rx-Tx1}$  is the first absolute UE Rx-Tx time difference measurement,

$T_{UE\ Rx-Tx2}$  is the second absolute UE Rx-Tx time difference measurement,

$T_c$  is defined in TS 38.211 [6],

$k_{min} \leq k \leq k_{max}$ ,

$k_{min}=2$  and  $k_{max}=5$ , when at least one of the PRS and the SRS resources configured for  $\Delta T_{UE\ Rx-Tx}$  is in FR1,

$k_{min}=0$  and  $k_{max}=5$ , when all the PRS and SRS resources configured for  $\Delta T_{UE\ Rx-Tx}$  are in FR2,

$k \geq \text{timingReportingGranularityFactor}$  [34] configured by LMF via LPP for the UE Rx-Tx time difference measurement.

The  $\Delta T_{UE\ Rx-Tx}$  report mapping for  $k = 0, 1, 2, 3, 4$ , and  $5$  are specified in Tables 10.1.25.3.2-1, 10.1.25.3.2-2, 10.1.25.3.2-3, 10.1.25.3.2-4, 10.1.25.3.2-5, and 10.1.25.3.2-6, respectively.

**Table 10.1.25.3.2-1: Differential UE Rx-Tx time difference measurement report mapping for  $k=0$** 

| Reported Quantity Value         | Measured Quantity Value                 | Unit  |
|---------------------------------|---|-------|
| DIFF_RX-TX_TIME_DIFFERENCE_0000 | $0 \leq \Delta T_{UE\ Rx-Tx} < 1$       | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0001 | $1 \leq \Delta T_{UE\ Rx-Tx} < 2$       | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0002 | $2 \leq \Delta T_{UE\ Rx-Tx} < 3$       | $T_c$ |
| ...                             | ...                                     | ...   |
| DIFF_RX-TX_TIME_DIFFERENCE_8189 | $8189 \leq \Delta T_{UE\ Rx-Tx} < 8190$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_8190 | $8190 \leq \Delta T_{UE\ Rx-Tx} < 8191$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_8191 | $8191 \leq \Delta T_{UE\ Rx-Tx}$        | $T_c$ |

**Table 10.1.25.3.2-2: Differential UE Rx-Tx time difference measurement report mapping for  $k=1$** 

| Reported Quantity Value         | Measured Quantity Value                 | Unit  |
|---------------------------------|---|-------|
| DIFF_RX-TX_TIME_DIFFERENCE_0000 | $0 \leq \Delta T_{UE\ Rx-Tx} < 2$       | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0001 | $2 \leq \Delta T_{UE\ Rx-Tx} < 4$       | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0002 | $4 \leq \Delta T_{UE\ Rx-Tx} < 6$       | $T_c$ |
| ...                             | ...                                     | ...   |
| DIFF_RX-TX_TIME_DIFFERENCE_4093 | $8186 \leq \Delta T_{UE\ Rx-Tx} < 8188$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_4094 | $8188 \leq \Delta T_{UE\ Rx-Tx} < 8190$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_4095 | $8190 \leq \Delta T_{UE\ Rx-Tx}$        | $T_c$ |

**Table 10.1.25.3.2-3: Differential UE Rx-Tx time difference measurement report mapping for  $k=2$** 

| Reported Quantity Value         | Measured Quantity Value                 | Unit  |
|---------------------------------|---|-------|
| DIFF_RX-TX_TIME_DIFFERENCE_0000 | $0 \leq \Delta T_{UE\ Rx-Tx} < 4$       | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0001 | $4 \leq \Delta T_{UE\ Rx-Tx} < 8$       | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0002 | $8 \leq \Delta T_{UE\ Rx-Tx} < 12$      | $T_c$ |
| ...                             | ...                                     | ...   |
| DIFF_RX-TX_TIME_DIFFERENCE_2045 | $8180 \leq \Delta T_{UE\ Rx-Tx} < 8184$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_2046 | $8184 \leq \Delta T_{UE\ Rx-Tx} < 8188$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_2047 | $8188 \leq \Delta T_{UE\ Rx-Tx}$        | $T_c$ |

**Table 10.1.25.3.2-4: Differential UE Rx-Tx time difference measurement report mapping for  $k=3$** 

| Reported Quantity Value         | Measured Quantity Value                 | Unit  |
|---------------------------------|---|-------|
| DIFF_RX-TX_TIME_DIFFERENCE_0000 | $0 \leq \Delta T_{UE\ Rx-Tx} < 8$       | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0001 | $8 \leq \Delta T_{UE\ Rx-Tx} < 16$      | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0002 | $16 \leq \Delta T_{UE\ Rx-Tx} < 24$     | $T_c$ |
| ...                             | ...                                     | ...   |
| DIFF_RX-TX_TIME_DIFFERENCE_1021 | $8168 \leq \Delta T_{UE\ Rx-Tx} < 8176$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_1022 | $8176 \leq \Delta T_{UE\ Rx-Tx} < 8184$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_1023 | $8184 \leq \Delta T_{UE\ Rx-Tx}$        | $T_c$ |

**Table 10.1.25.3.2-5: Differential UE Rx-Tx time difference measurement report mapping for  $k=4$** 

| Reported Quantity Value         | Measured Quantity Value                 | Unit  |
|---------------------------------|---|-------|
| DIFF_RX-TX_TIME_DIFFERENCE_0000 | $0 \leq \Delta T_{UE\ Rx-Tx} < 16$      | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0001 | $16 \leq \Delta T_{UE\ Rx-Tx} < 32$     | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0002 | $32 \leq \Delta T_{UE\ Rx-Tx} < 48$     | $T_c$ |
| ...                             | ...                                     | ...   |
| DIFF_RX-TX_TIME_DIFFERENCE_509  | $8144 \leq \Delta T_{UE\ Rx-Tx} < 8160$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_510  | $8160 \leq \Delta T_{UE\ Rx-Tx} < 8176$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_511  | $8176 \leq \Delta T_{UE\ Rx-Tx}$        | $T_c$ |

**Table 10.1.25.3.2-6: Differential UE Rx-Tx time difference measurement report mapping for  $k=5$** 

| Reported Quantity Value         | Measured Quantity Value                 | Unit  |
|---------------------------------|---|-------|
| DIFF_RX-TX_TIME_DIFFERENCE_0000 | $0 \leq \Delta T_{UE\ Rx-Tx} < 32$      | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0001 | $32 \leq \Delta T_{UE\ Rx-Tx} < 64$     | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_0002 | $64 \leq \Delta T_{UE\ Rx-Tx} < 96$     | $T_c$ |
| ...                             | ...                                     | ...   |
| DIFF_RX-TX_TIME_DIFFERENCE_253  | $8096 \leq \Delta T_{UE\ Rx-Tx} < 8128$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_254  | $8128 \leq \Delta T_{UE\ Rx-Tx} < 8160$ | $T_c$ |
| DIFF_RX-TX_TIME_DIFFERENCE_255  | $8160 \leq \Delta T_{UE\ Rx-Tx}$        | $T_c$ |

### 10.1.25.3.3 Additional Path Report Mapping for UE Rx-Tx Time Difference

The reporting range for the additional path reporting for an UE Rx-Tx time difference measurement is defined up to the range from  $-8175 \times T_c$  to  $8175 \times T_c$  with the resolution step of  $2^k \times T_c$ , where

$T_c$  is defined in TS 38.211 [6],

$$k_{min} \leq k \leq k_{max},$$

$k_{min}=2$  and  $k_{max}=5$ , when at least one of the PRS resource and SRS resource configured for the UE Rx-Tx time difference measurement is in FR1,

$k_{min}=0$  and  $k_{max}=5$ , when both of the PRS resource and SRS resource configured for the UE Rx-Tx time difference measurement is in FR2,

$k \geq \text{timingReportingGranularityFactor}$  [34] configured by LMF via LPP for the UE Rx-Tx time difference measurement.

The UE can report the timing of up to two additional paths with respect to the path timing determining the UE Rx-Tx time difference measurement.

The report mappings for different  $k$  values are specified in Tables 10.1.25.3.3-1 – 10.1.25.3.3-6.

**Table 10.1.25.3.3-1: Report mapping for  $k=0$**

| Reported Quantity Value, path_i | Measured Quantity Value, $\Delta\text{path}$ | Unit  |
|---------------------------------|--|-------|
| path_00000                      | $\Delta\text{path} < -8175$                  | $T_c$ |
| path_00001                      | $-8175 \leq \Delta\text{path} < -8174$       | $T_c$ |
| path_00002                      | $-8174 \leq \Delta\text{path} < -8173$       | $T_c$ |
| ...                             | ...  | ...   |
| path_08175                      | $-1 \leq \Delta\text{path} < 0$              | $T_c$ |
| path_08176                      | $0 \leq \Delta\text{path} < 1$               | $T_c$ |
| ...                             | ...  | ...   |
| path_16349                      | $8173 \leq \Delta\text{path} < 8174$         | $T_c$ |
| path_16350                      | $8174 \leq \Delta\text{path} < 8175$         | $T_c$ |
| path_16351                      | $8175 \leq \Delta\text{path}$                | $T_c$ |

**Table 10.1.25.3.3-2: Report mapping for  $k=1$**

| Reported Quantity Value, path_i | Measured Quantity Value, $\Delta\text{path}$ | Unit  |
|---------------------------------|--|-------|
| path_0000                       | $\Delta\text{path} < -8175$                  | $T_c$ |
| path_0001                       | $-8175 \leq \Delta\text{path} < -8173$       | $T_c$ |
| path_0002                       | $-8173 \leq \Delta\text{path} < -8171$       | $T_c$ |
| ...                             | ...  | ...   |
| path_4088                       | $-1 \leq \Delta\text{path} < 1$              | $T_c$ |
| ...                             | ...  | ...   |
| path_8174                       | $8171 \leq \Delta\text{path} < 8173$         | $T_c$ |
| path_8175                       | $8173 \leq \Delta\text{path} < 8175$         | $T_c$ |
| path_8176                       | $8175 \leq \Delta\text{path}$                | $T_c$ |



**Table 10.1.25.3.3-3: Report mapping for  $k=2$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_0000                          | $\Delta\text{path} < -8174$                     | $T_c$ |
| path_0001                          | $-8174 \leq \Delta\text{path} < -8170$          | $T_c$ |
| path_0002                          | $-8170 \leq \Delta\text{path} < -8166$          | $T_c$ |
| ...                                | ...   | ...   |
| path_2044                          | $-2 \leq \Delta\text{path} < 2$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_4086                          | $8166 \leq \Delta\text{path} < 8170$            | $T_c$ |
| path_4087                          | $8170 \leq \Delta\text{path} < 8174$            | $T_c$ |
| path_4088                          | $8174 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.25.3.3-4: Report mapping for  $k=3$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_0000                          | $\Delta\text{path} < -8172$                     | $T_c$ |
| path_0001                          | $-8172 \leq \Delta\text{path} < -8164$          | $T_c$ |
| path_0002                          | $-8164 \leq \Delta\text{path} < -8156$          | $T_c$ |
| ...                                | ...   | ...   |
| path_1022                          | $-4 \leq \Delta\text{path} < 4$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_2042                          | $8156 \leq \Delta\text{path} < 8164$            | $T_c$ |
| path_2043                          | $8164 \leq \Delta\text{path} < 8172$            | $T_c$ |
| path_2044                          | $8172 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.25.3.3-5: Report mapping for  $k=4$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_0000                          | $\Delta\text{path} < -8168$                     | $T_c$ |
| path_0001                          | $-8168 \leq \Delta\text{path} < -8152$          | $T_c$ |
| path_0002                          | $-8152 \leq \Delta\text{path} < -8136$          | $T_c$ |
| ...                                | ...   | ...   |
| path_511                           | $-8 \leq \Delta\text{path} < 8$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_1020                          | $8136 \leq \Delta\text{path} < 8152$            | $T_c$ |
| path_1021                          | $8152 \leq \Delta\text{path} < 8168$            | $T_c$ |
| path_1022                          | $8168 \leq \Delta\text{path}$                   | $T_c$ |

**Table 10.1.25.3.3-6: Report mapping for  $k=5$** 

| Reported Quantity Value,<br>path_i | Measured Quantity Value,<br>$\Delta\text{path}$ | Unit  |
|------------------------------------|---|-------|
| path_000                           | $\Delta\text{path} < -8160$                     | $T_c$ |
| path_001                           | $-8160 \leq \Delta\text{path} < -8128$          | $T_c$ |
| path_002                           | $-8128 \leq \Delta\text{path} < -8096$          | $T_c$ |
| ...                                | ...   | ...   |
| path_256                           | $0 \leq \Delta\text{path} < 32$                 | $T_c$ |
| ...                                | ...   | ...   |
| path_509                           | $8096 \leq \Delta\text{path} < 8128$            | $T_c$ |
| path_510                           | $8128 \leq \Delta\text{path} < 8160$            | $T_c$ |
| path_511                           | $8160 \leq \Delta\text{path}$                   | $T_c$ |

## 10.1.26 FR2 P-MPR report

The FR2 P-MPR report mapping is defined by this clause.

### 10.1.26.1 Report mapping

Table 10.1.26.1-1 defines the FR2 P-MPR report mapping.

**Table 10.1.26.1-1 Mapping of FR2 P-MPR**

| Reported value | Measured quantity value    | Unit |
|----------------|----------------------------|------|
| P-MPR_00       | $3 \leq \text{PMP-R} < 6$  | dB   |
| P-MPR_01       | $6 \leq \text{PMP-R} < 9$  | dB   |
| P-MPR_02       | $9 \leq \text{PMP-R} < 12$ | dB   |
| P-MPR_03       | $\text{PMP-R} \geq 12$     | dB   |

## 10.1.27 L1-SINR accuracy requirements for FR1

### 10.1.27.1 L1-SINR accuracy requirements with CSI-RS based CMR and no dedicated IMR configured

#### 10.1.27.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources configured as CMR and no dedicated resource configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements in Table 10.1.27.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 10.1.27.1.1-1.

Table 10.1.27.1.1-1: L1-SINR absolute accuracy for CSI-RS based CMR only in FR1

| Accuracy         |                   | Conditions                        |  |  |  |  |                           |                           |
|------------------|-------------------|-----------------------------------|--|--|--|--|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$ | $I_0$ <sup>Note 1</sup> range                  |  |  |  |                           |                           |
|                  |                   |                                   | NR operating band groups <sup>Note 2</sup>     | Minimum $I_0$                          |  |  | Maximum $I_0$             |                           |
| dB               | dB                | dB                                |  | dBm / $SCS_{\text{CSI-RS}}$            |  |  | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                                   |  | $SCS_{\text{CSI-RS}} = 15 \text{ kHz}$ | $SCS_{\text{CSI-RS}} = 30 \text{ kHz}$ | $SCS_{\text{CSI-RS}} = 60 \text{ kHz}$ |                           |                           |
| $\pm 5.5$        | $\pm 6.5$         | $\geq 3$                          | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                                   | -118                                   | -115                                   | N/A                       | -50                       |
|                  |                   |                                   | NR_FDD_FR1_B                                   | -120.5                                 | -117.5                                 | -114.5                                 | N/A                       | -50                       |
|                  |                   |                                   | NR_TDD_FR1_C                                   | -120                                   | -117                                   | -114                                   | N/A                       | -50                       |
|                  |                   |                                   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                                 | -116.5                                 | -113.5                                 | N/A                       | -50                       |
|                  |                   |                                   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                                   | -116                                   | -113                                   | N/A                       | -50                       |
|                  |                   |                                   | NR_FDD_FR1_F                                   | -118.5                                 | -115.5                                 | -112.5                                 | N/A                       | -50                       |
|                  |                   |                                   | NR_FDD_FR1_G                                   | -118                                   | -115                                   | -112                                   | N/A                       | -50                       |
|                  |                   |                                   | NR_FDD_FR1_H                                   | -117.5                                 | -114.5                                 | -111.5                                 | N/A                       | -50                       |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.27.1.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS compared to the largest measured value of L1-SINR among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.27.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 10.1.27.1.2-1.

Table 10.1.27.1.2-1: L1-SINR relative accuracy for CSI-RS based CMR only in FR1

| Accuracy         |                   | Conditions                          |  |                         |                         |        |                   |                   |
|------------------|-------------------|-------------------------------------|--|-------------------------|-------------------------|--------|-------------------|-------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}s/lot$<br>Note 2 | $I_o$ Note 1 range                             |                         |                         |        |                   | Maximum $I_o$     |
|                  |                   |                                     | NR operating band groups<br>Note 2             | Minimum $I_o$           |                         |        | dBm/BW<br>Channel |                   |
| dB               | dB                | dB                                  |  | dBm / $SCS_{CSI-RS}$    |                         |        |                   | dBm/BW<br>Channel |
|                  |                   |                                     | $SCS_{CSI-RS} = 15$ kHz                        | $SCS_{CSI-RS} = 30$ kHz | $SCS_{CSI-RS} = 60$ kHz |        |                   |                   |
| $\pm[4.5]$       | $\pm[5.5]$        | $\geq 3$                            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                    | -118                    | -115   | N/A               | -50               |
|                  |                   |                                     | NR_FDD_FR1_B                                   | -120.5                  | -117.5                  | -114.5 | N/A               | -50               |
|                  |                   |                                     | NR_TDD_FR1_C                                   | -120                    | -117                    | -114   | N/A               | -50               |
|                  |                   |                                     | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                  | -116.5                  | -113.5 | N/A               | -50               |
|                  |                   |                                     | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                    | -116                    | -113   | N/A               | -50               |
|                  |                   |                                     | NR_FDD_FR1_F                                   | -118.5                  | -115.5                  | -112.5 | N/A               | -50               |
|                  |                   |                                     | NR_FDD_FR1_G                                   | -118                    | -115                    | -112   | N/A               | -50               |
|                  |                   |                                     | NR_FDD_FR1_H                                   | -117.5                  | -114.5                  | -111.5 | N/A               | -50               |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter CSI-RS CMR  $\hat{E}s/lot$  is the minimum CMR CMR  $\hat{E}s/lot$  of the pair of CSI-RS resources to which the requirement applies.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.27.2 L1-SINR accuracy requirements with SSB based CMR and dedicated IMR configured

### 10.1.27.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-SINR in this clause apply to all SSBs configured as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 10.1.27.2.1-1 for SSB based CMR and NZP-IMR and in Table 10.1.27.2.1-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.27.2.1-1 and 10.1.27.2.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.27.2.1-1 and 10.1.27.2.1-2.

Table 10.1.27.2.1-1: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR1

| Accuracy         |                   | Conditions        |                   |  |                             |        |                           |                           |
|------------------|-------------------|-------------------|-------------------|--|-----------------------------|--------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB-CMR<br>Ês/lot | NZP-IMR<br>Ês/lot | I <sub>o</sub> <sup>Note 1</sup> range         |                             |        |                           |                           |
|                  |                   |                   |                   | NR operating band groups <sup>Note 2</sup>     | Minimum I <sub>o</sub>      |        | Maximum I <sub>o</sub>    |                           |
| dB               | dB                | dB                | dB                |  | dBm / SCS <sub>SSB</sub>    |        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                   |                   | SCS <sub>SSB</sub> = 15 kHz                    | SCS <sub>SSB</sub> = 30 kHz |        |                           |                           |
| ±4.0             | ±5.0              | ≥0                | ≥0                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                        | -118   | N/A                       | -50                       |
|                  |                   |                   |                   | NR_FDD_FR1_B                                   | -120.5                      | -117.5 | N/A                       | -50                       |
|                  |                   |                   |                   | NR_TDD_FR1_C                                   | -120                        | -117   | N/A                       | -50                       |
|                  |                   |                   |                   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                      | -116.5 | N/A                       | -50                       |
|                  |                   |                   |                   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                        | -116   | N/A                       | -50                       |
|                  |                   |                   |                   | NR_FDD_FR1_F                                   | -118.5                      | -115.5 | N/A                       | -50                       |
|                  |                   |                   |                   | NR_FDD_FR1_G                                   | -118                        | -115   | N/A                       | -50                       |
|                  |                   |                   |                   | NR_FDD_FR1_H                                   | -117.5                      | -114.5 | N/A                       | -50                       |

NOTE 1: I<sub>o</sub> is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 10.1.27.2.1-2: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR1

| Accuracy         |                   | Conditions        |  |                        |                             |                        |                           |                           |
|------------------|-------------------|-------------------|--|------------------------|-----------------------------|------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB-CMR<br>Ês/lot | I <sub>o</sub> <sup>Note 1</sup> range         |                        |                             |                        |                           |                           |
|                  |                   |                   | NR operating band groups <sup>Note 2</sup>     | Minimum I <sub>o</sub> |                             | Maximum I <sub>o</sub> |                           |                           |
| dB               | dB                | dB                |  | dB                     | dBm / SCS <sub>SSB</sub>    |                        | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                   | SCS <sub>SSB</sub> = 15 kHz                    |                        | SCS <sub>SSB</sub> = 30 kHz |                        |                           |                           |
| ±4.5             | ±5.5              | ≥-3               | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                   | -118                        | N/A                    | -50                       |                           |
|                  |                   |                   | NR_FDD_FR1_B                                   | -120.5                 | -117.5                      | N/A                    | -50                       |                           |
|                  |                   |                   | NR_TDD_FR1_C                                   | -120                   | -117                        | N/A                    | -50                       |                           |
|                  |                   |                   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                 | -116.5                      | N/A                    | -50                       |                           |
|                  |                   |                   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                   | -116                        | N/A                    | -50                       |                           |
|                  |                   |                   | NR_FDD_FR1_F                                   | -118.5                 | -115.5                      | N/A                    | -50                       |                           |
|                  |                   |                   | NR_FDD_FR1_G                                   | -118                   | -115                        | N/A                    | -50                       |                           |
|                  |                   |                   |  | NR_FDD_FR1_H           | -117.5                      | -114.5                 | N/A                       | -50                       |

NOTE 1: I<sub>o</sub> is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.27.2.2 Relative Accuracy

The relative accuracy of SSB based L1-SINR is defined as the L1-SINR measured from one SSB configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all SSBs and IMRs of the serving cell.

The accuracy requirements are defined in Table 10.1.27.2.2-1 for SSB based CMR and NZP-IMR and in Table 10.1.27.2.2-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.27.2.2-1 and 10.1.27.2.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.27.2.2-1 and 10.1.27.2.2-2.

**Table 10.1.27.2.2-1: L1-SINR relative accuracy for SSB based CMR and NZP-IMR in FR1**

| Accuracy         |                   | Conditions                               |                                |  |                      |                      |                     |                     |
|------------------|-------------------|--|--------------------------------|--|----------------------|----------------------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB-CMR $\hat{E}_s/\text{lot}$<br>Note 2 | NZP-IMR $\hat{E}_s/\text{lot}$ | $I_o$ Note 1 range                         |                      |                      |                     |                     |
|                  |                   |  |                                | NR operating band groups <sup>Note 3</sup> | Minimum $I_o$        |                      | Maximum $I_o$       |                     |
| dB               | dB                | dB                                       | dB                             |  | dBm / $SCS_{SSB}$    |                      | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |  |                                |  | $SCS_{SSB} = 15$ kHz | $SCS_{SSB} = 30$ kHz |                     |                     |
| $\pm[3.0]$       | $\pm[4.0]$        | $\geq 0$                                 | $\geq 0$                       | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A   | -121                 | -118                 | N/A                 | -50                 |
|                  |                   |  |                                | NR_FDD_FR1_B                               | -120.5               | -117.5               | N/A                 | -50                 |
|                  |                   |  |                                | NR_TDD_FR1_C                               | -120                 | -117                 | N/A                 | -50                 |
|                  |                   |  |                                | NR_FDD_FR1_D, NR_TDD_FR1_D                 | -119.5               | -116.5               | N/A                 | -50                 |
|                  |                   |  |                                | NR_FDD_FR1_E, NR_TDD_FR1_E                 | -119                 | -116                 | N/A                 | -50                 |
|                  |                   |  |                                | NR_FDD_FR1_F                               | -118.5               | -115.5               | N/A                 | -50                 |
|                  |                   |  |                                | NR_FDD_FR1_G                               | -118                 | -115                 | N/A                 | -50                 |
|                  |                   |  |                                | NR_FDD_FR1_H                               | -117.5               | -114.5               | N/A                 | -50                 |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The parameter SSB CMR  $\hat{E}_s/\text{lot}$  is the minimum SSB CMR  $\hat{E}_s/\text{lot}$  of the pair of SSBs to which the requirement applies.  
 NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 10.1.27.2.2-2: L1-SINR relative accuracy for SSB based CMR and ZP-IMR in FR1

| Accuracy         |                   | Conditions                               |  |                         |        |                     |                     |
|------------------|-------------------|--|--|-------------------------|--------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB-CMR $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                             |                         |        |                     |                     |
|                  |                   |  | NR operating band groups<br>Note 3             | Minimum $I_o$           |        | Maximum $I_o$       |                     |
| dB               | dB                | dB                                       |  | dBm / $SCS_{SSB}$       |        | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |  | $SCS_{SSB} = 15$<br>kHz                        | $SCS_{SSB} = 30$<br>kHz |        |                     |                     |
| $\pm[3.5]$       | $\pm[4.5]$        | $\geq -3$                                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                    | -118   | N/A                 | -50                 |
|                  |                   |  | NR_FDD_FR1_B                                   | -120.5                  | -117.5 | N/A                 | -50                 |
|                  |                   |  | NR_TDD_FR1_C                                   | -120                    | -117   | N/A                 | -50                 |
|                  |                   |  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                  | -116.5 | N/A                 | -50                 |
|                  |                   |  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                    | -116   | N/A                 | -50                 |
|                  |                   |  | NR_FDD_FR1_F                                   | -118.5                  | -115.5 | N/A                 | -50                 |
|                  |                   |  | NR_FDD_FR1_G                                   | -118                    | -115   | N/A                 | -50                 |
|                  |                   |  | NR_FDD_FR1_H                                   | -117.5                  | -114.5 | N/A                 | -50                 |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB CMR  $\hat{E}_s/\text{lot}$  is the minimum SSB CMR  $\hat{E}_s/\text{lot}$  of the pair of SSBs to which the requirement applies.  
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.27.3 L1-SINR accuracy requirements with CSI-RS based CMR and dedicated IMR configured

#### 10.1.27.3.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources configured as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 10.1.27.3.1-1 for CSI-RS based CMR and NZP-IMR and in Table 10.1.27.3.1-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.27.3.1-1 and 10.1.27.3.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.27.3.1-1 and 10.1.27.3.1-2.

Table 10.1.27.3.1-1: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR1

| Accuracy         |                   | Conditions                                  |                                |  |                                |                                |                                |                            |                            |
|------------------|-------------------|---|--------------------------------|--|--------------------------------|--------------------------------|--------------------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$<br>Note 2 | NZP-IMR $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 1</sup> range              |                                |                                |                                |                            |                            |
|                  |                   |   |                                | NR operating band groups <sup>Note 3</sup> | Minimum $I_o$                  |                                |                                | Maximum $I_o$              |                            |
| dB               | dB                | dB  | dB                             |  | dBm / $SCS_{\text{CSI-RS}}$    |                                |                                | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |   |                                |  | $SCS_{\text{CSI-RS}} = 15$ kHz | $SCS_{\text{CSI-RS}} = 30$ kHz | $SCS_{\text{CSI-RS}} = 60$ kHz |                            |                            |
| $\pm 4.0$        | $\pm 5.0$         | $\geq 0$                                    | $\geq 0$                       | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A   | -121                           | -118                           | -115                           | N/A                        | -50                        |
|                  |                   |   |                                | NR_FDD_FR1_B                               | -120.5                         | -117.5                         | -114.5                         | N/A                        | -50                        |
|                  |                   |   |                                | NR_TDD_FR1_C                               | -120                           | -117                           | -114                           | N/A                        | -50                        |
|                  |                   |   |                                | NR_FDD_FR1_D, NR_TDD_FR1_D                 | -119.5                         | -116.5                         | -113.5                         | N/A                        | -50                        |
|                  |                   |   |                                | NR_FDD_FR1_E, NR_TDD_FR1_E                 | -119                           | -116                           | -113                           | N/A                        | -50                        |
|                  |                   |   |                                | NR_FDD_FR1_F                               | -118.5                         | -115.5                         | -112.5                         | N/A                        | -50                        |
|                  |                   |   |                                | NR_FDD_FR1_G                               | -118                           | -115                           | -112                           | N/A                        | -50                        |
|                  |                   |   |                                | NR_FDD_FR1_H                               | -117.5                         | -114.5                         | -111.5                         | N/A                        | -50                        |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 10.1.27.3.1-2: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR1

| Accuracy         |                   | Conditions                                  |  |                                |                                |                                |                            |                            |
|------------------|-------------------|---|--|--------------------------------|--------------------------------|--------------------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ <sup>Note 1</sup> range              |                                |                                |                                |                            |                            |
|                  |                   |   | NR operating band groups <sup>Note 3</sup> | Minimum $I_o$                  |                                |                                | Maximum $I_o$              |                            |
| dB               | dB                | dB  |  | dBm / $SCS_{\text{CSI-RS}}$    |                                |                                | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |   |  | $SCS_{\text{CSI-RS}} = 15$ kHz | $SCS_{\text{CSI-RS}} = 30$ kHz | $SCS_{\text{CSI-RS}} = 60$ kHz |                            |                            |
| $\pm 4.5$        | $\pm 5.5$         | $\geq -3$                                   | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A   | -121                           | -118                           | -115                           | N/A                        | -50                        |
|                  |                   |   | NR_FDD_FR1_B                               | -120.5                         | -117.5                         | -114.5                         | N/A                        | -50                        |
|                  |                   |   | NR_TDD_FR1_C                               | -120                           | -117                           | -114                           | N/A                        | -50                        |
|                  |                   |   | NR_FDD_FR1_D, NR_TDD_FR1_D                 | -119.5                         | -116.5                         | -113.5                         | N/A                        | -50                        |
|                  |                   |   | NR_FDD_FR1_E, NR_TDD_FR1_E                 | -119                           | -116                           | -113                           | N/A                        | -50                        |
|                  |                   |   | NR_FDD_FR1_F                               | -118.5                         | -115.5                         | -112.5                         | N/A                        | -50                        |
|                  |                   |   | NR_FDD_FR1_G                               | -118                           | -115                           | -112                           | N/A                        | -50                        |
|                  |                   |   | NR_FDD_FR1_H                               | -117.5                         | -114.5                         | -111.5                         | N/A                        | -50                        |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.



10.1.27.3.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all CSI-RS and IMR resources of the serving cell.

The accuracy requirements are defined in Table 10.1.27.3.2-1 for CSI-RS based CMR and NZP-IMR and in Table 10.1.27.3.2-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.27.3.2-1 and 10.1.27.3.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- An AWGN channel.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.27.3.2-1 and 10.1.27.3.2-2.

**Table 10.1.27.3.2-1: L1-SINR relative accuracy for CSI-RS based CMR and NZP-IMR in FR1**

| Accuracy         |                   | Conditions        |                |  |  |   |  |                           |                           |
|------------------|-------------------|-------------------|----------------|--|--|---|--|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS CMR Ês/lot | NZP-IMR Ês/lot | I <sub>o</sub> <sup>Note 1</sup> range         |  |   |  |                           |                           |
|                  |                   |                   |                | NR operating band groups <sup>Note 2</sup>     | Minimum I <sub>o</sub>                   |   |  | Maximum I <sub>o</sub>    |                           |
| dB               | dB                | dB                | dB             |  | dBm / SCS <sub>CSI-RS</sub>              |   |  | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                   |                |  | SCS <sub>C</sub><br>SI-RS =<br>15<br>kHz | SCS <sub>CSI-RS</sub><br>RS = 30<br>kHz | SCS <sub>C</sub><br>SI-RS =<br>60<br>kHz |                           |                           |
| ±[3.0]           | ±[4.0]            | ≥0                | ≥0             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                                     | -118                                    | -115                                     | N/A                       | -50                       |
|                  |                   |                   |                | NR_FDD_FR1_B                                   | -<br>120.5                               | -117.5                                  | -114.5                                   | N/A                       | -50                       |
|                  |                   |                   |                | NR_TDD_FR1_C                                   | -120                                     | -117                                    | -114                                     | N/A                       | -50                       |
|                  |                   |                   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -<br>119.5                               | -116.5                                  | -113.5                                   | N/A                       | -50                       |
|                  |                   |                   |                | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                                     | -116                                    | -113                                     | N/A                       | -50                       |
|                  |                   |                   |                | NR_FDD_FR1_F                                   | -<br>118.5                               | -115.5                                  | -112.5                                   | N/A                       | -50                       |
|                  |                   |                   |                | NR_FDD_FR1_G                                   | -118                                     | -115                                    | -112                                     | N/A                       | -50                       |
|                  |                   |                   |                | NR_FDD_FR1_H                                   | -<br>117.5                               | -114.5                                  | -111.5                                   | N/A                       | -50                       |

NOTE 1: I<sub>o</sub> is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The parameter CSI-RS CMR Ês/lot is the minimum CMR Ês/lot of the pair of CSI-RS resources to which the requirement applies.  
 NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 10.1.27.3.2-2: L1-SINR relative accuracy for CSI-RS based CMR and ZP-IMR in FR1

| Accuracy         |                   | Conditions                        |  |                                |                                |                                |                            |                            |
|------------------|-------------------|-----------------------------------|--|--------------------------------|--------------------------------|--------------------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$ | $I_0$ <sup>Note 1</sup> range                  |                                |                                |                                |                            |                            |
|                  |                   |                                   | NR operating band groups <sup>Note 2</sup>     | Minimum $I_0$                  |                                |                                | Maximum $I_0$              |                            |
| dB               | dB                | dB                                |  | dBm / $SCS_{\text{CSI-RS}}$    |                                |                                | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                   |  | $SCS_{\text{CSI-RS}} = 15$ kHz | $SCS_{\text{CSI-RS}} = 30$ kHz | $SCS_{\text{CSI-RS}} = 60$ kHz |                            |                            |
| $\pm[3.5]$       | $\pm[4.5]$        | $\geq -3$                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | -115                           | N/A                        | -50                        |
|                  |                   |                                   | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | -114.5                         | N/A                        | -50                        |
|                  |                   |                                   | NR_TDD_FR1_C                                   | -120                           | -117                           | -114                           | N/A                        | -50                        |
|                  |                   |                                   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | -113.5                         | N/A                        | -50                        |
|                  |                   |                                   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | -113                           | N/A                        | -50                        |
|                  |                   |                                   | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | -112.5                         | N/A                        | -50                        |
|                  |                   |                                   | NR_FDD_FR1_G                                   | -118                           | -115                           | -112                           | N/A                        | -50                        |
|                  |                   |                                   | NR_FDD_FR1_H                                   | -117.5                         | -114.5                         | -111.5                         | N/A                        | -50                        |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter CSI-RS CMR  $\hat{E}_s/\text{lot}$  is the minimum CMR CMR  $\hat{E}_s/\text{lot}$  of the pair of CSI-RS resources to which the requirement applies.  
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.28 L1-SINR accuracy requirements for FR2

### 10.1.28.1 L1-SINR accuracy requirements with CSI-RS based CMR and no dedicated IMR configured

#### 10.1.28.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources configured as CMR and no dedicated resource configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements in Table 10.1.28.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 10.1.28.1.1-1.

**Table 10.1.28.1.1-1: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2**

| Accuracy  |                   | Conditions                                  |   |                         |                     |
|---|-------------------|---|---|-------------------------|---------------------|
| Normal condition  | Extreme condition | CSI-RS CMR $\hat{E}s/lot$ <sup>Note 3</sup> | $I_o$ <sup>Note 1</sup> range   |                         |                     |
|   |                   |   | Minimum $I_o$   |                         | Maximum $I_o$       |
| dB  | dB                | dB  | dBm / $SCS_{CSI-RS}$ <sup>Note 2</sup>  |                         | dBm/ $BW_{Channel}$ |
|   |                   |   | $SCS_{CSI-RS} = 60kHz$  | $SCS_{CSI-RS} = 120kHz$ |                     |
| $\pm 5.5$   | $\pm 6.5$         | $\geq -3$                                   | Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival |                         | N/A                 |
| NOTE 1: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the CSI-RS CMR $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table. |                   |   |   |                         |                     |

### 10.1.28.1.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS compared to the largest measured value of L1-SINR among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.28.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 10.1.28.1.2-1.

**Table 10.1.28.2.1-1: L1-SINR relative accuracy for CSI-RS based CMR only in FR2**

| Accuracy  |                   | Conditions  |   |                         |                     |
|---|-------------------|---|---|-------------------------|---------------------|
| Normal condition  | Extreme condition | CSI-RS CMR $\hat{E}s/lot$ <sup>Note 2, Note 4</sup> | $I_o$ <sup>Note 1</sup> range   |                         |                     |
|   |                   |   | Minimum $I_o$   |                         | Maximum $I_o$       |
| dB  | dB                | dB  | dBm / $SCS_{CSI-RS}$ <sup>Note 3</sup>  |                         | dBm/ $BW_{Channel}$ |
|   |                   |   | $SCS_{CSI-RS} = 60kHz$  | $SCS_{CSI-RS} = 120kHz$ |                     |
| $\pm[4.5]$  | $\pm[5.5]$        | $\geq -3$   | Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival |                         | N/A                 |
| NOTE 1: $I_o$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter CSI-RS CMR $\hat{E}s/lot$ is the minimum CSI-RS CMR $\hat{E}s/lot$ of the pair of CSI-RS resources to which the requirement applies.<br>NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>NOTE 4: In the test cases, the CSI-RS CMR $\hat{E}s/lot$ and related parameters may need to be adjusted to ensure $\hat{E}s/lot$ at UE baseband is above the value defined in this table. |                   |   |   |                         |                     |

### 10.1.28.2 L1-SINR accuracy requirements with SSB based CMR and dedicated IMR configured

#### 10.1.28.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-SINR in this clause apply to all SSBs configured as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 10.1.28.2.1-1 for SSB based CMR and NZP-IMR and in Table 10.1.28.2.1-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.2.1-1 and 10.1.28.2.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.
- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.2.1-1 and 10.1.28.2.1-2.

**Table 10.1.28.2.1-1: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2**

| Accuracy         |                   | Conditions                               |  |  |                            |                           |
|------------------|-------------------|--|--|--|----------------------------|---------------------------|
| Normal condition | Extreme condition | SSB CMR $\hat{E}_s/\text{lot}$<br>Note 3 | NZP-IMR $\hat{E}_s/\text{lot}$<br>Note 3 | $I_o$ Note 1 range   |                            |                           |
|                  |                   |  |  | Minimum $I_o$  |                            | Maximum $I_o$             |
| dB               | dB                | dB                                       | dB                                       | dBm / $SCS_{SSB}$ Note 2   |                            | dBm/BW <sub>Channel</sub> |
|                  |                   |  |  | $SCS_{SSB}$<br>=<br>120kHz   | $SCS_{SSB}$<br>=<br>240kHz |                           |
| $\pm 4.0$        | $\pm 5.0$         | $\geq 0$                                 | $\geq 0$                                 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival |                            | -50                       |

NOTE 1:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
 NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
 NOTE 3: In the test cases, the SSB  $\hat{E}_s/\text{lot}$ , NZP-IMR  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.

**Table 10.1.28.2.1-2: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2**

| Accuracy         |                   | Conditions                               |                    |
|------------------|-------------------|--|--------------------|
| Normal condition | Extreme condition | SSB CMR $\hat{E}_s/\text{lot}$<br>Note 3 | $I_o$ Note 1 range |
|                  |                   |  | Minimum $I_o$      |

| dB   | dB   | dB  | dBm / SCS <sub>SSB</sub> <sup>Note 2</sup>   |                             | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|--|------|-----|--|-----------------------------|---------------------------|---------------------------|
|  |      |     | SCS <sub>SSB</sub> = 120kHz  | SCS <sub>SSB</sub> = 240kHz |                           |                           |
| ±4.5   | ±5.5 | ≥-3 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival |                             | N/A                       | -50                       |
| <p>NOTE 1: <math>I_0</math> specified at the Reference point, and assumed to have constant EPRE across the bandwidth.</p> <p>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.</p> <p>NOTE 3: In the test cases, the SSB CMR <math>\hat{E}_s/\text{lot}</math> and related parameters may need to be adjusted to ensure <math>\hat{E}_s/\text{lot}</math> at UE baseband is above the value defined in this table.</p> |      |     |  |                             |                           |                           |

### 10.1.28.2.2 Relative Accuracy

The relative accuracy of SSB based L1-SINR is defined as the L1-SINR measured from one SSB configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all SSB based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 10.1.28.2.2-1 for SSB based CMR and NZP-IMR and in Table 10.1.28.2.2-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.2.2-1 and 10.1.28.2.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.
- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.2.2-1 and 10.1.28.2.2-2.

**Table 10.1.28.2.2-1: L1-SINR relative accuracy for SSB based CMR and NZP-IMR in FR2**

| Accuracy         |                   | Conditions   |  |  |                             |                           |
|------------------|-------------------|--|--|--|-----------------------------|---------------------------|
| Normal condition | Extreme condition | SSB CMR $\hat{E}_s/\text{lot}$ <sup>Note 2, Note 4</sup> | NZP-IMR $\hat{E}_s/\text{lot}$ <sup>Note 4</sup> | $I_0$ <sup>Note 1</sup> range              |                             |                           |
|                  |                   |  |  | Minimum $I_0$                              |                             | Maximum $I_0$             |
| dB               | dB                | dB   | dB   | dBm / SCS <sub>SSB</sub> <sup>Note 3</sup> |                             | dBm/BW <sub>Channel</sub> |
|                  |                   |  |  | SCS <sub>SSB</sub> = 120kHz                | SCS <sub>SSB</sub> = 240kHz |                           |
|                  |                   |  |  |  |                             |                           |

|   |            |          |          |  |     |     |
|---|------------|----------|----------|--|-----|-----|
| $\pm[3.0]$  | $\pm[4.0]$ | $\geq 0$ | $\geq 0$ | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| NOTE 1: $I_0$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.   |            |          |          |  |     |     |
| NOTE 2: The parameter SSB CMR $\hat{E}_s/\text{lot}$ is the minimum SSB CMR $\hat{E}_s/\text{lot}$ of the pair of SSBs to which the requirement applies.  |            |          |          |  |     |     |
| NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.   |            |          |          |  |     |     |
| NOTE 4: In the test cases, the SSB CMR $\hat{E}_s/\text{lot}$ , NZP-IMR $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |            |          |          |  |     |     |

Table 10.1.28.2.2-2: L1-SINR relative accuracy for SSB based CMR and ZP-IMR in FR2

| Accuracy   |                   | Conditions   |  |                             |                            |
|--|-------------------|--|--|-----------------------------|----------------------------|
| Normal condition   | Extreme condition | SSB CMR $\hat{E}_s/\text{lot}$ <sup>Note 2, Note 4</sup> | $I_0$ <sup>Note 1</sup> range  |                             |                            |
|  |                   |  | Minimum $I_0$  |                             | Maximum $I_0$              |
| dB   | dB                | dB   | dBm / $SCS_{SSB}$ <sup>Note 3</sup>  |                             | dBm/ $BW_{\text{Channel}}$ |
|  |                   |  | $SCS_{SSB} = 120\text{kHz}$  | $SCS_{SSB} = 240\text{kHz}$ |                            |
| $\pm[3.5]$   | $\pm[4.5]$        | $\geq -3$  | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival |                             | N/A                        |
| NOTE 1: $I_0$ specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  |                   |  |  |                             |                            |
| NOTE 2: The parameter SSB CMR $\hat{E}_s/\text{lot}$ is the minimum SSB CMR $\hat{E}_s/\text{lot}$ of the pair of SSBs to which the requirement applies.   |                   |  |  |                             |                            |
| NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.                |                   |  |  |                             |                            |
| NOTE 4: In the test cases, the SSB CMR $\hat{E}_s/\text{lot}$ and related parameters may need to be adjusted to ensure $\hat{E}_s/\text{lot}$ at UE baseband is above the value defined in this table. |                   |  |  |                             |                            |

### 10.1.28.3 L1-SINR accuracy requirements with CSI-RS based CMR and dedicated IMR configured

#### 10.1.28.3.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 10.1.28.3.1-1 for CSI-RS based CMR and NZP-IMR and in Table 10.1.28.3.1-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.3.1-1 and 10.1.28.3.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.
- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.3.1-1 and 10.1.28.3.1-2.

**Table 10.1.28.3.1-1: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2**

| Accuracy         |                   | Conditions                               |                                       |   |                                       |                           |                           |
|------------------|-------------------|--|---------------------------------------|---|---------------------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$ Note 3 | NZP-IMR $\hat{E}_s/\text{lot}$ Note 3 | $I_o$ Note 1 range  |                                       |                           |                           |
|                  |                   |  |                                       | Minimum $I_o$   |                                       | Maximum $I_o$             |                           |
| dB               | dB                | dB                                       | dB                                    | dBm / $SCS_{\text{CSI-RS}}$ Note 2  |                                       | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |  |                                       | $SCS_{\text{CSI-RS}} = 60\text{kHz}$  | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |                           |                           |
| $\pm 4.0$        | $\pm 5.0$         | $\geq 0$                                 | $\geq 0$                              | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival |                                       | N/A                       | -50                       |

NOTE 1:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
 NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
 NOTE 3: In the test cases, the CSI-RS  $\hat{E}_s/\text{lot}$ , NZP-IMR  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.

**Table 10.1.28.3.1-2: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2**

| Accuracy         |                   | Conditions                               |   |                                       |                           |                           |
|------------------|-------------------|--|---|---------------------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$ Note 3 | $I_o$ Note 1 range  |                                       |                           |                           |
|                  |                   |  | Minimum $I_o$   |                                       | Maximum $I_o$             |                           |
| dB               | dB                | dB                                       | dBm / $SCS_{\text{CSI-RS}}$ Note 2  |                                       | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |  | $SCS_{\text{CSI-RS}} = 60\text{kHz}$  | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |                           |                           |
| $\pm 4.5$        | $\pm 5.5$         | $\geq -3$                                | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival |                                       | N/A                       | -50                       |

NOTE 1:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
 NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
 NOTE 3: In the test cases, the CSI-RS  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.

**10.1.28.3.2 Relative Accuracy**

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all CSI-RS based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 10.1.28.3.2-1 for CSI-RS based CMR and NZP-IMR and in Table 10.1.28.3.2-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.3.2-1 and 10.1.28.3.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.
- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.3.2-1 and 10.1.28.3.2-2.

**Table 10.1.28.3.2-1: L1-SINR relative accuracy for CSI-RS based CMR and NZP-IMR in FR2**

| Accuracy         |                   | Conditions  |  |   |                                       |                           |
|------------------|-------------------|---|--|---|---------------------------------------|---------------------------|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$<br>Note 2, Note 4 | NZP-IMR $\hat{E}_s/\text{lot}$<br>Note 4 | $I_o$ <sup>Note 1</sup> range   |                                       |                           |
|                  |                   |   |  | Minimum $I_o$   |                                       | Maximum $I_o$             |
| dB               | dB                | dB  | dB                                       | dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 3</sup>   |                                       | dBm/BW <sub>Channel</sub> |
|                  |                   |   |  | $SCS_{\text{CSI-RS}} = 60\text{kHz}$  | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |                           |
| $\pm[3.0]$       | $\pm[4.0]$        | $\geq 0$  | $\geq 0$                                 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival |                                       | -50                       |

NOTE 1:  $I_o$  specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The parameter CSI-RS CMR  $\hat{E}_s/\text{lot}$  is the minimum CSI-RS CMR  $\hat{E}_s/\text{lot}$  of the pair of CSI-RS resources to which the requirement applies.  
 NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  
 NOTE 4: In the test cases, the CSI-RS CMR  $\hat{E}_s/\text{lot}$ , NZP-IMR  $\hat{E}_s/\text{lot}$  and related parameters may need to be adjusted to ensure  $\hat{E}_s/\text{lot}$  at UE baseband is above the value defined in this table.

**Table 10.1.28.3.2-2: L1-SINR relative accuracy for CSI-RS based CMR and ZP-IMR in FR2**

| Accuracy         |                   | Conditions  |   |                                       |                           |  |
|------------------|-------------------|---|---|---------------------------------------|---------------------------|--|
| Normal condition | Extreme condition | CSI-RS CMR $\hat{E}_s/\text{lot}$<br>Note 2, Note 4 | $I_o$ <sup>Note 1</sup> range                 |                                       |                           |  |
|                  |                   |   | Minimum $I_o$                                 |                                       | Maximum $I_o$             |  |
| dB               | dB                | dB  | dBm / $SCS_{\text{CSI-RS}}$ <sup>Note 3</sup> |                                       | dBm/BW <sub>Channel</sub> |  |
|                  |                   |   | $SCS_{\text{CSI-RS}} = 60\text{kHz}$          | $SCS_{\text{CSI-RS}} = 120\text{kHz}$ |                           |  |



|   |        |     |   |     |     |
|---|--------|-----|---|-----|-----|
| ±[3.5]  | ±[4.5] | ≥-3 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| <p>NOTE 1: <math>I_0</math> specified at the Reference point, and assumed to have constant EPRE across the bandwidth.</p> <p>NOTE 2: The parameter CSI-RS CMR <math>\hat{E}_s/I_{0T}</math> is the minimum CSI-RS CMR <math>\hat{E}_s/I_{0T}</math> of the pair of CSI-RS resources to which the requirement applies.</p> <p>NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.</p> <p>NOTE 4: In the test cases, the CSI-RS CMR <math>\hat{E}_s/I_{0T}</math> and related parameters may need to be adjusted to ensure <math>\hat{E}_s/I_{0T}</math> at UE baseband is above the value defined in this table.</p> |        |     |   |     |     |

### 10.1.29 Intra-frequency RSRQ accuracy requirements under CCA

#### 10.1.29.1 Intra-frequency SS-RSRQ accuracy requirements in FR1

##### 10.1.29.1.1 Absolute SS-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell under CCA.

The accuracy requirements in Table 10.1.29.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant SSB.

**Table 10.1.29.1.1-1: SS-RSRQ intra-frequency absolute accuracy under CCA**

| Accuracy         |                   | Conditions             |  |                             |                             |                           |                           |
|------------------|-------------------|------------------------|--|-----------------------------|-----------------------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/I_{0T}$ | $I_0$ <sup>Note 1</sup> range              |                             |                             |                           |                           |
|                  |                   |                        | NR operating band groups <sup>Note 3</sup> | Minimum $I_0$               |                             | Maximum $I_0$             |                           |
| dB               | dB                | dB                     |  | dBm / SCS <sub>SSB</sub>    |                             | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                        |  | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |                           |                           |
| ±2.5             | ±4                | ≥-3                    | NR_CCA_FR1_I                               | -117                        | -114                        | N/A                       | -50                       |
|                  |                   |                        | NR_CCA_FR1_J                               | -116.5                      | -113.5                      |                           |                           |
| ±3.5             | ±4                | ≥-6                    | Note 2                                     | Note 2                      | Note 2                      | Note 2                    | Note 2                    |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: The same bands and the same  $I_0$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
 NOTE 3: NR operating band groups are as defined in clause 3.5.2.

### 10.1.30 Inter-frequency RSRQ accuracy requirements under CCA

#### 10.1.30.1 Inter-frequency SS-RSRQ accuracy requirements in FR1

##### 10.1.30.1.1 Absolute Accuracy of SS-RSRQ

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency under CCA that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.30.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant SSB.

**Table 10.1.30.1.1-1: SS-RSRQ inter-frequency absolute accuracy under CCA**

| Accuracy         |                   | Conditions                 |  |                              |        |               |                            |
|------------------|-------------------|----------------------------|--|------------------------------|--------|---------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ <sup>Note 1</sup> range              |                              |        |               |                            |
|                  |                   |                            | NR operating band groups <sup>Note 3</sup> | Minimum $I_o$                |        | Maximum $I_o$ |                            |
| dB               | dB                | dB                         |  | dBm / $SCS_{SSB}$            |        |               | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                            | $SCS_{SSB} = 15 \text{ kHz}$               | $SCS_{SSB} = 30 \text{ kHz}$ |        |               |                            |
| $\pm 2.5$        | $\pm 4$           | $\geq 3$                   | NR_CCA_FR1_I                               | -117                         | -114   | N/A           | -50                        |
|                  |                   |                            | NR_CCA_FR1_J                               | -116.5                       | -113.5 |               |                            |
| $\pm 3.5$        | $\pm 4$           | $\geq 6$                   | Note 2                                     | Note 2                       | Note 2 | Note 2        | Note 2                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: NR operating band groups are as defined in clause 3.5.2.

### 10.1.30.1.2 Relative Accuracy of SS-RSRQ

The relative accuracy of SS-RSRQ in inter-frequency case is defined as the RSRQ measured from one cell on a frequency compared to the RSRP measured from another cell on a different frequency, with at least one of the two frequencies being under CCA.

The accuracy requirements in Table 10.1.30.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant SSB.
- $|SSB\_RP1_{\text{dBm}} - SSB\_RP2_{\text{dBm}}| \leq 27 \text{ dB}$
- $|\text{Channel 1}_{I_o} - \text{Channel 2}_{I_o}| \leq 20 \text{ dB}$

**Table 10.1.30.1.2-1: SS-RSRQ inter-frequency relative accuracy under CCA**

| Accuracy         |                   | Conditions                                   |  |                              |        |               |                            |
|------------------|-------------------|--|--|------------------------------|--------|---------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ <sup>Note 2</sup> | $I_o$ <sup>Note 1</sup> range              |                              |        |               |                            |
|                  |                   |  | NR operating band groups <sup>Note 4</sup> | Minimum $I_o$                |        | Maximum $I_o$ |                            |
| dB               | dB                | dB   |  | dBm / $SCS_{SSB}$            |        |               | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |  | $SCS_{SSB} = 15 \text{ kHz}$               | $SCS_{SSB} = 30 \text{ kHz}$ |        |               |                            |
| $\pm 3$          | $\pm 4$           | $\geq 3$                                     | NR_CCA_FR1_I                               | -117                         | -114   | N/A           | -50                        |
|                  |                   |  | NR_CCA_FR1_J                               | -116.5                       | -113.5 |               |                            |
| $\pm 4$          | $\pm 4$           | $\geq 6$                                     | Note 3                                     | Note 3                       | Note 3 | Note 3        | Note 3                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: NR operating band groups are as defined in clause 3.5.2.

## 10.1.31 Intra-frequency SINR accuracy requirements under CCA

### 10.1.31.1 Intra-frequency SS-SINR accuracy requirements in FR1

#### 10.1.31.1.1 Absolute SS-SINR Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell under CCA.

The accuracy requirements in Table 10.1.31.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band.

**Table 10.1.31.1.1-1: SS-SINR intra-frequency absolute accuracy under CCA**

| Accuracy         |                   | Conditions                           |                                    |                              |        |                            |                            |
|------------------|-------------------|--------------------------------------|------------------------------------|------------------------------|--------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 3 | $I_o$ Note 1 range                 |                              |        |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 4 | Minimum $I_o$                |        | Maximum $I_o$              |                            |
| dB               | dB                | dB                                   |                                    | dBm / $SCS_{SSB}$            |        | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      | $SCS_{SSB} = 15 \text{ kHz}$       | $SCS_{SSB} = 30 \text{ kHz}$ |        |                            |                            |
| $\pm 3.0$        | $\pm 4$           | $\geq 3$                             | NR_CCA_FR1_I                       | -117                         | -114   | N/A                        | -50                        |
|                  |                   |                                      | NR_CCA_FR1_J                       | -116.5                       | -113.5 |                            |                            |
| $\pm 3.5$        | $\pm 4$           | $\geq 6$                             | Note 2                             | Note 2                       | Note 2 | Note 2                     | Note 2                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 25 \text{ dB}$ .  
NOTE 4: NR operating band groups are as defined in clause 3.5.2.

## 10.1.32 Inter-frequency SINR accuracy requirements under CCA

### 10.1.32.1 Inter-frequency SS-SINR accuracy requirements in FR1

#### 10.1.32.1.1 Absolute Accuracy of SS-SINR

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency under CCA that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.32.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band.

Table 10.1.32.1.1-1: SS-SINR inter-frequency absolute accuracy under CCA

| Accuracy         |                   | Conditions                           |                                    |                              |                              |                            |                            |
|------------------|-------------------|--------------------------------------|------------------------------------|------------------------------|------------------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 3 | $I_o$ Note 1 range                 |                              |                              |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 4 | Minimum $I_o$                |                              | Maximum $I_o$              |                            |
| dB               | dB                | dB                                   |                                    | dBm / $SCS_{SSB}$            |                              | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      |                                    | $SCS_{SSB} = 15 \text{ kHz}$ | $SCS_{SSB} = 30 \text{ kHz}$ |                            |                            |
| $\pm 3.0$        | $\pm 4$           | $\geq 3$                             | NR_CCA_FR1_I                       | -117                         | -114                         | N/A                        | -50                        |
|                  |                   |                                      | NR_CCA_FR1_J                       | 116.5                        | -113.5                       |                            |                            |
| $\pm 3.5$        | $\pm 4$           | $\geq 6$                             | Note 2                             | Note 2                       | Note 2                       | Note 2                     | Note 2                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 3: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 25 \text{ dB}$ .  
NOTE 4: NR operating band groups are as defined in clause 3.5.2.

## 10.1.32.1.2 Relative Accuracy of SS-SINR

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency compared to the SS-SINR measured from another cell on a different frequency, with at least one of the two frequencies being under CCA.

The accuracy requirements in Table 10.1.32.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band.
- $|\text{SSB\_RP1}_{\text{dBm}} - \text{SSB\_RP2}_{\text{dBm}}| \leq 27 \text{ dB}$
- $|\text{Channel 1\_}I_o - \text{Channel 2\_}I_o| \leq 20 \text{ dB}$

Table 10.1.32.1.2-1: SS-SINR inter-frequency relative accuracy under CCA

| Accuracy         |                   | Conditions                             |                                    |                               |                               |                            |                            |
|------------------|-------------------|--|------------------------------------|-------------------------------|-------------------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2,4 | $I_o$ Note 1 range                 |                               |                               |                            |                            |
|                  |                   |  | NR operating band groups<br>Note 5 | Minimum $I_o$                 |                               | Maximum $I_o$              |                            |
| dB               | dB                | dB                                     |                                    | dBm / $SCS_{SSB}$             |                               | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |  |                                    | $SCS_{SSB} = 120 \text{ kHz}$ | $SCS_{SSB} = 240 \text{ kHz}$ |                            |                            |
| $\pm 3.5$        | $\pm 4$           | $\geq 3$                               | NR_CCA_FR1_I                       | -117                          | -114                          | N/A                        | -50                        |
|                  |                   |  | NR_CCA_FR1_J                       | -116.5                        | -113.5                        |                            |                            |
| $\pm 4$          | $\pm 4$           | $\geq 6$                               | Note 3                             | Note 3                        | Note 3                        | Note 3                     | Note 3                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: The requirements apply for SSB  $\hat{E}_s/\text{lot} \leq 25 \text{ dB}$ .  
NOTE 5: NR operating band groups are as defined in clause 3.5.2.

## 10.1.33 L1-RSRP accuracy requirements under CCA

### 10.1.33.1 SSB based L1-RSRP accuracy requirements in FR1

#### 10.1.33.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement under CCA.

The accuracy requirements in Table 10.1.33.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.10.1 for a corresponding Band for each relevant SSB.

**Table 10.1.33.1.1-1: SSB based L1-RSRP absolute accuracy under CCA**

| Accuracy         |                   | Conditions                |  |                      |                      |                     |                     |
|------------------|-------------------|---------------------------|--|----------------------|----------------------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{\epsilon}$ /lot | $I_o$ <sup>Note 1</sup> range              |                      |                      |                     |                     |
|                  |                   |                           | NR operating band groups <sup>Note 2</sup> | Minimum $I_o$        |                      | Maximum $I_o$       |                     |
| dB               | dB                | dB                        |  | dBm / $SCS_{SSB}$    |                      | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                           |  | $SCS_{SSB} = 15$ kHz | $SCS_{SSB} = 30$ kHz |                     |                     |
| $\pm 5.0$        | $\pm 9.5$         | $\geq -3$                 | NR_CCA_FR1_I                               | -117                 | -114                 | N/A                 | -70                 |
|                  |                   |                           | NR_CCA_FR1_J                               | -116.5               | -113.5               |                     |                     |
| $\pm 8.5$        | $\pm 11.5$        | $\geq -3$                 | NR_CCA_FR1_I                               | N/A                  | N/A                  | -70                 | -50                 |
|                  |                   |                           | NR_CCA_FR1_J                               |                      |                      |                     |                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR operating band groups are as defined in clause 3.5.2.

#### 10.1.33.1.2 Relative Accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell under CCA.

The accuracy requirements in Table 10.1.33.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.10.1 for a corresponding Band for each relevant SSB.

Table 10.1.33.1.2-1: SSB based L1-RSRP relative accuracy under CCA

| Accuracy         |                   | Conditions                           |                                    |                              |        |                            |                            |
|------------------|-------------------|--------------------------------------|------------------------------------|------------------------------|--------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                 |                              |        |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 3 | Minimum $I_o$                |        | Maximum $I_o$              |                            |
| dB               | dB                | dB                                   |                                    | dBm / $SCS_{SSB}$            |        | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      | $SCS_{SSB} = 15 \text{ kHz}$       | $SCS_{SSB} = 30 \text{ kHz}$ |        |                            |                            |
| $\pm 3$          | $\pm 4$           | $\geq -3$                            | NR_CCA_FR1_I                       | -117                         | -114   | N/A                        | -50                        |
|                  |                   |                                      | NR_CCA_FR1_J                       | -116.5                       | -113.5 |                            |                            |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of SSBs to which the requirement applies.  
NOTE 3: NR operating band groups are as defined in clause 3.5.2.

## 10.1.34 RSSI measurements under CCA

### 10.1.34.1 Intra-frequency absolute RSSI measurement accuracy requirements in FR1

The accuracy requirements for intra-frequency RSSI measurements on a carrier frequency under CCA are specified in Table 10.1.34.1-1. The requirements apply for any configured RSSI *measDuration* [2], provided that:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same reporting interval.

The intra-frequency RSSI measurement bandwidth is the channel bandwidth defined in Clause 4 of TS 37.213 [33], where the channel has the center frequency configured by *ARFCN-valueNR*.

Table 10.1.34.1-1: Intra-frequency RSSI accuracy under CCA

| Accuracy         |                   | Conditions                         |               |                              |               |                            |
|------------------|-------------------|------------------------------------|---------------|------------------------------|---------------|----------------------------|
| Normal condition | Extreme condition | $I_o$ Note 1 range                 |               |                              |               |                            |
|                  |                   | NR operating band groups<br>Note 2 | Minimum $I_o$ |                              | Maximum $I_o$ |                            |
| dB               | dB                |                                    |               | dBm / $SCS_{SSB}$            |               | dBm/ $BW_{\text{Channel}}$ |
|                  |                   | $SCS_{SSB} = 15 \text{ kHz}$       |               | $SCS_{SSB} = 30 \text{ kHz}$ |               |                            |
| [ $\pm 3.5$ ]    | [ $\pm 6.5$ ]     | NR_CCA_FR1_I                       | -117          | -114                         | N/A           | -70                        |
|                  |                   | NR_CCA_FR1_J                       | -116.5        | -113.5                       |               |                            |
| [ $\pm 5.5$ ]    | [ $\pm 8.5$ ]     | NR_CCA_FR1_I                       | N/A           | N/A                          | -70           | -50                        |
|                  |                   | NR_CCA_FR1_J                       |               |                              |               |                            |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR operating band groups are as defined in clause 3.5.2.

### 10.1.34.2 Inter-frequency absolute RSSI measurement accuracy requirements in FR1

The accuracy requirements for inter-frequency RSSI measurements on a carrier frequency under CCA are the same as specified in clause 10.1.34.1.

The inter-frequency RSSI measurement bandwidth is the channel bandwidth defined in Clause 4 of TS 37.213 [33], where the channel has the center frequency configured by *ARFCN-valueNR*.

### 10.1.34.3 RSSI measurement report mapping

The reporting range of RSSI measurement is defined from -100 dBm to -25 dBm with 1 dBm resolution.

The mapping of the measured quantity is defined in Table 10.1.34.3-1. The range in the signalling may be larger than the guaranteed accuracy range, provided that the following condition is met:

the RSSI measurement bandwidth is the channel bandwidth defined in Clause 4 of TS 37.213 [33], where the channel has the center frequency configured by *ARFCN-valueNR*.

**Table 10.1.34.3-1: RSSI measurement report mapping**

| Reported value | Measured quantity value | Unit |
|----------------|-------------------------|------|
| RSSI_00        | RSSI < -100             | dBm  |
| RSSI_01        | -100 ≤ RSSI < -99       | dBm  |
| RSSI_02        | -99 ≤ RSSI < -98        | dBm  |
| ...            | ...                     | ...  |
| RSSI_74        | -27 ≤ RSSI < -26        | dBm  |
| RSSI_75        | -26 ≤ RSSI < -25        | dBm  |
| RSSI_76        | -25 ≤ RSSI              | dBm  |

### 10.1.35 Channel occupancy measurements under CCA

#### 10.1.35.1 Intra-frequency channel occupancy measurement accuracy requirements in FR1

The UE shall be able to correctly evaluate the intra-frequency channel occupancy configured according to TS 38.331 [2], provided that the following conditions are met:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same reporting interval,
- RSSI at the UE receiver meets the following condition with respect to the configured *channelOccupancyThreshold* [2]:

RSSI at the UE receiver is below  $channelOccupancyThreshold - \Delta_{RSSI}$ , or

RSSI at the UE receiver is above  $channelOccupancyThreshold + \Delta_{RSSI}$ ,

where  $\Delta_{RSSI}$  is the applicable RSSI measurement accuracy value from the RSSI measurement accuracy requirements specified in clause 10.1.34.1.

The channel occupancy measurement bandwidth is the same as the RSSI measurement bandwidth in Clause 10.1.34.1.

#### 10.1.35.2 Inter-frequency channel occupancy measurement accuracy requirements in FR1

The UE shall be able to correctly evaluate the inter-frequency channel occupancy configured according to TS 38.331 [2], provided that the following conditions are met:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same reporting interval,
- RSSI at the UE receiver meets the following condition with respect to the configured *channelOccupancyThreshold* [2]:

RSSI at the UE receiver is below  $channelOccupancyThreshold - \Delta_{RSSI}$ , or

RSSI at the UE receiver is above  $channelOccupancyThreshold + \Delta_{RSSI}$ .

where  $\Delta_{RSSI}$  is the applicable RSSI measurement accuracy value from the RSSI measurement accuracy requirements specified in clause 10.1.34.2.

The channel occupancy measurement bandwidth is the same as the RSSI measurement bandwidth in Clause 10.1.34.2.

### 10.1.36 Intra-frequency RSRP accuracy requirements under CCA

#### 10.1.36.1 Intra-frequency SS-RSRP accuracy requirements in FR1

##### 10.1.36.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell under CCA.

The accuracy requirements in Table 10.1.36.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant SSB.

**Table 10.1.36.1.1-1: SS-RSRP intra-frequency absolute accuracy**

| Accuracy         |                   | Conditions                 |  |                      |                      |                     |                     |
|------------------|-------------------|----------------------------|--|----------------------|----------------------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $l_o$ <sup>Note 1</sup> range              |                      |                      |                     |                     |
|                  |                   |                            | NR operating band groups <sup>Note 2</sup> | Minimum $l_o$        |                      | Maximum $l_o$       |                     |
| dB               | dB                | dB                         |  | dBm / $SCS_{SSB}$    |                      | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                            |  | $SCS_{SSB} = 15$ kHz | $SCS_{SSB} = 30$ kHz |                     |                     |
| ±4.5             | ±9                | ≥-6                        | NR_CCA_FR1_I                               | -117                 | -114                 | N/A                 | -70                 |
|                  |                   |                            | NR_CCA_FR1_J                               | -116.5               | -113.5               |                     |                     |
| ±8               | ±11               | ≥-6                        | NR_CCA_FR1_I                               | N/A                  | N/A                  | -70                 | -50                 |
|                  |                   |                            | NR_CCA_FR1_J                               |                      |                      |                     |                     |

NOTE 1:  $l_o$  is assumed to have constant EPRE across the bandwidth.  
 NOTE 2: NR operating band groups are as defined in clause 3.5.2.

##### 10.1.36.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell under CCA.

The accuracy requirements in Table 10.1.36.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant SSB.



Table 10.1.36.1.2-1: SS-RSRP intra-frequency relative accuracy under CCA

| Accuracy         |                   | Conditions                           |                                    |                      |        |                     |                     |
|------------------|-------------------|--------------------------------------|------------------------------------|----------------------|--------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                 |                      |        |                     |                     |
|                  |                   |                                      | NR operating band groups<br>Note 4 | Minimum $I_o$        |        | Maximum $I_o$       |                     |
| dB               | dB                | dB                                   |                                    | dBm / $SCS_{SSB}$    |        | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                                      | $SCS_{SSB} = 15$ kHz               | $SCS_{SSB} = 30$ kHz |        |                     |                     |
| $\pm 2$          | $\pm 3$           | $\geq -3$                            | NR_CCA_FR1_I                       | -117                 | -114   | N/A                 | -50                 |
|                  |                   |                                      | NR_CCA_FR1_J                       | -116.5               | -113.5 |                     |                     |
| $\pm 3$          | $\pm 3$           | $\geq -6$                            | Note 3                             | Note 3               | Note 3 | N/A                 | Note 3              |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.  
NOTE 4: NR operating band groups are as defined in clause 3.5.2.

## 10.1.37 Inter-frequency RSRP accuracy requirements under CCA

### 10.1.37.1 Inter-frequency SS-RSRP accuracy requirements in FR1

#### 10.1.37.1.1 Absolute Accuracy of SS-RSRP

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency under CCA that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.37.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant SSB.

Table 10.1.37.1.1-1: SS-RSRP inter-frequency absolute accuracy under CCA

| Accuracy         |                   | Conditions                 |                                    |                      |        |                     |                     |
|------------------|-------------------|----------------------------|------------------------------------|----------------------|--------|---------------------|---------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$ | $I_o$ Note 1 range                 |                      |        |                     |                     |
|                  |                   |                            | NR operating band groups<br>Note 2 | Minimum $I_o$        |        | Maximum $I_o$       |                     |
| dB               | dB                | dB                         |                                    | dBm / $SCS_{SSB}$    |        | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                            | $SCS_{SSB} = 15$ kHz               | $SCS_{SSB} = 30$ kHz |        |                     |                     |
| $\pm 4.5$        | $\pm 9$           | $\geq -6$                  | NR_CCA_FR1_I                       | -117                 | -114   | N/A                 | -70                 |
|                  |                   |                            | NR_CCA_FR1_J                       | -116.5               | -113.5 |                     |                     |
| $\pm 8$          | $\pm 11$          | $\geq -6$                  | NR_CCA_FR1_I                       | N/A                  | N/A    | -70                 | -50                 |
|                  |                   |                            | NR_CCA_FR1_J                       |                      |        |                     |                     |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR operating band groups are as defined in clause 3.5.2.

### 10.1.37.1.2 Relative Accuracy of SS-RSRP

The relative accuracy of SS-RSRP in inter frequency case is defined as the RSRP measured from one cell on a frequency compared to the RSRP measured from another cell on a different frequency, with at least one of the two frequencies being under CCA.

The accuracy requirements in Table 10.1.37.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant SSB.
- $|\text{SSB\_RP1}_{\text{dBm}} - \text{SSB\_RP2}_{\text{dBm}}| \leq 27 \text{ dB}$
- $|\text{Channel 1\_Io} - \text{Channel 2\_Io}| \leq 20 \text{ dB}$

**Table 10.1.37.1.2-1: SS-RSRP inter-frequency relative accuracy under CCA**

| Accuracy         |                   | Conditions                           |                                    |                                     |                                     |                            |                            |
|------------------|-------------------|--------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|----------------------------|----------------------------|
| Normal condition | Extreme condition | SSB $\hat{E}_s/\text{lot}$<br>Note 2 | $I_o$ Note 1 range                 |                                     |                                     |                            |                            |
|                  |                   |                                      | NR operating band groups<br>Note 3 | Minimum $I_o$                       |                                     | Maximum $I_o$              |                            |
| dB               | dB                | dB                                   |                                    | dBm / $SCS_{\text{SSB}}$            |                                     | dBm/ $BW_{\text{Channel}}$ | dBm/ $BW_{\text{Channel}}$ |
|                  |                   |                                      |                                    | $SCS_{\text{SSB}} = 15 \text{ kHz}$ | $SCS_{\text{SSB}} = 30 \text{ kHz}$ |                            |                            |
| $\pm 4.5$        | $\pm 6$           | $\geq -6$                            | NR_CCA_FR1_I                       | -117                                | -114                                | N/A                        | -50                        |
|                  |                   |                                      | NR_CCA_FR1_J                       | -116.5                              | -113.5                              |                            |                            |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: The parameter SSB  $\hat{E}_s/\text{lot}$  is the minimum SSB  $\hat{E}_s/\text{lot}$  of the pair of cells to which the requirement applies.  
NOTE 3: NR operating band groups are as defined in clause 3.5.2.

## 10.2 E-UTRAN measurements

### 10.2.1 Introduction

Accuracy requirements for measurements on E-UTRAN carrier frequencies are specified in clause 10.2 and apply for UE in SA or NR-DC or NE-DC operation mode, unless otherwise specified.

Unless otherwise specified, the requirements in clause 10.2 are applicable for a UE:

- in RRC\_CONNECTED state
- performing measurements with appropriate measurement gaps according to clause 9.1.2.
- that is synchronised to the cell that is measured.

The reported measurement result after layer 1 filtering shall be an estimate of the average value of the measured quantity over the measurement period. The reference point for the measurement result after layer 1 filtering is referred to as point B in the measurement model described in TS 36.300 [24].

The accuracy requirements of E-UTRA measurements in this clause are valid for the reported measurement result after layer 1 filtering. The accuracy requirements are verified from the measurement report at point D in the measurement model having the layer 3 filtering disabled.

If the UE needs measurement gaps to perform the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD measurements, the relevant measurement procedure and measurement gap patterns stated in clause 9.1.2 shall apply.

## 10.2.2 E-UTRAN RSRP measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RSRP in RRC\_CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RSRP measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRP Accuracy Requirements in clause 9.1.3 of TS 36.133 [15].

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [15] shall apply.

## 10.2.3 E-UTRAN RSRQ measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RSRQ in RRC\_CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RSRQ measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [15].

The requirements for accuracy of E-UTRA RSRQ measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [15].

The reporting range and mapping specified for RSRQ measurements in clause 9.1.7 of TS 36.133 [15] shall apply.

## 10.2.4 E-UTRAN RSTD measurements

The requirements in this clause are valid for UE supporting this capability.

The measurement period is specified in clauses 9.4.4.1 and 9.4.4.2 for inter-RAT NR — E-UTRAN FDD and inter-RAT NR — E-UTRAN TDD RSTD measurements, respectively.

The accuracy requirements and the corresponding side conditions shall be the same as the inter-frequency measurement accuracy requirements for RSTD measurements in RRC\_CONNECTED in clause 9.1.10.2 of TS 36.133 [15].

If the UE needs measurement gaps to perform the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD RSTD measurements, the relevant measurement procedure and measurement gap patterns stated in clause 9.1.2 shall apply.

The reporting range and mapping for the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD RSTD measurements is the same as specified for RSTD measurements in TS 36.133 [15, clauses 9.1.10.3 and 9.1.10.4].

## 10.2.5 E-UTRAN RS-SINR measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RS-SINR in RRC\_CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RS-SINR measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RS-SINR Accuracy Requirements in clause 9.1.17.3 of TS 36.133 [15].

The reporting range and mapping for E-UTRA RS-SINR measurements shall be the same as specified for RS-SINR measurements in clause 9.1.17.1 of TS 36.133 [15].

## 10.2.6 E-UTRAN RSRP measurements for CA/DC Idle Mode Measurements

NOTE: This measurement is for CA/DC Idle Mode measurements between NR and E-UTRAN.

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of E-UTRA RSRP.

The measurement period of E-UTRA RSRP in RRC\_IDLE and RRC\_INACTIVE states are specified in clause 4.4.2.

The accuracy requirements of E-UTRA RSRP measurements in RRC\_IDLE and RRC\_INACTIVE states and the corresponding side conditions shall be as the inter-frequency RSRP Accuracy Requirements in clause 9.1.3B.2 of TS 36.133 [15].

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [15] shall apply.

## 10.2.7 E-UTRAN RSRQ measurements for CA/DC Idle Mode Measurements

NOTE: This measurement is for CA/DC Idle Mode measurements between NR and E-UTRAN.

The requirements in this clause are applicable for a UE:

- in state RRC\_IDLE or RRC\_INACTIVE
- that is synchronised to the cell that is measured.

The requirements are for absolute accuracy of E-UTRA RSRQ.

The measurement period of E-UTRA RSRQ in RRC\_IDLE and RRC\_INACTIVE states are specified in clause 4.4.2.

The accuracy requirements of E-UTRA RSRQ measurements in RRC\_IDLE and RRC\_INACTIVE states and the corresponding side conditions shall be as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6B.2 of TS 36.133 [15].

The reporting range and mapping specified for RSRQ measurements in clause 9.1.7 of TS 36.133 [15] shall apply.

## 10.3 UTRAN FDD Measurements

The requirements in this clause are applicable for a UE:

- in state RRC\_CONNECTED
- performing measurements according to clause 9.4.6 with appropriate measurement gaps
- that is synchronised to the cell that is measured.

The reported measurement result after layer 1 filtering shall be an estimate of the average value of the measured quantity over the measurement period. The reference point for the measurement result after layer 1 filtering is referred to as point B in the measurement model described in TS 25.302 [30].

The accuracy requirements in this clause are valid for the reported measurement result after layer 1 filtering. The accuracy requirements are verified from the measurement report at point D in the measurement model having the layer 3 filtering disabled.

### 10.3.1 UTRAN FDD CPICH RSCP

NOTE: This measurement is for handover between E-UTRAN and UTRAN FDD.

The requirements in this clause are valid for terminals supporting this capability.

The measurement period for RRC\_CONNECTED state is specified in clause 9.4.6.

In RRC\_CONNECTED state the accuracy requirements shall meet the absolute accuracy requirements in table 10.3.1-1, under the following conditions:

- CPICH Ec/Io condition for a detectable cell is as specified in clause 9.4.6;
- SCH\_Ec/Io condition for a detectable cell is as specified in clause 9.4.6.

**Table 10.3.1-1: UTRAN FDD CPICH\_RSCP absolute accuracy**

| Accuracy   |                   | Conditions                                   |              |              |
|--|-------------------|--|--------------|--------------|
| Normal condition   | Extreme condition | Io range                                     |              |              |
|  |                   | UTRA operating bands                         | Minimum Io   | Maximum Io   |
| dB   | dB                |  | dBm/3.84 MHz | dBm/3.84 MHz |
| ±6   | ±9                | Band I, IV, VI, X XI, XIX and XXI            | -94          | -70          |
|  |                   | Band IX                                      | -93          | -70          |
|  |                   | Band II, V and VII                           | -92          | -70          |
|  |                   | Band III, VIII, XII, XIII, XIV , XX and XXII | -91          | -70          |
|  |                   | Band XXV, XXVI <sup>Note 1</sup>             | -90.5        | -70          |
| ±8   | ±11               | Note 2                                       | -70          | -50          |
| NOTE 1: For Band XXVI, the condition has the minimum Io of -92 dBm/3.84 MHz when the carrier frequency of the assigned UTRA channel is within 869-894 MHz for the UE which supports both Band V and Band XXVI operating frequencies. |                   |  |              |              |
| NOTE 2: The same bands apply for this requirement as for the corresponding highest accuracy requirement.   |                   |  |              |              |

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the relevant UTRAN FDD measurement procedure and measurement gap pattern stated in clause 9.4.6 shall apply.

The reporting range and mapping specified for FDD CPICH RSCP in TS 25.133 [29] shall apply.

## 10.3.2 UTRAN FDD CPICH Ec/No

NOTE: This measurement is for handover between E-UTRAN and UTRAN FDD.

The requirements in this clause are valid for terminals supporting this capability.

The measurement period for RRC\_CONNECTED state is specified in clause 9.4.6.

In RRC\_CONNECTED state the accuracy requirements shall be the same as the inter-frequency measurement accuracy requirements for FDD CPICH Ec/No in TS 25.133 [29].

If the UE, in RRC\_CONNECTED state, needs measurement gaps to perform UTRAN FDD measurements, the UTRAN FDD measurement procedure and measurement gap pattern stated in clause 9.4.6 shall apply.

The reporting range and mapping specified for FDD CPICH Ec/No in TS 25.133 [29] shall apply.

## 10.4 V2X measurements

### 10.4.1 Introduction

The requirements in this section are applicable for a UE capable of V2X sidelink communication.

The accuracy requirements in this clause are:

- applicable for AWGN radio propagation conditions,
- assume independent interference (noise) at each receiver antenna port.

## 10.4.2 Intra-frequency PSBCH-RSRP accuracy requirements for FR1

### 10.4.2.1 PSBCH-RSRP Absolute Accuracy

The requirements for absolute accuracy of PSBCH-RSRP in this clause apply to a V2X synchronization source on the same frequency as that of the own V2X UE performing the measurement in FR1.

The accuracy requirements in Table 10.4.2.1-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 10.4.2.1-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1**

| Accuracy         |                   | Conditions                       |  |                           |                           |                           |                     |                     |
|------------------|-------------------|----------------------------------|--|---------------------------|---------------------------|---------------------------|---------------------|---------------------|
| Normal condition | Extreme condition | $\hat{E}_s/\text{lot}$<br>Note 3 | NR V2X operating band groups<br>Note 2 | $I_0$ Note 1 range        |                           |                           |                     |                     |
|                  |                   |                                  |  | Minimum $I_0$             |                           |                           | Maximum $I_0$       |                     |
| dB               | dB                | dB                               |  | dBm / $SCS_{SL}$          |                           |                           | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                                  |  | $SCS_{SL}$<br>= 15<br>kHz | $SCS_{SL}$<br>= 30<br>kHz | $SCS_{SL}$<br>= 60<br>kHz |                     |                     |
| ±4.5             | ±9                | ≥-6                              | NR_TDD_FR1_B                           | -120.5                    | -117.5                    | -114.5                    | N/A                 | -70                 |
|                  |                   |                                  | NR_TDD_FR1_J                           | -116.5                    | -113.5                    | -110.5                    | N/A                 | -70                 |
| ±8               | ±11               | ≥-6                              | NR_TDD_FR1_B,<br>NR_TDD_FR1_J          | N/A                       | N/A                       | N/A                       | -70                 | -50                 |

NOTE 1:  $I_0$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR V2X operating band groups in FR1 are as defined in clause 3.5.2.  
NOTE 3:  $\hat{E}_s/\text{lot}$  for a SyncRef UE is the  $\hat{E}_s/\text{lot}$  of PSBCH-DMRS.

### 10.4.2.2 PSBCH-RSRP Relative Accuracy

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one V2X synchronization source compared to the PSBCH-RSRP measured from another V2X synchronization source on the same frequency in FR1.

The accuracy requirements in Table 10.4.2.2-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

Table 10.4.2-1: Intra-frequency PSBCH-RSRP relative accuracy in FR1

| Accuracy         |                   | Conditions                       |  |                        |                        |                        |                     |                     |
|------------------|-------------------|----------------------------------|--|------------------------|------------------------|------------------------|---------------------|---------------------|
| Normal condition | Extreme condition | $\hat{E}_s/\text{lot}$<br>Note 3 | NR V2X operating band groups<br>Note 2 | $I_o$ Note 1 range     |                        |                        |                     |                     |
|                  |                   |                                  |  | Minimum $I_o$          |                        |                        | Maximum $I_o$       |                     |
| dB               | dB                | dB                               |  | dBm / $SCS_{SL}$       |                        |                        | dBm/ $BW_{Channel}$ | dBm/ $BW_{Channel}$ |
|                  |                   |                                  |  | $SCS_{SL} = 15$<br>kHz | $SCS_{SL} = 30$<br>kHz | $SCS_{SL} = 60$<br>kHz |                     |                     |
| $\pm 2$          | $\pm 3$           | $\geq 3$                         | NR_TDD_FR1_B                           | -120.5                 | -117.5                 | -114.5                 | N/A                 | -50                 |
|                  |                   |                                  | NR_TDD_FR1_J                           | -116.5                 | -113.5                 | -110.5                 | N/A                 | -50                 |
| $\pm 3$          | $\pm 3$           | $\geq 6$                         | Note 4                                 | Note 4                 | Note 4                 | Note 4                 | N/A                 | Note 4              |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR V2X operating band groups in FR1 are as defined in clause 3.5.2.  
NOTE 3:  $\hat{E}_s/\text{lot}$  for a SyncRef UE is the  $\hat{E}_s/\text{lot}$  of PSBCH-DMRS.  
NOTE 4: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

### 10.4.3 Intra-Frequency SL-RSSI Measurement Accuracy Requirements for FR1

#### 10.4.3.1 Absolute SL-RSSI Accuracy

The intra-frequency SL-RSSI requirements are specified in Table 10.4.3.1-1. The requirements apply for measurement period of 1 slot and for any configured measurement bandwidth larger than 10 RBs, provided that:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same measurement interval.

Table 10.4.3.1-1: Intra-frequency SL-RSSI absolute accuracy

| Accuracy         |                   | Conditions                             |                        |                        |                        |                     |
|------------------|-------------------|--|------------------------|------------------------|------------------------|---------------------|
| Normal condition | Extreme condition | NR V2X operating band groups<br>Note 2 | $I_o$ Note 1 range     |                        |                        | Maximum $I_o$       |
|                  |                   |  | Minimum $I_o$          |                        |                        |                     |
| dB               | dB                |  | dBm/ $SCS_{SL}$        |                        |                        | dBm/ $BW_{Channel}$ |
|                  |                   |  | $SCS_{SL} = 15$<br>kHz | $SCS_{SL} = 30$<br>kHz | $SCS_{SL} = 60$<br>kHz |                     |
| $\pm 2.5$        | $\pm 5.5$         | NR_TDD_FR1_B                           | -120.5                 | -117.5                 | -114.5                 | -50                 |
|                  |                   | NR_TDD_FR1_J                           | -116.5                 | -113.5                 | -110.5                 | -50                 |
| $\pm 4.5$        | $\pm 7.5$         | Note 3                                 | Note 3                 | Note 3                 | Note 3                 | Note 3              |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.  
NOTE 3: The same bands and the same  $I_o$  conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

### 10.4.4 Intra-Frequency L1 SL-RSRP Measurement Accuracy Requirements for FR1

#### 10.4.4.1 Absolute L1 SL-RSRP Accuracy

The requirements for absolute accuracy of L1 SL-RSRP in this clause apply to a UE performing PSCCH-RSRP and/or PSSCH-RSRP measurements on the same frequency as used by operating V2X sidelink communication.

The accuracy requirements in Table 10.4.4.1-1 are valid under the following conditions:

- Demodulation reference signals for PSCCH and/or PSSCH are transmitted from one port.
- Conditions defined in clause 7.3E of TS38.101-1 [18] for reference sensitivity are fulfilled.
- PSCCH-RSRP[dBm] and/or PSSCH-RSRP[dBm] according to Annex B.4.4 for a corresponding Band are fulfilled.

**Table 10.4.4.1-1: Intra-frequency L1 SL-RSRP absolute accuracy for UE capable of V2X sidelink communication**

| Accuracy         |                   | Conditions                       |  |                    |                |                |                           |                           |
|------------------|-------------------|----------------------------------|--|--------------------|----------------|----------------|---------------------------|---------------------------|
| Normal condition | Extreme condition | $\hat{E}_s/\text{lot}$<br>Note 3 | NR V2X operating band groups<br>Note 2 | $I_o$ Note 1 range |                |                |                           |                           |
|                  |                   |                                  |  | Minimum $I_o$      |                |                | Maximum $I_o$             |                           |
| dB               | dB                | dB                               |  | dBm/SCS            |                |                | dBm/BW <sub>Channel</sub> | dBm/BW <sub>Channel</sub> |
|                  |                   |                                  |  | SCS =<br>15kHz     | SCS =<br>30kHz | SCS =<br>60kHz |                           |                           |
| ± 4.5            | ± 9               | ≥ 0 dB                           | NR_TDD_FR1_B                           | -120.5             | -117.5         | -114.5         | N/A                       | -70                       |
|                  |                   |                                  | NR_TDD_FR1_J                           | -116.5             | -113.5         | -110.5         | N/A                       | -70                       |
| ± 8              | ± 11              | ≥ 0 dB                           | NR_TDD_FR1_B<br>NR_TDD_FR1_J           | N/A                | N/A            | N/A            | -70                       | -50                       |

NOTE 1:  $I_o$  is assumed to have constant EPRE across the bandwidth.  
NOTE 2: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.  
NOTE 3: The parameter  $\hat{E}_s/\text{lot}$  is the  $\hat{E}_s/\text{lot}$  of PSCCH-DMRS and/or PSSCH-DMRS.

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## 11 Void

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## 12 V2X Requirements

### 12.1 Introduction

This clause contains the requirements for the UE capable of V2X sidelink communication when the UE is out of coverage on the carrier used for V2X sidelink operation, as defined in TS 38.304 [1]. The requirements apply when the UE is:

- in any cell selection state, or,
- configured for V2X SL operation on a V2X carrier which is dedicated to only V2X SL operation and configured with only a PCell on WAN carrier.

Note: Any cell selection state refers to a UE that is out of network coverage and is not associated with a serving cell on any carrier as defined in TS 38.304 [1].

Note: When a UE in RRC\_CONNECTED state is performing transmissions and/or reception for V2X sidelink communication, the UE shall meet all the requirements specified in Clause 9 assuming that UE has a dedicated RX/TX chain for V2X sidelink communication. Otherwise, the UE may interrupt the V2X sidelink communication in order to meet the measurement requirements specified in Clause 9.



## 12.2 UE Transmit Timing

### 12.2.1 Introduction

This clause contains requirements of transmission timing for V2X sidelink communication when:

- GNSS is used as the synchronization reference source;
- NR Cell is used as the synchronization reference source;
- E-UTRAN Cell is used as the synchronization reference source;
- SyncRef UE is used as the synchronization reference source.

### 12.2.2 GNSS as synchronization reference source

The requirements in this subclause are applicable when the reference timing used by the UE for V2X sidelink communication is derived from GNSS.

The sidelink transmissions takes place  $(N_{TA,SL} + N_{TA\ offset}) \times T_c$  before the subframe starting boundary as defined in TS 38.331 [2], where  $N_{TA\ offset} = 0$  and  $N_{TA,SL} = 0$ .

The transmission timing error for sidelink transmissions shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is defined in Table 12.2.2-1.

**Table 12.2.2-1:  $T_e$  Timing Error Limit**

| Frequency Range of sidelink                                      | $T_e$                   |
|--|-------------------------|
| FR1  | $12 \cdot 64 \cdot T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [6]. |                         |

### 12.2.3 NR Cell as synchronization reference source

The requirements in this subclause are applicable when the reference timing used for sidelink transmissions is a NR serving cell on a non-V2X sidelink carrier.

The sidelink transmissions takes place  $(N_{TA,SL} + N_{TA\ offset}) \times T_c$  before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell, where  $N_{TA\ offset} = 0$  and  $N_{TA,SL} = 0$ .

The transmission timing error for sidelink transmissions shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is defined in Table 12.2.3-1.

**Table 12.2.3-1:  $T_e$  Timing Error Limit**

| Frequency Range of sidelink                                      | SCS of SSB signals ( kHz) | SCS of sidelink signals (kHz) | $T_e$                   |
|--|---------------------------|-------------------------------|-------------------------|
| FR1  | 15                        | 15                            | $14 \cdot 64 \cdot T_c$ |
|  |                           | 30                            | $12 \cdot 64 \cdot T_c$ |
|  |                           | 60                            | $12 \cdot 64 \cdot T_c$ |
|  | 30                        | 15                            | $10 \cdot 64 \cdot T_c$ |
|  |                           | 30                            | $10 \cdot 64 \cdot T_c$ |
|  |                           | 60                            | $9 \cdot 64 \cdot T_c$  |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [6]. |                           |                               |                         |

## 12.2.4 E-UTRAN Cell as synchronization reference source

The requirements in this subclause are applicable when the reference timing used for sidelink transmissions is an E-UTRAN serving cell on a non-V2X sidelink carrier.

The sidelink transmissions takes place  $(N_{TA,SL} + N_{TA\ offset}) \times T_c$  before the reception of the first detected path (in time) of the corresponding E-UTRAN downlink frame from the reference cell, where  $N_{TA\ offset} = 0$  and  $N_{TA,SL} = 0$ .

The transmission timing error for sidelink transmissions shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is defined in Table 12.2.4-1.

**Table 12.2.4-1:  $T_e$  Timing Error Limit**

| Frequency Range of sidelink                                      | E-UTRAN downlink bandwidth (MHz) | $T_e$                   |
|--|----------------------------------|-------------------------|
| FR1  | $\geq 3$                         | $14 \cdot 64 \cdot T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [6]. |                                  |                         |

## 12.2.5 SyncRef UE as synchronization reference source

The requirements in this subclause are applicable when the reference timing used for deriving sidelink transmission is from SyncRef UE transmitting sidelink synchronization signals.

The sidelink transmissions takes place  $(N_{TA,SL} + N_{TA\ offset}) \times T_c$  before the reception of the first detected path (in time) of the corresponding timing reference frame from the SyncRef UE, where  $N_{TA\ offset} = 0$  and  $N_{TA,SL} = 0$ .

The transmission timing error for sidelink transmissions shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is defined in Table 12.2.5-1.

**Table 12.2.5-1:  $T_e$  Timing Error Limit**

| Frequency Range of sidelink                                      | SCS of sidelink signals (kHz) | $T_e$                   |
|--|-------------------------------|-------------------------|
| FR1  | 15                            | $12 \cdot 64 \cdot T_c$ |
|  | 30                            | $8 \cdot 64 \cdot T_c$  |
|  | 60                            | $5 \cdot 64 \cdot T_c$  |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [6]. |                               |                         |

## 12.3 Initiation/Cease of SLSS Transmissions

### 12.3.1 Introduction

The requirements in this subclause are applicable to the UE capable of V2X sidelink communication when:

- GNSS is used as the synchronization reference source;
- NR Cell is used as the synchronization reference source;
- EUTRAN Cell is used as the synchronization reference source;
- SyncRef UE is used as the synchronization reference source.

#### 12.3.1.1 Initiation/Cease of SLSS transmissions with NR cell as synchronization reference source

The requirements apply when the NR Cell is used as synchronization reference source and when the UE is

- out of coverage on the V2X NR sidelink carrier and in-coverage with a serving cell on a NR non-V2X sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331[2] are met; *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType12*. The UE shall be capable of measuring the RSRP of the cell used as synchronization reference source to evaluate to initiate/cease SLSS transmissions within  $T_{\text{evaluate,SLSS}}$

where,

- $T_{\text{evaluate,SLSS}}$  is as specified in Table 12.3.1.1-1 when UE performs SSB based measurements without measurement gaps.
- $T_{\text{evaluate,SLSS}}$  is as specified in Table 12.3.1.1-2 when UE performs SSB based measurements with measurement gaps.

**Table 12.3.1.1-1:  $T_{\text{evaluate,SLSS}}$  for measurements without measurement gaps when NR cell is used as synchronization reference source (FR1)**

| DRX cycle in NR cell  | $T_{\text{evaluate,SLSS}}$  |
|---|---|
| No DRX  | $\max(400\text{ms}, \text{ceil}(2 \times 5 \times K_p) \times \text{SMTC period})^{\text{Note 1}}$                    |
| $\text{DRX cycle} \leq 320\text{ms}$  | $\max(400\text{ms}, \text{ceil}(1.5 \times 2 \times 5 \times K_p) \times \max(\text{SMTC period}, \text{DRX cycle}))$ |
| $\text{DRX cycle} > 320\text{ms}$   | $\text{ceil}(7 \times K_p) \times \text{DRX cycle}$   |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |   |

**Table 12.3.1.1-2:  $T_{\text{evaluate,SLSS}}$  for measurements with measurement gaps when NR cell is used as synchronization reference source (FR1)**

| DRX cycle in NR cell                 | $T_{\text{evaluate,SLSS}}$  |
|--------------------------------------|---|
| No DRX                               | $\max(400\text{ms}, 2 \times 5 \times \max(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{\text{intra}}$   |
| $\text{DRX cycle} \leq 320\text{ms}$ | $\max(400\text{ms}, \text{ceil}(2 \times 1.5 \times 5) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{\text{intra}}$ |
| $\text{DRX cycle} > 320\text{ms}$    | $7 \times \max(\text{MGRP}, \text{DRX cycle}) \times \text{CSSF}_{\text{intra}}$  |

If higher layer filtering is configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the NR cell as synchronization reference source:

- SS-RSRP related side conditions given in clauses 10.1.2 for FR1, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.7 for FR1, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.12 for FR1, respectively, for a corresponding Band,
- SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$  according to Annex B.2.2 for a corresponding Band.

### 12.3.1.2 Initiation/Cease of SLSS transmissions with EUTRAN cell as synchronization reference source

The requirements apply when the EUTRAN Cell is used as synchronization reference source and when the UE is

- out of coverage on the V2X NR sidelink carrier and in-coverage with a serving cell on a LTE non-V2X sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 36.331[16] are met; *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType28*. The UE shall be capable of measuring the RSRP of the cell used as synchronization reference source to evaluate to initiate/cease SLSS transmissions within  $T_{\text{evaluate,SLSS}}$

where,

- $T_{\text{evaluate,SLSS}} = 0.4$  seconds when UE is not configured with DRX.
- $T_{\text{evaluate,SLSS}} =$  as specified in Table 12.3.1.2-1 when UE is configured with DRX.

**Table 12.3.1.2-1:  $T_{\text{evaluate,SLSS}}$  when EUTRAN cell is used as synchronization reference source**

| DRX cycle length in EUTRAN cell[s]  | $T_{\text{evaluate,SLSS}}$ [s] (number of DRX cycles)  |
|-------------------------------------|--|
| $\leq 0.04$                         | 0.4 (Note 1)   |
| $0.04 < \text{DRX-cycle} \leq 2.56$ | Note 2 (6)   |
| Note1:                              | Number of DRX cycles depends upon the DRX cycle in use |
| Note2:                              | Time depends upon the DRX cycles in use                |

If higher layer filtering is configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the cell as synchronization reference source:

- RSRP related side conditions given in TS 36.133[15] Clauses 9.1.2.1 and 9.1.2.2 and RSRQ related side conditions given in TS 36.133[15] Clause 9.1.5.1 for a corresponding Band are fulfilled,
- SCH<sub>RP</sub> and SCH<sub>ES</sub>/I<sub>ot</sub> according to TS 36.133[15] Annex B.2.1 for a corresponding Band are fulfilled.

### 12.3.1.3 Initiation/Cease of SLSS transmissions with GNSS as synchronization reference source

The requirements apply when GNSS is used as synchronization reference source and when the UE is

- out of coverage on the V2X sidelink carrier and in-coverage with a serving cell on a non-V2X sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331[2] are met; *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType12* in a NR cell.

When the conditions for SLSS transmissions specified in TS 36.331[16] are met; *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType28* in a EUTRAN cell.

The requirements in Clause 12.3.1.1 shall apply if the serving cell is a NR cell.

The requirements in Clause 12.3.1.2 shall apply if the serving cell is a EUTRAN cell.

### 12.3.1.4 Initiation/Cease of SLSS transmissions with SyncRef UE as synchronization reference source

The requirements apply when SyncRef UE is used as synchronization reference source and when the UE is

- in any cell selection state, or
- out of coverage on the V2X sidelink carrier and is associated with a serving cell on a non-V2X sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331[2] are met and when SyncRef UE is used as synchronization reference source and if *syncTxThreshOoC* is included in the preconfigured V2X parameters.

The UE shall be capable of measuring the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease SLSS transmissions within  $T_{\text{evaluate,SLSS}} = 4$  S-SSB periods.

If higher layer filtering for PSBCH-RSRP measurements is pre-configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the selected SyncRef UE as defined in TS 38.331 [2] used to derive transmission timing for V2X sidelink communication:

- PSBCH-RSRP related side conditions given in Clause 12.4 for a corresponding Band are fulfilled,
- V2X S-SSB<sub>RP</sub> and S-SSB  $\hat{E}_s/I_{ot}$  according to Annex B. 4 for a corresponding Band are fulfilled.

## 12.4 Selection / Reselection of V2X Synchronization Reference Source

The requirements defined in this clause do not apply to the UEs that do not support transmission and reception of SLSS.

A SyncRef UE is considered to be detectable when

- PSBCH-RSRP related side conditions given in Clause 10 are fulfilled for a corresponding Band,
- V2X SCH<sub>RP</sub> and SCH  $\hat{E}_s/I_{ot}$  according to Annex B for a corresponding Band are fulfilled.

When GNSS synchronization reference source is configured as the highest priority and

- UE is synchronized to GNSS directly,
  - UE shall not drop any V2X SLSS and data transmission for the purpose of selection/reselection to the SyncRef UE.
- UE is synchronized to a SyncRef UE that is synchronized to GNSS directly or in-directly,
  - UE shall not drop any V2X data transmission for the purpose of selection/reselection to the SyncRef UE. The UE shall be able to identify newly detectable intra-frequency SyncRef UE within  $T_{\text{detect,SyncRef UE\_V2X}}$  seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[2].  $T_{\text{detect,SyncRef UE\_V2X}}$  is defined as 1.6 seconds at SCH  $E_s/I_{ot} \geq 0$  dB, provided that the UE is allowed to drop a maximum of 30% of its SLSS transmissions during  $T_{\text{detect,SyncRef UE\_V2X}}$  for the purpose of selection / reselection to the SyncRef UE.
- in other case
  - The UE shall be able to identify newly detectable intra-frequency SyncRef UE within  $T_{\text{detect,SyncRef UE\_V2X}}$  seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[2].  $T_{\text{detect,SyncRef UE\_V2X}}$  is defined as 8 seconds at SCH  $E_s/I_{ot} \geq 0$  dB, provided that the UE is allowed to drop a maximum of 6 % of its V2X data and SLSS transmissions during  $T_{\text{detect,SyncRef UE\_V2X}}$  for the purpose of selection / reselection to the SyncRef UE.
  - UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its V2X data reception during  $T_{\text{detect,SyncRef UE\_V2X}}$  for the purpose of selection / reselection to the SyncRef UE.

When serving cell/PCell synchronization reference source is configured as the highest priority,

- UE shall be able to identify newly detectable intra-frequency SyncRef UE within  $T_{\text{detect,SyncRef UE\_V2X}}$  seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[2].  $T_{\text{detect,SyncRef UE\_V2X}}$  is defined as 8 seconds at SCH  $E_s/I_{ot} \geq 0$  dB, provided that the V2X UE is allowed to drop a maximum of 6 % of its V2X data and SLSS transmissions for the purpose of selection / reselection to the SyncRef UE.
- UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its V2X data reception during  $T_{\text{detect,SyncRef UE\_V2X}}$  for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing PSBCH-RSRP measurements for 3 identified intra-frequency SyncRef UEs with the measurement period of 320 ms. It is assumed that the SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

When UE is synchronized to GNSS directly, before selection / reselection of the new synchronization reference source UE shall evaluate the GNSS synchronization source reliability for at least 20 seconds before changing the synchronization reference from GNSS to another synchronization reference source. UE shall be always synchronized to GNSS directly during the evaluation of GNSS synchronization source reliability.

## 12.5 L1 SL-RSRP measurements

### 12.5.1 Introduction

This clause contains the measurement requirements related to resource reselection and resource pre-emption of the UE capable of V2X sidelink communication.

### 12.5.2 SL-RSRP measurements

The UE physical layer shall be capable of performing the L1 SL-RSRP measurements on the carrier operating V2X sidelink communication for determining the subset of resources to be excluded in PSSCH resource selection in sidelink transmission mode 2. The L1 SL-RSRP measurement period corresponds to one slot and the measurement shall meet the L1 SL-RSRP measurement accuracy requirement in Clause 10. After resource (re-)selection procedure, re-evaluation is performed on the reserved resources by L1 SL-RSRP measurements before transmission of SCI with reservation when the conditions specified in TS 38.214[26] are satisfied.

When the pre-emption mechanism is enabled for the resource pool that UE is monitoring and selecting resource from, after UE selects from the resource not excluded based on L1 SL-RSRP measurement procedure, the UE shall be capable of triggering reselection of already signalled resource(s) as a resource reservation when the conditions specified in TS38.214[26] are satisfied.

## 12.6 Congestion Control measurements

The UE shall be capable of estimating the channel busy ratio for one or more transmission pools indicated by higher layers in TS 38.331[2], based on SL-RSSI measurements provided by the physical layer.

When no sidelink transmissions occur, the UE physical layer shall perform a single-shot SL-RSSI measurement for each sub-channel included in all the slots configured as transmission pools.

The SL-RSSI measurement performed according to this clause shall meet the SL-RSSI measurement accuracy requirements defined in Clause 10.

The UE shall perform channel busy ratio (CBR) measurement based on SL-RSSI measurements as described in TS 38.215 [4].

## 12.7 Interruption

### 12.7.1 Interruptions to WAN due to V2X Sidelink Communication

This clause contains the requirements related to the interruptions on the PCell/serving cell due to V2X sidelink communication.

A UE capable of V2X sidelink communication may indicate its interest (initiation or termination) in V2X sidelink communication to the connected gNodeB using IE *SidelinkUEInformationNR* in TS38.331[2].

The UE is allowed an interruption of up to the duration shown in table 12.7.1-1 on the PCell/serving cell during the RRC reconfiguration procedure that includes the V2X sidelink communication configuration message *SL-ConfigDedicatedNR* in TS 38.331[2] (setup and release). This interruption is for both uplink and downlink of the PCell/serving cell.

**Table 12.7.1-1: Interruption length at V2X RRC reconfiguration**

| $\mu$ | NR Slot length (ms) | Interruption length (number of slots) |
|-------|---------------------|---------------------------------------|
| 0     | 1                   | 2                                     |
| 1     | 0.5                 | 3                                     |
| 2     | 0.25                | 5                                     |
| 3     | 0.125               | 9                                     |

## 12.7.2 V2X Sidelink Communication Dropping due to synchronization source change

This clause contains the requirements related to the interruptions on the V2X sidelink communication due to synchronization source change.

For NR V2X UE not supporting gNB/eNB as synchronization reference source, UE is allowed to drop LTE and NR V2X SL transmission or reception for up to 1ms when synchronization source is changed, where the drop of LTE V2X SL transmission or reception applies only to in-device coexistence scenario in TS38.213 [3]:

- From GNSS
  - to syncRef UE that is synchronized to GNSS directly/in-directly
  - to syncRef UE that has the lowest priority
- From syncRef UE that is synchronized to GNSS directly/in-directly
  - to GNSS
  - to syncRef UE that has the lowest priority
- From syncRef UE that has the lowest priority
  - to GNSS
  - to syncRef UE that is synchronized to GNSS directly/in-directly
  - to syncRef UE that has the lowest priority

For NR V2X UE supporting gNB/eNB as synchronization reference source, UE is allowed to drop LTE and NR V2X SL transmission or reception for up to 1ms when synchronization source is changed, where the drop of LTE V2X SL transmission or reception applies only to in-device coexistence scenario in TS38.213 [3]:

- From GNSS
  - to syncRef UE that is synchronized to GNSS directly/in-directly
  - to gNB/eNB
  - to syncRef UE that is synchronized to gNB/eNB directly
  - to syncRef UE that is synchronized to gNB/eNB in-directly
  - to syncRef UE that has the lowest priority
- From syncRef UE that is synchronized to GNSS directly/in-directly
  - to GNSS
  - to gNB/eNB
  - to syncRef UE that is synchronized to gNB/eNB directly
  - to syncRef UE that is synchronized to gNB/eNB in-directly

- to syncRef UE that has the lowest priority
- From gNB or eNB
  - to GNSS
  - to syncRef UE that is synchronized to GNSS directly/in-directly
  - to eNB or gNB
  - to syncRef UE that is synchronized to gNB or eNB directly
  - to syncRef UE that is synchronized to gNB or eNB in-directly
  - to syncRef UE that has the lowest priority
- From syncRef UE that is synchronized to gNB/eNB directly
  - to GNSS
  - to syncRef UE that is synchronized to GNSS directly/in-directly
  - to gNB/eNB
  - to syncRef UE that is synchronized to gNB/eNB directly
  - to syncRef UE that is synchronized to gNB/eNB in-directly
  - to syncRef UE that has the lowest priority
- From syncRef UE that is synchronized to gNB/eNB in-directly
  - to GNSS
  - to syncRef UE that is synchronized to GNSS directly/in-directly
  - to gNB/eNB
  - to syncRef UE that is synchronized to gNB/eNB directly
  - to syncRef UE that is synchronized to gNB/eNB in-directly
  - to syncRef UE that has the lowest priority
- From syncRef UE that has the lowest priority
  - to GNSS
  - to syncRef UE that is synchronized to GNSS directly
  - to syncRef UE that is synchronized to GNSS in-directly
  - to gNB/eNB
  - to syncRef UE that is synchronized to gNB/eNB directly
  - to syncRef UE that is synchronized to gNB/eNB in-directly
  - to syncRef UE that has the lowest priority

UE is allowed to interruption any V2X sidelink signals including PSSCH, PSCCH, PSBCH, PSFCH and SLSS signals.



### 12.7.3 Interruptions to WAN due to switching between E-UTRA V2X Sidelink and NR V2X Sidelink

This sub-clause contains the requirements related to the interruptions on the PCell/serving cell due to switching between E-UTRA V2X sidelink and NR V2X sidelink transmissions on a dedicated carrier. It is applicable for UE capable of both NR V2X sidelink and E-UTRA V2X sidelink transmissions in TDM-ed manner.

When a UE capable of switching between E-UTRA V2X sidelink and NR V2X sidelink, the UE is allowed an interruption of up to the duration shown in table 12.7.3-1 on the PCell/serving cell during the E-UTRA V2X sidelink and NR V2X sidelink switch.

This interruption is for both uplink and downlink of the PCell/serving cell.

**Table 12.7.3-1: Interruption length due to switching between E-UTRA V2X and NR V2X**

| $\mu$ | Slot length (ms) | Interruption length (number of slots) |
|-------|------------------|---------------------------------------|
| 0     | 1                | 2                                     |
| 1     | 0.5              | 2                                     |
| 2     | 0.25             | 2                                     |
| 3     | 0.125            | 3                                     |

## 12.8 Reliability of GNSS signal

This clause contains requirements regarding reliability of GNSS signal for the UE capable of V2X sidelink communication under the following additional condition:

- The UE is configured or pre-configured with parameters for enabling the UE to acquire the GNSS synchronization.

If UE considers GNSS is a reliable synchronization reference, the UE shall meet timing accuracy requirement as specified in 12.2 and frequency accuracy requirement as specified in 6.4E of TS38.101-1[18]. Otherwise, the UE shall be capable to select another synchronization reference source.

## 12.9 Scheduling availability

### 12.9.1 Scheduling availability of UE switching between E-UTRA sidelink and NR sidelink

This clause contains the restrictions on the scheduling availability for V2X sidelink due to switching between E-UTRA V2X sidelink and NR V2X sidelink transmission on a dedicated carrier. For the NR V2X sidelink, the assumed number of configured symbols in a slot is 14.

When switch from E-UTRA V2X sidelink to NR V2X sidelink occurs in NR slot 'n',

- UE is not expected to transmit or receive on NR V2X sidelink on the slot 'n'.

When switch from NR V2X sidelink to E-UTRA V2X sidelink occurs in NR slot 'n-1',

- UE is not expected to transmit or receive on NR V2X sidelink on the slot 'n-1'.

When switch from NR V2X sidelink to E-UTRA V2X sidelink occurs in E-UTRA subframe 'n',

- UE is not expected to transmit or receive on E-UTRA V2X sidelink on the subframe 'n'.

When switch from E-UTRA V2X sidelink to NR V2X sidelink occurs in E-UTRA subframe 'n-1',

- UE is not expected to transmit or receive E-UTRA on V2X sidelink on the subframe 'n-1'.

# 13 Measurement Performance Requirements for NR gNB

## 13.1 UL-RTOA

### 13.1.1 Report mapping

The reporting range of UL Relative Time of Arrival (UL-RTOA), as defined in Clause 5.2.2 of TS 38.215 [4], is defined from  $-985024T_c$  to  $+985024T_c$ . The reporting resolution is uniform across the reporting range and is defined as  $T = T_c * 2^k$  where  $k$  is selected by gNB from the set  $\{0, 1, 2, 3, 4, 5\}$ .

$T_c$  is defined in TS 38.211 [6].

LMF provides a recommended resolution parameter, *timingReportingGranularityFactor* [35]. gNB selects parameter  $k$  based on *timingReportingGranularityFactor* [35] and informs the LMF.

The mapping of measured quantity for each reporting resolution ( $k$ ) is defined in Table 13.1.1-1 to Table 13.1.1-6.

**Table 13.1.1-1: UL-RTOA measurement report mapping for reporting resolution of  $T_c$  ( $k=0$ )**

| Reported Value  | Measured Quantity Value                  | Unit  |
|-----------------|--|-------|
| UL_RTOA_0000    | $-985024 > \text{UL\_RTOA}$              | $T_c$ |
| UL_RTOA_0001    | $-985024 \leq \text{UL\_RTOA} < -985023$ | $T_c$ |
| UL_RTOA_0002    | $-985023 \leq \text{UL\_RTOA} < -985022$ | $T_c$ |
| ...             | ...                                      | ...   |
| UL_RTOA_985023  | $-2 \leq \text{UL\_RTOA} < -1$           | $T_c$ |
| UL_RTOA_985024  | $-1 \leq \text{UL\_RTOA} \leq 0$         | $T_c$ |
| UL_RTOA_985025  | $0 < \text{UL\_RTOA} \leq 1$             | $T_c$ |
| UL_RTOA_985026  | $1 < \text{UL\_RTOA} \leq 2$             | $T_c$ |
| UL_RTOA_985027  | $2 < \text{UL\_RTOA} \leq 3$             | $T_c$ |
| ...             | ...                                      | ...   |
| UL_RTOA_1970048 | $985023 < \text{UL\_RTOA} \leq 985024$   | $T_c$ |
| UL_RTOA_1970049 | $985024 < \text{UL\_RTOA}$               | $T_c$ |

**Table 13.1.1-2: UL-RTOA measurement report mapping for reporting resolution of  $2T_c$  ( $k=1$ )**

| Reported Value | Measured Quantity Value                  | Unit  |
|----------------|--|-------|
| UL_RTOA_0000   | $-985024 > \text{UL\_RTOA}$              | $T_c$ |
| UL_RTOA_0001   | $-985024 \leq \text{UL\_RTOA} < -985022$ | $T_c$ |
| UL_RTOA_0002   | $-985022 \leq \text{UL\_RTOA} < -985020$ | $T_c$ |
| ...            | ...                                      | ...   |
| UL_RTOA_492511 | $-4 \leq \text{UL\_RTOA} < -2$           | $T_c$ |
| UL_RTOA_492512 | $-2 \leq \text{UL\_RTOA} \leq 0$         | $T_c$ |
| UL_RTOA_492513 | $0 < \text{UL\_RTOA} \leq 2$             | $T_c$ |
| UL_RTOA_492514 | $2 < \text{UL\_RTOA} \leq 4$             | $T_c$ |
| UL_RTOA_492515 | $4 < \text{UL\_RTOA} \leq 6$             | $T_c$ |
| ...            | ...                                      | ...   |
| UL_RTOA_985024 | $985022 < \text{UL\_RTOA} \leq 985024$   | $T_c$ |
| UL_RTOA_985025 | $985024 < \text{UL\_RTOA}$               | $T_c$ |

**Table 13.1.1-3: UL-RTOA measurement report mapping for reporting resolution of 4T<sub>c</sub> (k=2)**

| Reported Value | Measured Quantity Value     | Unit           |
|----------------|-----------------------------|----------------|
| UL_RTOA_0000   | -985024 > UL_RTOA           | T <sub>c</sub> |
| UL_RTOA_0001   | -985024 ≤ UL_RTOA < -985020 | T <sub>c</sub> |
| UL_RTOA_0002   | -985020 ≤ UL_RTOA < -985018 | T <sub>c</sub> |
| ...            | ...                         | ...            |
| UL_RTOA_246255 | -8 ≤ UL_RTOA < -4           | T <sub>c</sub> |
| UL_RTOA_246256 | -4 ≤ UL_RTOA ≤ 0            | T <sub>c</sub> |
| UL_RTOA_246257 | 0 < UL_RTOA ≤ 4             | T <sub>c</sub> |
| UL_RTOA_246258 | 4 < UL_RTOA ≤ 8             | T <sub>c</sub> |
| UL_RTOA_246259 | 8 < UL_RTOA ≤ 12            | T <sub>c</sub> |
| ...            | ...                         | ...            |
| UL_RTOA_492512 | 985020 < UL_RTOA ≤ 985024   | T <sub>c</sub> |
| UL_RTOA_492513 | 985024 < UL_RTOA            | T <sub>c</sub> |

**Table 13.1.1-4: UL-RTOA measurement report mapping for reporting resolution of 8T<sub>c</sub> (k=3)**

| Reported Value | Measured Quantity Value     | Unit           |
|----------------|-----------------------------|----------------|
| UL_RTOA_0000   | -985024 > UL_RTOA           | T <sub>c</sub> |
| UL_RTOA_0001   | -985024 ≤ UL_RTOA < -985016 | T <sub>c</sub> |
| UL_RTOA_0002   | -985016 ≤ UL_RTOA < -985008 | T <sub>c</sub> |
| ...            | ...                         | ...            |
| UL_RTOA_123127 | -16 ≤ UL_RTOA < -8          | T <sub>c</sub> |
| UL_RTOA_123128 | -8 ≤ UL_RTOA ≤ 0            | T <sub>c</sub> |
| UL_RTOA_123129 | 0 < UL_RTOA ≤ 8             | T <sub>c</sub> |
| UL_RTOA_123130 | 8 < UL_RTOA ≤ 16            | T <sub>c</sub> |
| UL_RTOA_123131 | 16 < UL_RTOA ≤ 24           | T <sub>c</sub> |
| ...            | ...                         | ...            |
| UL_RTOA_246256 | 985016 < UL_RTOA ≤ 985024   | T <sub>c</sub> |
| UL_RTOA_246257 | 985024 < UL_RTOA            | T <sub>c</sub> |

**Table 13.1.1-5: UL-RTOA measurement report mapping for reporting resolution of 16T<sub>c</sub> (k=4)**

| Reported Value | Measured Quantity Value     | Unit           |
|----------------|-----------------------------|----------------|
| UL_RTOA_0000   | -985024 > UL_RTOA           | T <sub>c</sub> |
| UL_RTOA_0001   | -985024 ≤ UL_RTOA < -985008 | T <sub>c</sub> |
| UL_RTOA_0002   | -985008 ≤ UL_RTOA < -984992 | T <sub>c</sub> |
| ...            | ...                         | ...            |
| UL_RTOA_61563  | -32 ≤ UL_RTOA < -16         | T <sub>c</sub> |
| UL_RTOA_61564  | -16 ≤ UL_RTOA ≤ 0           | T <sub>c</sub> |
| UL_RTOA_61565  | 0 < UL_RTOA ≤ 16            | T <sub>c</sub> |
| UL_RTOA_61566  | 16 < UL_RTOA ≤ 32           | T <sub>c</sub> |
| UL_RTOA_61567  | 32 < UL_RTOA ≤ 48           | T <sub>c</sub> |
| ...            | ...                         | ...            |
| UL_RTOA_123128 | 985008 < UL_RTOA ≤ 985024   | T <sub>c</sub> |
| UL_RTOA_123129 | 985024 < UL_RTOA            | T <sub>c</sub> |

**Table 13.1.1-5: UL-RTOA measurement report mapping for reporting resolution of  $32T_c$  ( $k=5$ )**

| Reported Value | Measured Quantity Value                  | Unit  |
|----------------|--|-------|
| UL_RTOA_0000   | $-985024 > \text{UL\_RTOA}$              | $T_c$ |
| UL_RTOA_0001   | $-985024 \leq \text{UL\_RTOA} < -984992$ | $T_c$ |
| UL_RTOA_0002   | $-984992 \leq \text{UL\_RTOA} < -984960$ | $T_c$ |
| ...            | ...                                      | ...   |
| UL_RTOA_30781  | $-64 \leq \text{UL\_RTOA} < -32$         | $T_c$ |
| UL_RTOA_30782  | $-32 \leq \text{UL\_RTOA} \leq 0$        | $T_c$ |
| UL_RTOA_30783  | $0 < \text{UL\_RTOA} \leq 32$            | $T_c$ |
| UL_RTOA_30784  | $32 < \text{UL\_RTOA} \leq 64$           | $T_c$ |
| UL_RTOA_30785  | $64 < \text{UL\_RTOA} \leq 96$           | $T_c$ |
| ...            | ...                                      | ...   |
| UL_RTOA_61564  | $984992 < \text{UL\_RTOA} \leq 985024$   | $T_c$ |
| UL_RTOA_61565  | $985024 < \text{UL\_RTOA}$               | $T_c$ |

## 13.2 gNB Rx-Tx time difference

### 13.2.1 Report mapping

The reporting range of gNB Rx-Tx time difference, as defined in Clause 5.2.3 of TS 38.215 [4], is defined from  $-985024T_c$  to  $+985024 \times T_c$ . The reporting resolution is uniform across the reporting range and is defined as  $T = T_c \cdot 2^k$  where  $k$  is selected by gNB from the set  $\{0, 1, 2, 3, 4, 5\}$ .

$T_c$  is defined in TS 38.211 [6].

LMF provides a recommended resolution parameter, *timingReportingGranularityFactor* [35]. gNB selects parameter  $k$  based on *timingReportingGranularityFactor* [35] and informs the LMF.

The mapping of measured quantity for each reporting resolution ( $k$ ) is defined in Table 13.2.1-1 to Table 13.2.1-6.

**Table 13.2.1-1: gNB Rx-Tx time difference measurement report mapping for reporting resolution of  $T_c$  ( $k=0$ )**

| Reported Value | Measured Quantity Value               | Unit  |
|----------------|---------------------------------------|-------|
| RX-TX_0000     | $-985024 > \text{RX-TX}$              | $T_c$ |
| RX-TX_0001     | $-985024 \leq \text{RX-TX} < -985023$ | $T_c$ |
| RX-TX_0002     | $-985023 \leq \text{RX-TX} < -985022$ | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_985023   | $-2 \leq \text{RX-TX} < -1$           | $T_c$ |
| RX-TX_985024   | $-1 \leq \text{RX-TX} \leq 0$         | $T_c$ |
| RX-TX_985025   | $0 < \text{RX-TX} \leq 1$             | $T_c$ |
| RX-TX_985026   | $1 < \text{RX-TX} \leq 2$             | $T_c$ |
| RX-TX_985027   | $2 < \text{RX-TX} \leq 3$             | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_1970048  | $985023 < \text{RX-TX} \leq 985024$   | $T_c$ |
| RX-TX_1970049  | $985024 < \text{RX-TX}$               | $T_c$ |

**Table 13.2.1-2: gNB Rx-Tx time difference measurement report mapping for reporting resolution of  $2T_c$  ( $k=1$ )**

| Reported Value | Measured Quantity Value               | Unit  |
|----------------|---------------------------------------|-------|
| RX-TX_0000     | $-985024 > \text{RX-TX}$              | $T_c$ |
| RX-TX_0001     | $-985024 \leq \text{RX-TX} < -985022$ | $T_c$ |
| RX-TX_0002     | $-985022 \leq \text{RX-TX} < -985020$ | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_492511   | $-4 \leq \text{RX-TX} < -2$           | $T_c$ |
| RX-TX_492512   | $-2 \leq \text{RX-TX} \leq 0$         | $T_c$ |
| RX-TX_492513   | $0 < \text{RX-TX} \leq 2$             | $T_c$ |
| RX-TX_492514   | $2 < \text{RX-TX} \leq 4$             | $T_c$ |
| RX-TX_492515   | $4 < \text{RX-TX} \leq 6$             | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_985024   | $985022 < \text{RX-TX} \leq 985024$   | $T_c$ |
| RX-TX_985025   | $985024 < \text{RX-TX}$               | $T_c$ |

**Table 13.2.1-3: gNB Rx-Tx time difference measurement report mapping for reporting resolution of  $4T_c$  ( $k=2$ )**

| Reported Value | Measured Quantity Value               | Unit  |
|----------------|---------------------------------------|-------|
| RX-TX_0000     | $-985024 > \text{RX-TX}$              | $T_c$ |
| RX-TX_0001     | $-985024 \leq \text{RX-TX} < -985020$ | $T_c$ |
| RX-TX_0002     | $-985020 \leq \text{RX-TX} < -985018$ | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_246255   | $-8 \leq \text{RX-TX} < -4$           | $T_c$ |
| RX-TX_246256   | $-4 \leq \text{RX-TX} \leq 0$         | $T_c$ |
| RX-TX_246257   | $0 < \text{RX-TX} \leq 4$             | $T_c$ |
| RX-TX_246258   | $4 < \text{RX-TX} \leq 8$             | $T_c$ |
| RX-TX_246259   | $8 < \text{RX-TX} \leq 12$            | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_492512   | $985020 < \text{RX-TX} \leq 985024$   | $T_c$ |
| RX-TX_492513   | $985024 < \text{RX-TX}$               | $T_c$ |

**Table 13.2.1-4: gNB Rx-Tx time difference measurement report mapping for reporting resolution of  $8T_c$  ( $k=3$ )**

| Reported Value | Measured Quantity Value               | Unit  |
|----------------|---------------------------------------|-------|
| RX-TX_0000     | $-985024 > \text{RX-TX}$              | $T_c$ |
| RX-TX_0001     | $-985024 \leq \text{RX-TX} < -985016$ | $T_c$ |
| RX-TX_0002     | $-985016 \leq \text{RX-TX} < -985008$ | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_123127   | $-16 \leq \text{RX-TX} < -8$          | $T_c$ |
| RX-TX_123128   | $-8 \leq \text{RX-TX} \leq 0$         | $T_c$ |
| RX-TX_123129   | $0 < \text{RX-TX} \leq 8$             | $T_c$ |
| RX-TX_123130   | $8 < \text{RX-TX} \leq 16$            | $T_c$ |
| RX-TX_123131   | $16 < \text{RX-TX} \leq 24$           | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_246256   | $985016 < \text{RX-TX} \leq 985024$   | $T_c$ |
| RX-TX_246257   | $985024 < \text{RX-TX}$               | $T_c$ |

**Table 13.2.1-5: gNB Rx-Tx time difference measurement report mapping for reporting resolution of  $16T_c$  ( $k=4$ )**

| Reported Value | Measured Quantity Value               | Unit  |
|----------------|---------------------------------------|-------|
| RX-TX_0000     | $-985024 > \text{RX-TX}$              | $T_c$ |
| RX-TX_0001     | $-985024 \leq \text{RX-TX} < -985008$ | $T_c$ |
| RX-TX_0002     | $-985008 \leq \text{RX-TX} < -984992$ | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_61563    | $-32 \leq \text{RX-TX} < -16$         | $T_c$ |
| RX-TX_61564    | $-16 \leq \text{RX-TX} \leq 0$        | $T_c$ |
| RX-TX_61565    | $0 < \text{RX-TX} \leq 16$            | $T_c$ |
| RX-TX_61566    | $16 < \text{RX-TX} \leq 32$           | $T_c$ |
| RX-TX_61567    | $32 < \text{RX-TX} \leq 48$           | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_123128   | $985008 < \text{RX-TX} \leq 985024$   | $T_c$ |
| RX-TX_123129   | $985024 < \text{RX-TX}$               | $T_c$ |

**Table 13.2.1-5: gNB Rx-Tx time difference measurement report mapping for reporting resolution of  $32T_c$  ( $k=5$ )**

| Reported Value | Measured Quantity Value               | Unit  |
|----------------|---------------------------------------|-------|
| RX-TX_0000     | $-985024 > \text{RX-TX}$              | $T_c$ |
| RX-TX_0001     | $-985024 \leq \text{RX-TX} < -984992$ | $T_c$ |
| RX-TX_0002     | $-984992 \leq \text{RX-TX} < -984960$ | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_30781    | $-64 \leq \text{RX-TX} < -32$         | $T_c$ |
| RX-TX_30782    | $-32 \leq \text{RX-TX} \leq 0$        | $T_c$ |
| RX-TX_30783    | $0 < \text{RX-TX} \leq 32$            | $T_c$ |
| RX-TX_30784    | $32 < \text{RX-TX} \leq 64$           | $T_c$ |
| RX-TX_30785    | $64 < \text{RX-TX} \leq 96$           | $T_c$ |
| ...            | ...                                   | ...   |
| RX-TX_61564    | $984992 < \text{RX-TX} \leq 985024$   | $T_c$ |
| RX-TX_61565    | $985024 < \text{RX-TX}$               | $T_c$ |

## 13.2.2 Measurement Accuracy Requirements

### 13.2.2.1 Introduction

This clause defines accuracy requirements for gNB Rx-Tx time difference measurement in FR1 and FR2. The requirements are applicable for gNB supporting gNB Rx-Tx time difference measurement. The gNB, which declares the support for gNB Rx-Tx time difference measurement also declares that it meets gNB Rx-Tx time difference accuracy requirements at least for one side condition  $\hat{E}_s/I_{ot} \geq +3$  dB or  $\hat{E}_s/I_{ot} \geq -13$  dB.

### 13.2.2.2 Requirements

The accuracy requirements for gNB Rx-Tx time difference measurement shall be within  $\pm(X+Y) T_c$  under the following conditions:

- AWGN propagation conditions.
- The measured signals are in the directions covered by RoAoA of OTA reference sensitivity requirements for gNB type 1-O and 2-O BS

where

- X is defined in Table 13.2.2.2-1 for gNB types 1-C, 1-H and 1-O and in Table 13.2.2.2-2 for gNB type 2-O.
- Y is declared by manufacturer and can be different for different gNB types 1-C, 1-H, 1-O and 2-O.

Note: The measurement accuracy requirements in Table 13.2.2.2-1 and Table 13.2.2.2-2 are defined under an assumption that gNB is not mandated to perform receive beam sweeping.

**Table 13.2.2.2-1: gNB Rx-Tx time difference absolute accuracy in FR1 for gNB type 1-C, 1-H and 1-O**

| Accuracy | SRS $\bar{\epsilon}$ s/lot | SCS       | SRS bandwidth range   |
|----------|----------------------------|-----------|-----------------------|
| Unit: Tc | Unit: dB                   | Unit: kHz | Unit: RB              |
| 123      | $\geq -13$                 | 15        | $44 \leq BW \leq 84$  |
| 48       |                            |           | $88 \leq BW \leq 168$ |
| 17       |                            |           | $176 \leq BW$         |
| 122      | $\geq +3$                  |           | $24 \leq BW \leq 40$  |
| 62       |                            |           | $44 \leq BW \leq 84$  |
| 32       |                            |           | $88 \leq BW \leq 168$ |
| 16       | $\geq -13$                 | 30        | $176 \leq BW$         |
| 42       |                            |           | $48 \leq BW \leq 84$  |
| 24       |                            |           | $88 \leq BW \leq 168$ |
| 8        | $\geq +3$                  |           | $176 \leq BW$         |
| 32       |                            |           | $48 \leq BW \leq 84$  |
| 17       |                            |           | $88 \leq BW \leq 168$ |
| 9        | $\geq -13$                 | 60        | $176 \leq BW$         |
| 21       |                            |           | $48 \leq BW \leq 84$  |
| 12       |                            |           | $88 \leq BW$          |
| 16       | $\geq +3$                  |           | $48 \leq BW \leq 84$  |
| 9        |                            |           | $88 \leq BW$          |

**Table 13.2.2.2-2: gNB Rx-Tx time difference absolute accuracy in FR2 for gNB type 2-O**

| Accuracy | SRS $\bar{\epsilon}$ s/lot | SCS       | SRS bandwidth range    |
|----------|----------------------------|-----------|------------------------|
| Unit: Tc | Unit: dB                   | Unit: kHz | Unit: RB               |
| 9        | $\geq -13$                 | 60        | $132 \leq BW \leq 168$ |
| 8        |                            |           | $176 \leq BW$          |
| 9        | $\geq +3$                  |           | $132 \leq BW \leq 168$ |
| 8        |                            |           | $176 \leq BW$          |
| 22       | $\geq -13$                 | 120       | $32 \leq BW \leq 40$   |
| 15       |                            |           | $44 \leq BW \leq 84$   |
| 8        |                            |           | $88 \leq BW$           |
| 16       | $\geq +3$                  |           | $32 \leq BW \leq 40$   |
| 9        |                            |           | $44 \leq BW \leq 84$   |
| 8        |                            |           | $88 \leq BW$           |

## 13.3 UL SRS RSRP measurement

### 13.3.1 Report mapping

The reporting range of UL SRS RSRP, as defined in clause 5.2.5 of 38.215 [4], is defined from -156dBm to -31dBm with resolution 1dB.

The mapping of measured quantity is defined in Table 13.3.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 13.3.1-1: UL SRS RSRP report mapping

| Reported value | Measured quantity value | Unit |
|----------------|-------------------------|------|
| SRS_RSRP_0     | SRS-RSRP<-156           | dBm  |
| SRS_RSRP_1     | -156≤SRS-RSRP<-155      | dBm  |
| SRS_RSRP_2     | -155≤SRS-RSRP<-154      | dBm  |
| SRS_RSRP_3     | -154≤SRS-RSRP<-153      | dBm  |
| SRS_RSRP_4     | -153≤SRS-RSRP<-152      | dBm  |
| SRS_RSRP_5     | -152≤SRS-RSRP<-151      | dBm  |
| SRS_RSRP_6     | -151≤SRS-RSRP<-150      | dBm  |
| SRS_RSRP_7     | -150≤SRS-RSRP<-149      | dBm  |
| SRS_RSRP_8     | -149≤SRS-RSRP<-148      | dBm  |
| SRS_RSRP_9     | -148≤SRS-RSRP<-147      | dBm  |
| SRS_RSRP_10    | -147≤SRS-RSRP<-146      | dBm  |
| SRS_RSRP_11    | -146≤SRS-RSRP<-145      | dBm  |
| SRS_RSRP_12    | -145≤SRS-RSRP<-144      | dBm  |
| SRS_RSRP_13    | -144≤SRS-RSRP<-143      | dBm  |
| SRS_RSRP_14    | -143≤SRS-RSRP<-142      | dBm  |
| SRS_RSRP_15    | -142≤SRS-RSRP<-141      | dBm  |
| SRS_RSRP_16    | -141≤SRS-RSRP<-140      | dBm  |
| SRS_RSRP_17    | -140≤SRS-RSRP<-139      | dBm  |
| SRS_RSRP_18    | -139≤SRS-RSRP<-138      | dBm  |
| ...            | ...                     | ...  |
| SRS_RSRP_111   | -46≤SRS-RSRP<-45        | dBm  |
| SRS_RSRP_112   | -45≤SRS-RSRP<-44        | dBm  |
| SRS_RSRP_113   | -44≤SRS-RSRP<-43        | dBm  |
| SRS_RSRP_114   | -43≤SRS-RSRP<-42        | dBm  |
| SRS_RSRP_115   | -42≤SRS-RSRP<-41        | dBm  |
| SRS_RSRP_116   | -41≤SRS-RSRP<-40        | dBm  |
| SRS_RSRP_117   | -40≤SRS-RSRP<-39        | dBm  |
| SRS_RSRP_118   | -39≤SRS-RSRP<-38        | dBm  |
| SRS_RSRP_119   | -38≤SRS-RSRP<-37        | dBm  |
| SRS_RSRP_120   | -37≤SRS-RSRP<-36        | dBm  |
| SRS_RSRP_121   | -36≤SRS-RSRP<-35        | dBm  |
| SRS_RSRP_122   | -35≤SRS-RSRP<-34        | dBm  |
| SRS_RSRP_123   | -34≤SRS-RSRP<-33        | dBm  |
| SRS_RSRP_124   | -33≤SRS-RSRP<-32        | dBm  |
| SRS_RSRP_125   | -32≤SRS-RSRP<-31        | dBm  |
| SRS_RSRP_126   | -31≤SRS-RSRP            | dBm  |

## 13.3.2 Measurement accuracy requirements

### 13.3.2.1 Introduction

This clause defines accuracy requirements for SRS-RSRP measurement in FR1 and FR2. The requirements are applicable for gNB supporting SRS-RSRP measurement. The gNB, which declares the support for SRS-RSRP measurement also declares that it meets SRS-RSRP accuracy requirements at least for one side condition  $\hat{\epsilon}_s/\text{lot} \geq +3$  dB or  $\hat{\epsilon}_s/\text{lot} \geq -13$  dB.

### 13.3.2.2 Requirements

The accuracy requirements in Table 13.3.2.2-1, Table 13.3.2.2-2 and Table 13.3.2.2-3 are valid under the following conditions:

AWGN propagation conditions.

The measured signals are in the directions covered by RoAoA of OTA reference sensitivity requirements for gNB type 1-O and 2-O BS



Note: The measurement accuracy requirements in Table 13.3.2.2-1, Table 13.3.2.2-2 and Table 13.3.2.2-3 are defined under an assumption that gNB is not mandated to perform receive beam sweeping.

**Table 13.3.2.2-1 gNB SRS-RSRP absolute accuracy requirements in FR1 for gNB type 1-C**

| Accuracy  | Conditions                        |                           |
|-----------|-----------------------------------|---------------------------|
|           | SRS $\hat{\epsilon}$ s/lot        | SRS bandwidth range       |
| <b>dB</b> | <b>dB</b>                         | <b>RB</b>                 |
| $\pm 4$   | $\hat{\epsilon}$ s/lot $\geq +3$  | $24 \leq \text{BW} < 48$  |
| $\pm 4$   |                                   | $48 \leq \text{BW} < 132$ |
| $\pm 4$   |                                   | $132 \leq \text{BW}$      |
| $\pm 6.5$ | $\hat{\epsilon}$ s/lot $\geq -13$ | $48 \leq \text{BW} < 132$ |
| $\pm 5.5$ |                                   | $132 \leq \text{BW}$      |

**Table 13.3.2.2-2 gNB SRS-RSRP absolute accuracy requirements in FR1 for gNB type 1-H and 1-O**

| Accuracy  | Conditions                        |                           |
|-----------|-----------------------------------|---------------------------|
|           | SRS $\hat{\epsilon}$ s/lot        | SRS bandwidth range       |
| <b>dB</b> | <b>dB</b>                         | <b>RB</b>                 |
| $\pm 5.5$ | $\hat{\epsilon}$ s/lot $\geq +3$  | $24 \leq \text{BW} < 48$  |
| $\pm 5.5$ |                                   | $48 \leq \text{BW} < 132$ |
| $\pm 5.5$ |                                   | $132 \leq \text{BW}$      |
| $\pm 8$   | $\hat{\epsilon}$ s/lot $\geq -13$ | $48 \leq \text{BW} < 132$ |
| $\pm 7$   |                                   | $132 \leq \text{BW}$      |

**Table 13.3.2.2-3 gNB SRS-RSRP absolute accuracy requirements in FR2 for gNB type 2-O**

| Accuracy  | Conditions                        |                           |
|-----------|-----------------------------------|---------------------------|
|           | SRS $\hat{\epsilon}$ s/lot        | SRS bandwidth range       |
| <b>dB</b> | <b>dB</b>                         | <b>RB</b>                 |
| $\pm 5.5$ | $\hat{\epsilon}$ s/lot $\geq +3$  | $32 \leq \text{BW} < 64$  |
| $\pm 5.5$ |                                   | $64 \leq \text{BW} < 132$ |
| $\pm 5.5$ |                                   | $132 \leq \text{BW}$      |
| $\pm 8$   | $\hat{\epsilon}$ s/lot $\geq -13$ | $64 \leq \text{BW} < 132$ |
| $\pm 7$   |                                   | $132 \leq \text{BW}$      |

## 13.4 AoA/ZoA

### 13.4.1 Report mapping

The reporting range of UL Angle of Arrival, as defined in Clause 5.2.4 of TS 38.215 [4], is defined from -180 degree to +180 degree for azimuth angle (AoA). The reporting resolution is 0.1 degree.

The reporting range of UL Angle of Arrival, as defined in Clause 5.2.4 of TS 38.215 [4], is defined from 0 degree to +180 degree for vertical angle (ZoA). The reporting resolution is 0.1 degree.

The mapping of AoA measured quantity is defined in Table 13.4.1-1. The mapping of ZoA measured quantity is defined in Table 13.4.1-2.

**Table 13.4.1-1: AoA measurement report mapping**

| Reported value | Measured quantity value (AoA)     | Unit   |
|----------------|-----------------------------------|--------|
| AoA_0          | $-180 \leq \text{AoA} < -179.9$   | degree |
| AoA_1          | $-179.9 \leq \text{AoA} < -179.8$ | degree |
| AoA_2          | $-179.8 \leq \text{AoA} < -179.7$ | degree |
| ...            | ...                               | ...    |
| AoA_1798       | $-0.2 \leq \text{AoA} \leq -0.1$  | degree |
| AoA_1799       | $-0.1 \leq \text{AoA} < 0$        | degree |
| AoA_1800       | $0 \leq \text{AoA} < 0.1$         | degree |
| AoA_1801       | $0.1 \leq \text{AoA} < 0.2$       | degree |
| AoA_1802       | $0.2 \leq \text{AoA} < 0.3$       | degree |
| ...            | ...                               | ...    |
| AoA_3598       | $179.8 \leq \text{AoA} < 179.9$   | degree |
| AoA_3599       | $179.9 \leq \text{AoA} < 180$     | degree |

**Table 13.4.1-2: ZoA measurement report mapping**

| Reported value | Measured quantity value (ZoA)   | Unit   |
|----------------|---------------------------------|--------|
| ZoA_0          | $0 \leq \text{ZoA} < 0.1$       | degree |
| ZoA_1          | $0.1 \leq \text{ZoA} < 0.2$     | degree |
| ZoA_2          | $0.2 \leq \text{ZoA} < 0.3$     | degree |
| ...            | ...                             | ...    |
| ZoA_1798       | $179.8 \leq \text{ZoA} < 179.9$ | degree |
| ZoA_1799       | $179.9 \leq \text{ZoA} < 180$   | degree |

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# Annex A (normative): Test Cases

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## A.1 Purpose of annex

## A.2 Requirement classification for statistical testing

Requirements in this specification are either expressed as absolute requirements with a single value stating the requirement, or expressed as a success rate. There are no provisions for the statistical variations that will occur when the parameter is tested.

Annex A outlines the tests in more detail and lists the test parameters needed. The test will result in an outcome of a test variable value for the device under test (DUT) inside or outside the test limit. Overall, the probability of a "good" DUT being inside the test limit(s) and the probability of a "bad" DUT being outside the test limit(s) should be as high as possible. For this reason, when selecting the test variable and the test limit(s), the statistical nature of the test is accounted for.

The statistical nature depends on the type of requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a DUT passing the test actually meets the requirements and determines how many times a test has to be repeated and what the pass and fail criteria are. Those aspects are not covered by TS 38.133. The details of the tests on how many times to run it and how to establish confidence in the tests are described in TS 38.533 [5]. This Annex establishes the variable to be used in the test and whether it can be viewed as statistical in nature or not.

### A.2.1 Types of requirements in TS 38.133

#### A.2.1.1 Time and delay requirements on UE higher layer actions

A very large part of the RRM requirements are delay requirements:

- In RRC\_IDLE state mobility (clause A.6.1 and A.7.1) there is cell re-selection delay.
- In RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6) there is handover delay, cell search delay and measurement reporting delay.
- In RRC Connection Control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2) there is RRC re-establishment delay.

All have in common that the UE is required to perform an action observable in higher layers (e.g. camp on the correct cell) within a certain time after a specific event (e.g. when a new strong pilot or reference signal appears). The delay time is statistical in nature for several reasons, among others that several of the measurements are performed by the UE in a fading radio environment.

The variations make a strict limit unsuitable for a test. Instead there is a condition set for a correct action by the UE, e.g. that the UE shall camp on the correct cell within X seconds. Then the rate of correct events is observed during repeated tests and a limit is set on the rate of correct events, usually 90% correct events are required. How the limit is applied in the test depends on the confidence required, further detailed are in TS 38.533 [5].

#### A.2.1.2 Measurements of power levels, relative powers and time

A very large number of requirements are on measurements that the UE performs:

- In RRC\_CONNECTED state mobility (clauses A.4.3, A.5.3, A.6.3 and A.7.3) there are measurement reports.
- In Measurement Performance Requirements (clauses A.4.7, A.5.7, A.6.7 and A.7.7) there are requirements for all type of measurements.

The accuracy requirements on measurements are expressed in this specification as a fixed limit (e.g. +/-X dB), but the measurement error will have a distribution that is not easily confined in fixed limits. Assuming a Gaussian distribution of the error, the limits will have to be set at  $\pm 3.29\sigma$  if the probability of failing a "good DUT" in a single test is to be kept at 0.1%. It is more reasonable to set the limit tighter and test the DUT by counting the rate of measurements that are within the limits, in a way similar to the requirements on delay.

### A.2.1.3 Implementation requirements

A few requirements are strict actions the UE should take or capabilities the UE should have, without any allowance for deviations. These requirements are absolute and should be tested as such. Examples are:

- "Event triggered report rate" in RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6)
- "Correct behaviour at time-out" in RRC connection control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2)

### A.2.1.4 Physical layer timing requirements

There are requirements on Timing (clauses A.4.4, A.5.4, A.6.4 and A.7.4). There are both absolute and relative limits on timing accuracy depending upon the type of requirement. Examples are:

- Initial Transmit Timing (clauses A.4.4.1, A.5.4.1, A.6.4.1 and A.7.4.1) has an absolute limit on timing accuracy.
- Timing Advance (clauses A.4.4.2, A.5.4.2, A.6.4.2 and A.7.4.2) has a relative limit on timing accuracy.

### A.2.1.5 Requirements under CCA

A few requirements include CCA failures in DL and or UL. Considering that the CCA model is of statistical nature, requirements that include CCA failures are always considered of statistical nature.

## A.3 RRM test configurations

### A.3.1 Reference measurement channels

#### A.3.1.1 PDSCH

##### A.3.1.1.1 FDD

**Table A.3.1.1.1-1: PDSCH Reference Measurement Channels for SCS=15kHz**

| Parameter  | Unit  | Value                   |  |  |  |  |  |  |
|--|---|-------------------------|--|--|--|--|--|--|
| Reference channel  |   | SR.1.1<br>FDD           |  |  |  |  |  |  |
| Channel bandwidth  | MHz   | Defined in<br>test case |  |  |  |  |  |  |
| Number of transmitter<br>antennas                        |   | 1                       |  |  |  |  |  |  |
| Allocated resource blocks<br>for PDSCH <sup>Note 1</sup> |   | 24                      |  |  |  |  |  |  |
| Allocated slots per Radio<br>Frame                       |   | 10                      |  |  |  |  |  |  |
| Radio frame containing<br>SSB                            | slots   | Note 5                  |  |  |  |  |  |  |
| Radio frame not<br>containing SSB                        | slots   | 10                      |  |  |  |  |  |  |
| MCS index  |   | 4                       |  |  |  |  |  |  |
| Modulation   |   | QPSK                    |  |  |  |  |  |  |
| Target Coding Rate                                       |   | 1/3                     |  |  |  |  |  |  |
| Number of control symbols                                |   | 2                       |  |  |  |  |  |  |
| PDSCH mapping type                                       |   | Type A                  |  |  |  |  |  |  |
| Information Bit Payload                                  |   |                         |  |  |  |  |  |  |
| For slots with RMSI <sup>Note 2</sup>                    | bits  | 1608                    |  |  |  |  |  |  |
| For slots without RMSI                                   | bits  | 1864                    |  |  |  |  |  |  |
| Number of Code Blocks<br>per slot                        |   | 1                       |  |  |  |  |  |  |
| Binary Channel Bits Per<br>slot                          |   |                         |  |  |  |  |  |  |
| For slots with RMSI <sup>Note 2,<br/>Note 4</sup>        | bits  | 5184                    |  |  |  |  |  |  |
| For slots without RMSI<br><sup>Note 6</sup>              | bits  | 6048                    |  |  |  |  |  |  |
| Note 1:  | Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.   |                         |  |  |  |  |  |  |
| Note 2:  | PDSCH is scheduled on the slots with RMSI.  |                         |  |  |  |  |  |  |
| Note 3:  | If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].  |                         |  |  |  |  |  |  |
| Note 4:  | Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.                       |                         |  |  |  |  |  |  |
| Note 5:  | PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.  |                         |  |  |  |  |  |  |
| Note 6:  | Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.                       |                         |  |  |  |  |  |  |
| Note 7:  | When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms - drx-InactivityTimer) from timing when drx-onDurationTimer starts, unless otherwise specified in the test case |                         |  |  |  |  |  |  |

A.3.1.1.2 TDD

Table A.3.1.1.2-1: PDSCH Reference Measurement Channels for SCS=15kHz

| Parameter   | Unit  | Value                |                      |  |  |  |  |
|---|-------|----------------------|----------------------|--|--|--|--|
|   |       | SR.1.1<br>TDD        | SR.1.2<br>TDD        |  |  |  |  |
| Reference channel   |       |                      |                      |  |  |  |  |
| Channel bandwidth   | MHz   | Defined in test case | Defined in test case |  |  |  |  |
| Number of transmitter antennas  |       | 1                    | 1                    |  |  |  |  |
| Allocated resource blocks for PDSCH <sup>Note 1</sup>   |       | 24                   | 24                   |  |  |  |  |
| Allocated slots per Radio Frame   |       |                      |                      |  |  |  |  |
| Radio frame containing SSB  | slots | Note 5               | Note 5               |  |  |  |  |
| Radio frame not containing SSB  | slots | 4                    | 6                    |  |  |  |  |
| MCS table   |       | 64QAM                | 64QAM                |  |  |  |  |
| MCS index   |       | 4                    | 4                    |  |  |  |  |
| Modulation  |       | QPSK                 | QPSK                 |  |  |  |  |
| Target Coding Rate  |       | 1/3                  | 1/3                  |  |  |  |  |
| Number of control symbols   |       | 2                    | 2                    |  |  |  |  |
| PDSCH mapping type  |       | Type A               | Type A               |  |  |  |  |
| Information Bit Payload   |       |                      |                      |  |  |  |  |
| For slots with RMSI <sup>Note 2</sup>   | bits  | 1608                 | 1608                 |  |  |  |  |
| For slots without RMSI  | bits  | 1864                 | 1864                 |  |  |  |  |
| For special slots   | bits  | N/A                  | 1128                 |  |  |  |  |
| Number of Code Blocks per slot  |       | 1                    | 1                    |  |  |  |  |
| Binary Channel Bits Per slot  |       |                      |                      |  |  |  |  |
| For slots with RMSI <sup>Note 2, Note 4</sup>   | bits  | 5184                 | 5184                 |  |  |  |  |
| For slots without RMSI <sup>Note 6</sup>  | bits  | 6048                 | 6048                 |  |  |  |  |
| For special slots <sup>Note 6</sup>   | bits  | -                    | 3744                 |  |  |  |  |
| <p>Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.</p> <p>Note 2: PDSCH is scheduled on the slots with RMSI.</p> <p>Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].</p> <p>Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.</p> <p>Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.</p> <p>Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.</p> <p>Note 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms - drx-InactivityTimer) from timing when drx-onDurationTimer starts, unless otherwise specified in the test case</p> |       |                      |                      |  |  |  |  |

**Table A.3.1.1.2-2: PDSCH Reference Measurement Channels for SCS=30kHz**

| Parameter  | Unit  | Value                   |  |  |  |  |  |
|--|-------|-------------------------|--|--|--|--|--|
| Reference channel  |       | SR.2.1<br>TDD           |  |  |  |  |  |
| Channel bandwidth  | MHz   | Defined in<br>test case |  |  |  |  |  |
| Number of transmitter<br>antennas  |       | 1                       |  |  |  |  |  |
| Allocated resource blocks<br>for PDSCH <sup>Note 1</sup>   |       | 24                      |  |  |  |  |  |
| Allocated slots per Radio<br>Frame   |       |                         |  |  |  |  |  |
| Radio frame containing<br>SSB  | slots | Note 5                  |  |  |  |  |  |
| Radio frame not<br>containing SSB  | slots | 10                      |  |  |  |  |  |
| MCS table  |       | 64QAM                   |  |  |  |  |  |
| MCS index  |       | 4                       |  |  |  |  |  |
| Modulation   |       | QPSK                    |  |  |  |  |  |
| Target Coding Rate   |       | 1/3                     |  |  |  |  |  |
| Number of control symbols  |       | 2                       |  |  |  |  |  |
| PDSCH mapping type   |       | Type A                  |  |  |  |  |  |
| Information Bit Payload  |       |                         |  |  |  |  |  |
| For slots with RMSI <sup>Note 2</sup>  | bits  | 1608                    |  |  |  |  |  |
| For slots without RMSI   | bits  | 1864                    |  |  |  |  |  |
| Number of Code Blocks<br>per slot  |       | 1                       |  |  |  |  |  |
| Binary Channel Bits Per<br>slot  |       |                         |  |  |  |  |  |
| For slots with RMSI <sup>Note 2,<br/>Note 4</sup>  | bits  | 5184                    |  |  |  |  |  |
| For slots without RMSI<br><sup>Note 6</sup>  | bits  | 6048                    |  |  |  |  |  |
| <p>Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.</p> <p>Note 2: PDSCH is scheduled on the slots with RMSI.</p> <p>Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].</p> <p>Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.</p> <p>Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.</p> <p>Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1..</p> <p>Note 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms - drx-InactivityTimer) from timing when drx-onDurationTimer starts, unless otherwise specified in the test case</p> |       |                         |  |  |  |  |  |

**Table A.3.1.1.2-3: PDSCH Reference Measurement Channels for SCS=120kHz**

| Parameter   | Unit  | Value                |                      |                      |  |  |  |  |
|---|-------|----------------------|----------------------|----------------------|--|--|--|--|
|   |       | SR.3.1<br>TDD        | SR.3.2<br>TDD        | SR.3.3<br>TDD        |  |  |  |  |
| Reference channel   |       | SR.3.1<br>TDD        | SR.3.2<br>TDD        | SR.3.3<br>TDD        |  |  |  |  |
| Channel bandwidth   | MHz   | 100                  | 100                  | 100                  |  |  |  |  |
| Number of transmitter antennas  |       | 1                    | 1                    | 1                    |  |  |  |  |
| Allocated resource blocks for PDSCH   |       | 24 <sup>Note 1</sup> | 24 <sup>Note 7</sup> | 48 <sup>Note 7</sup> |  |  |  |  |
| Allocated slots per Radio Frame   |       |                      |                      |                      |  |  |  |  |
| Radio frame containing SSB  | slots | Note 5               | Note 5               | Note 5               |  |  |  |  |
| Radio frame not containing SSB  | slots | 48                   | 48                   | 48                   |  |  |  |  |
| MCS table   |       | 64QAM                | 64QAM                | 64QAM                |  |  |  |  |
| MCS index   |       | 4                    | 4                    | 4                    |  |  |  |  |
| Modulation  |       | QPSK                 | QPSK                 | QPSK                 |  |  |  |  |
| Target Coding Rate  |       | 1/3                  | 1/3                  | 1/3                  |  |  |  |  |
| Number of control symbols   |       | 2                    | 2                    | 2                    |  |  |  |  |
| PDSCH mapping type  |       | Type A               | Type A               | Type A               |  |  |  |  |
| Information Bit Payload   |       |                      |                      |                      |  |  |  |  |
| For slots with RMSI   | bits  | 1608                 | 1608                 | 3104                 |  |  |  |  |
| For slots without RMSI  | bits  | 1864                 | 1864                 | 3624                 |  |  |  |  |
| Number of Code Blocks per slot  |       | 1                    | 1                    | 1                    |  |  |  |  |
| Binary Channel Bits Per slot  |       |                      |                      |                      |  |  |  |  |
| For slots with RMSI <sup>Note 4</sup>   | bits  | 5184                 | 5184                 | 10368                |  |  |  |  |
| For slots without RMSI <sup>Note 6</sup>  | bits  | 6048                 | 6048                 | 12096                |  |  |  |  |
| <p>Note 1: Allocated in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block</p> <p>Note 2: Void</p> <p>Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].</p> <p>Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.</p> <p>Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.</p> <p>Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.</p> <p>Note 7: Allocated in the same resource blocks as the CORESET.</p> <p>Note 8: When DRX is configured, PDSCH is scheduled only while <i>drx-onDurationTimer</i> is running, unless otherwise specified in the test case.</p> |       |                      |                      |                      |  |  |  |  |



## A.3.1A Reference measurement channels under CCA

### A.3.1A.1 PDSCH

#### A.3.1A.1.1 TDD

**Table A.3.1A.1.1-1: PDSCH Reference Measurement Channels for SCS=30kHz**

| Parameter  | Unit  | Value         |  |  |  |  |  |
|--|-------|---------------|--|--|--|--|--|
| Reference channel  |       | SR.1.1<br>CCA |  |  |  |  |  |
| Channel bandwidth  | MHz   | 40            |  |  |  |  |  |
| Number of transmitter antennas   |       | 1             |  |  |  |  |  |
| Allocated resource blocks for PDSCH <sup>Note 1</sup>  |       | 24            |  |  |  |  |  |
| Allocated slots per Radio Frame  |       |               |  |  |  |  |  |
| Radio frame containing SSB   | slots | Note 5        |  |  |  |  |  |
| Radio frame not containing SSB   | slots | Note 7        |  |  |  |  |  |
| MCS table  |       | 64QAM         |  |  |  |  |  |
| MCS index  |       | 4             |  |  |  |  |  |
| Modulation   |       | QPSK          |  |  |  |  |  |
| Target Coding Rate   |       | 1/3           |  |  |  |  |  |
| Number of control symbols  |       | 2             |  |  |  |  |  |
| PDSCH mapping type   |       | Type A        |  |  |  |  |  |
| Information Bit Payload  |       |               |  |  |  |  |  |
| For slots with RMSI <sup>Note 2</sup>  | bits  | 1608          |  |  |  |  |  |
| For slots without RMSI   | bits  | 1864          |  |  |  |  |  |
| Number of Code Blocks per slot   |       | 1             |  |  |  |  |  |
| Binary Channel Bits Per slot   |       |               |  |  |  |  |  |
| For slots with RMSI <sup>Note 2, Note 4</sup>  | bits  | 5184          |  |  |  |  |  |
| For slots without RMSI <sup>Note 6</sup>   | bits  | 6048          |  |  |  |  |  |
| <p>Note 1: Allocated outside the discovery burst transmission window in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.</p> <p>Note 2: PDSCH is scheduled on the slots with RMSI.</p> <p>Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].</p> <p>Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.</p> <p>Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10A.</p> <p>Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.</p> <p>Note 7: PDSCH is transmitted during the RMC burst as specified in A.3.1A.5.</p> |       |               |  |  |  |  |  |

## A.3.1A.2 CORESET for RMSI scheduling

## A.3.1A.2.1 TDD

Table A.3.1A.2.1-1: RMSI CORESET Reference Channel for SCS=30KHz

| Parameter   | Unit    | Value         |  |  |  |  |  |
|---|---------|---------------|--|--|--|--|--|
| Reference channel   |         | CR.1.1<br>CCA |  |  |  |  |  |
| Channel bandwidth   | MHz     | 40            |  |  |  |  |  |
| Subcarrier spacing  | kHz     | 30            |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET <sup>Note 7</sup>  |         | 48            |  |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration <sup>Note 7</sup>   |         | Pattern 1     |  |  |  |  |  |
| Offset between SSB and RMSI CORESET <sup>Note 3, 7</sup>  | RB      | 0 (Note 8)    |  |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET <sup>Note 4</sup>  |         | Index 0       |  |  |  |  |  |
| Number of transmitter antennas  |         | 1             |  |  |  |  |  |
| Duration of RMSI CORESET <sup>Note 7</sup>  | symbols | 2             |  |  |  |  |  |
| DCI Format <sup>Note 1</sup>  |         | Note 2        |  |  |  |  |  |
| Aggregation level   | CCE     | 8             |  |  |  |  |  |
| DMRS precoder granularity   |         | 6             |  |  |  |  |  |
| REG bundle size   |         | 6             |  |  |  |  |  |
| Mapping from REG to CCE   |         | Distributed   |  |  |  |  |  |
| Cell ID   |         | Note 5        |  |  |  |  |  |
| Payload (without CRC)   | bits    | Note 6        |  |  |  |  |  |
| <p>Note 1: DCI formats are defined in TS 38.212.</p> <p>Note 2: DCI format shall depend upon the test configuration.</p> <p>Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.</p> <p>Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].</p> <p>Note 5: Cell ID shall depend upon the test configuration.</p> <p>Note 6: Payload size shall depend upon the test configuration.</p> <p>Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 4 in Table 13-4A in TS 38.213 [3].</p> <p>Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.</p> |         |               |  |  |  |  |  |

### A.3.1A.3 CORESET for RMC scheduling

#### A.3.1A.3.1 TDD

**Table A.3.1A.3.1-1: Control Channel RMC with SCS=30KHz**

| Parameter  | Unit    | Value                   |                         |                         |  |  |  |
|--|---------|-------------------------|-------------------------|-------------------------|--|--|--|
|  |         | CCR.1.1<br>CCA          | CCR.1.2<br>CCA          | CCR.1.3<br>CCA          |  |  |  |
| Reference channel  |         |                         |                         |                         |  |  |  |
| Channel bandwidth  | MHz     | 40                      | 40                      | 40                      |  |  |  |
| Subcarrier spacing   | kHz     | 30                      | 30                      | 30                      |  |  |  |
| Allocated resource blocks for CORESET <sup>Note 3</sup>  |         | 24                      | 24                      | 18                      |  |  |  |
| Number of transmitter antennas   |         | 1                       | 1                       | 1                       |  |  |  |
| Duration of CORESET  | symbols | 2                       | 2                       | 2                       |  |  |  |
| REG bundle size  |         | 6                       | 6                       | 6                       |  |  |  |
| DMRS precoder granularity  |         | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |  |
| CCE to REG mapping   |         | Interleaved             | Interleaved             | Interleaved             |  |  |  |
| Interleave n_shift   |         | 0                       | 0                       | 0                       |  |  |  |
| Interleave size  |         | 2                       | 2                       | 2                       |  |  |  |
| Beamforming Pre-Coder  |         | N/A                     | N/A                     | N/A                     |  |  |  |
| Aggregation level  | CCE     | 4                       | 8                       | 4                       |  |  |  |
| DCI formats  |         | Note 1                  | Note 1                  | Note 1                  |  |  |  |
| Payload size (without CRC)   | bits    | Note 2                  | Note 2                  | Note 2                  |  |  |  |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration.<br>Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. |         |                         |                         |                         |  |  |  |

### A.3.1A.4 TDD UL/DL configuration

**Table A.3.1A.4-1: TDD UL/DL configuration for SCS=30kHz**

| Parameter  | Unit | Value                       |  |
|--|------|-----------------------------|--|
|  |      | TDDConf.1.1 CCA             |  |
| Reference channel  |      |                             |  |
| referenceSubcarrierSpacing   | kHz  | N/A                         |  |
| TDD UL/DL pattern 1 <sup>Note 2, Note 3</sup>  |      | '3D1S4U'<br>S='6DL:4GP:4UL' |  |
| dl-UL-TransmissionPeriodicity  | ms   | N/A                         |  |
| nrofDownlinkSlots  |      | N/A                         |  |
| nrofDownlinkSymbols  |      | N/A                         |  |
| nrofUplinkSlot   |      | N/A                         |  |
| nrofUplinkSymbols  |      | N/A                         |  |
| TDD UL/DL pattern 2 <sup>Note 2, Note 3</sup>  |      | 'DD'                        |  |
| dl-UL-TransmissionPeriodicity  | ms   | N/A                         |  |
| nrofDownlinkSlots  |      | N/A                         |  |
| nrofDownlinkSymbols  |      | N/A                         |  |
| nrofUplinkSlot   |      | N/A                         |  |
| nrofUplinkSymbols  |      | N/A                         |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].<br>Note 2: Do not configure <i>tdd-UL-DL-ConfigurationCommon</i> using RRC configuration<br>Note 3: The UE will be scheduled via DCI according to the TDD pattern defined in the table. |      |                             |  |

### A.3.1A.5 RMC burst transmission model

RMC not conveying RMSI is scheduled during the RMC burst. The length of the transmission burst in slots is defined as  $N$ . The burst transmission format is determined according to the steps below:

1. Select  $N$  randomly from a given set of the number of slots  $S_1 = \{1,3,5\}$  with equal probability as the total length of RMC burst transmission format.
2. A uniform random variable from 0 to 1 is generated. If the random variable is less than  $P_{CCA\_DL}$ , a burst of  $N$  fully occupied slots is transmitted. Otherwise, the RMC burst transmission is muted and the muting duration is the same as the number  $N$  of slots for determined burst format.

RMC burst transmission is scheduled outside discovery burst transmission window. If transmission occurred in the previous slot, transmission is muted for a duration of one slot. Additionally, if the start time of the candidate RMC burst transmission is within 5 slots of the start of the discovery burst transmission window, RMC transmission is not performed.

## A.3.1.2 CORESET for RMSI scheduling

## A.3.1.2.1 FDD

Table A.3.1.2.1-1: RMSI CORESET Reference Channel for FDD with SCS=15KHz

| Parameter   | Unit    | Value                   |  |  |  |  |  |
|---|---------|-------------------------|--|--|--|--|--|
| Reference channel   |         | CR.1.1<br>FDD           |  |  |  |  |  |
| Channel bandwidth   | MHz     | Defined in<br>test case |  |  |  |  |  |
| Subcarrier spacing for<br>RMSI CORESET  | kHz     | 15                      |  |  |  |  |  |
| Allocated resource blocks<br>for RMSI CORESET <sup>Note 7</sup>   |         | 24                      |  |  |  |  |  |
| Subcarrier spacing for<br>SSB   | kHz     | 15                      |  |  |  |  |  |
| SSB and RMSI CORESET<br>multiplexing configuration<br><sup>Note 7</sup>   |         | Pattern 1               |  |  |  |  |  |
| Offset between SSB and<br>RMSI CORESET <sup>Note 3, 7</sup>   | RB      | 0 (Note8)               |  |  |  |  |  |
| Configuration of PDCCH<br>monitoring occasions for<br>RMSI CORESET <sup>Note 4</sup>  |         | Index 4                 |  |  |  |  |  |
| Number of transmitter<br>antennas   |         | 1                       |  |  |  |  |  |
| Duration of RMSI<br>CORESET <sup>Note 7</sup>   | symbols | 2                       |  |  |  |  |  |
| DCI Format <sup>Note 1</sup>  |         | Note 2                  |  |  |  |  |  |
| Aggregation level   | CCE     | 8                       |  |  |  |  |  |
| DMRS precoder<br>granularity  |         | 6                       |  |  |  |  |  |
| REG bundle size   |         | 6                       |  |  |  |  |  |
| Mapping from REG to<br>CCE  |         | Distributed             |  |  |  |  |  |
| Cell ID   |         | Note 5                  |  |  |  |  |  |
| Payload (without CRC)   | bits    | Note 6                  |  |  |  |  |  |
| <p>Note 1: DCI formats are defined in TS 38.212.</p> <p>Note 2: DCI format shall depend upon the test configuration.</p> <p>Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.</p> <p>Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].</p> <p>Note 5: Cell ID shall depend upon the test configuration.</p> <p>Note 6: Payload size shall depend upon the test configuration.</p> <p>Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3]</p> <p>Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.</p> |         |                         |  |  |  |  |  |

A.3.1.2.2 TDD

**Table A.3.1.2.2-1: RMSI CORESET Reference Channel for TDD with SCS=15KHz**

| Parameter  | Unit    | Value                   |  |  |  |  |  |
|--|---------|-------------------------|--|--|--|--|--|
| Reference channel  |         | CR.1.1<br>TDD           |  |  |  |  |  |
| Channel bandwidth  | MHz     | Defined in<br>test case |  |  |  |  |  |
| Subcarrier spacing   | kHz     | 15                      |  |  |  |  |  |
| Allocated resource blocks<br>for RMSI CORESET <sup>Note 7</sup>  |         | 24                      |  |  |  |  |  |
| SSB and RMSI CORESET<br>multiplexing configuration<br><sup>Note 7</sup>  |         | Pattern 1               |  |  |  |  |  |
| Offset between SSB and<br>RMSI CORESET <sup>Note 3, 7</sup>  | RB      | 0 (Note 8)              |  |  |  |  |  |
| Configuration of PDCCH<br>monitoring occasions for<br>RMSI CORESET <sup>Note 4</sup>   |         | Index 4                 |  |  |  |  |  |
| Number of transmitter<br>antennas  |         | 1                       |  |  |  |  |  |
| Duration of RMSI<br>CORESET <sup>Note 7</sup>  | symbols | 2                       |  |  |  |  |  |
| DCI Format <sup>Note 1</sup>   |         | Note 2                  |  |  |  |  |  |
| Aggregation level  | CCE     | 8                       |  |  |  |  |  |
| DMRS precoder<br>granularity   |         | 6                       |  |  |  |  |  |
| REG bundle size  |         | 6                       |  |  |  |  |  |
| Mapping from REG to<br>CCE   |         | Distributed             |  |  |  |  |  |
| Cell ID  |         | Note 5                  |  |  |  |  |  |
| Payload (without CRC)  | bits    | Note 6                  |  |  |  |  |  |
| <p>Note 1: DCI formats are defined in TS 38.212.</p> <p>Note 2: DCI format shall depend upon the test configuration.</p> <p>Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.</p> <p>Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].</p> <p>Note 5: Cell ID shall depend upon the test configuration.</p> <p>Note 6: Payload size shall depend upon the test configuration.</p> <p>Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3].</p> <p>Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.</p> |         |                         |  |  |  |  |  |

Table A.3.1.2.2-2: RMSI CORESET Reference Channel for TDD with SCS=30KHz

| Parameter  | Unit    | Value                   |  |  |  |  |  |
|--|---------|-------------------------|--|--|--|--|--|
| Reference channel  |         | CR.2.1<br>TDD           |  |  |  |  |  |
| Channel bandwidth  | MHz     | Defined in<br>test case |  |  |  |  |  |
| Subcarrier spacing   | kHz     | 30                      |  |  |  |  |  |
| Allocated resource blocks<br>for RMSI CORESET <sup>Note 7</sup>  |         | 24                      |  |  |  |  |  |
| SSB and RMSI CORESET<br>multiplexing configuration<br><sup>Note 7</sup>  |         | Pattern 1               |  |  |  |  |  |
| Offset between SSB and<br>RMSI CORESET <sup>Note 3, 7</sup>  | RB      | 0 (Note 8)              |  |  |  |  |  |
| Configuration of PDCCH<br>monitoring occasions for<br>RMSI CORESET <sup>Note 4</sup>   |         | Index 4                 |  |  |  |  |  |
| Number of transmitter<br>antennas  |         | 1                       |  |  |  |  |  |
| Duration of RMSI<br>CORESET <sup>Note 7</sup>  | symbols | 2                       |  |  |  |  |  |
| DCI Format <sup>Note 1</sup>   |         | Note 2                  |  |  |  |  |  |
| Aggregation level  | CCE     | 8                       |  |  |  |  |  |
| DMRS precoder<br>granularity   |         | 6                       |  |  |  |  |  |
| REG bundle size  |         | 6                       |  |  |  |  |  |
| Mapping from REG to<br>CCE   |         | Distributed             |  |  |  |  |  |
| Cell ID  |         | Note 5                  |  |  |  |  |  |
| Payload (without CRC)  | bits    | Note 6                  |  |  |  |  |  |
| <p>Note 1: DCI formats are defined in TS 38.212.</p> <p>Note 2: DCI format shall depend upon the test configuration.</p> <p>Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.</p> <p>Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].</p> <p>Note 5: Cell ID shall depend upon the test configuration.</p> <p>Note 6: Payload size shall depend upon the test configuration.</p> <p>Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-6 in TS 38.213 [3].</p> <p>Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.</p> |         |                         |  |  |  |  |  |

Table A.3.1.2.2-3: RMSI CORESET Reference Channel for TDD with SCS=120KHz

| Parameter   | Unit    | Value                |                      |  |  |  |  |
|---|---------|----------------------|----------------------|--|--|--|--|
|   |         | CR.3.1<br>TDD        | CR.3.2<br>TDD        |  |  |  |  |
| Reference channel   |         | CR.3.1<br>TDD        | CR.3.2<br>TDD        |  |  |  |  |
| Channel bandwidth   | MHz     | 100                  | 100                  |  |  |  |  |
| Subcarrier spacing  | kHz     | 120                  | 120                  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET  |         | 24 <sup>Note 7</sup> | 48 <sup>Note 9</sup> |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration   |         | Pattern 1<br>Note 7  | Pattern 1<br>Note 9  |  |  |  |  |
| Offset between SSB and RMSI CORESET <sup>Note 3</sup>   | RB      | 0 (Note 8)<br>Note 7 | 0 (Note 8)<br>Note 9 |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET <sup>Note 4</sup>  |         | Index 4              | Index 4              |  |  |  |  |
| Number of transmitter antennas  |         | 1                    | 1                    |  |  |  |  |
| Duration of RMSI CORESET  | symbols | 2 <sup>Note 7</sup>  | 2 <sup>Note 9</sup>  |  |  |  |  |
| DCI Format <sup>Note 1</sup>  |         | Note 2               | Note 2               |  |  |  |  |
| Aggregation level   | CCE     | 8                    | 8                    |  |  |  |  |
| DMRS precoder granularity   |         | 6                    | 6                    |  |  |  |  |
| REG bundle size   |         | 6                    | 6                    |  |  |  |  |
| Mapping from REG to CCE   |         | Distributed          | Distributed          |  |  |  |  |
| Cell ID   |         | Note 5               | Note 5               |  |  |  |  |
| Payload (without CRC)   | bits    | Note 6               | Note 6               |  |  |  |  |
| <p>Note 1: DCI formats are defined in TS 38.212.</p> <p>Note 2: DCI format shall depend upon the test configuration.</p> <p>Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.</p> <p>Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-12 in TS 38.213 [3].</p> <p>Note 5: Cell ID shall depend upon the test configuration.</p> <p>Note 6: Payload size shall depend upon the test configuration.</p> <p>Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-8 in TS 38.213 [3].</p> <p>Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.</p> <p>Note 9: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 2 in Table 13-10 in TS 38.213 [3].</p> |         |                      |                      |  |  |  |  |



## A.3.1.3 CORESET for RMC scheduling

## A.3.1.3.1 FDD

Table A.3.1.3.1-1: Control Channel RMC for FDD with SCS=15KHz

| Parameter   | Unit    | Value                         |                               |                               |                               |                               |  |
|---|---------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|--|
|   |         | CCR.1.1<br>FDD                | CCR.1.2<br>FDD                | CCR.1.3<br>FDD                | CCR.1.4<br>FDD                | CCR.1.5<br>FDD                |  |
| Reference channel   |         | CCR.1.1<br>FDD                | CCR.1.2<br>FDD                | CCR.1.3<br>FDD                | CCR.1.4<br>FDD                | CCR.1.5<br>FDD                |  |
| Channel bandwidth   | MHz     | Defined in<br>test case       | Defined in<br>test case       | Defined in<br>test case       | Defined in<br>test case       | Defined in<br>test case       |  |
| Subcarrier spacing  | kHz     | 15                            | 15                            | 15                            | 15                            | 15                            |  |
| Allocated resource blocks for<br>CORESET <sup>Note 3</sup>                      |         | 24                            | 18                            | 24                            | 18                            | 24                            |  |
| Number of transmitter<br>antennas   |         | 1                             | 1                             | 1                             | 1                             | 1                             |  |
| Duration of CORESET   | symbols | 2                             | 2                             | 2                             | 2                             | 2                             |  |
| REG bundle size   |         | 6                             | 6                             | 6                             | 6                             | 0011000<br>0000000            |  |
| monitoringSymbolsWithinSlot   |         | 1100000<br>0000000            | 1100000<br>0000000            | 1100000<br>0000000            | 1100000<br>0000000            | 6                             |  |
| DMRS precoder granularity   |         | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size |  |
| CCE to REG mapping  |         | Interleaved                   | Interleaved                   | Interleaved                   | Interleaved                   | Interleaved                   |  |
| Interleave n_shift  |         | 0                             | 0                             | 0                             | 0                             | 0                             |  |
| Interleave size   |         | 2                             | 2                             | 2                             | 2                             | 2                             |  |
| Beamforming Pre-Coder   |         | N/A                           | N/A                           | N/A                           | N/A                           | N/A                           |  |
| Aggregation level   | CCE     | 4                             | 2                             | 8                             | 4                             | 4                             |  |
| DCI formats   |         | Note 1                        | Note 1                        | Note 1                        | Note 1                        | Note 1                        |  |
| Payload size (without CRC)  | bits    | Note 2                        | Note 2                        | Note 2                        | Note 2                        | Note 2                        |  |
| Note 1: DCI format shall depend upon the test configuration.                    |         |                               |                               |                               |                               |                               |  |
| Note 2: Payload size shall depend upon the test configuration                   |         |                               |                               |                               |                               |                               |  |
| Note 3: Allocated in the resource blocks where the associated RMC is scheduled. |         |                               |                               |                               |                               |                               |  |

## A.3.1.3.2 TDD

Table A.3.1.3.2-1: Control Channel RMC for TDD with SCS=15KHz

| Parameter  | Unit    | Value                         |                               |                               |                               |                               |  |
|--|---------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|--|
|  |         | CCR.1.1<br>TDD                | CCR.1.2<br>TDD                | CCR.1.3<br>TDD                | CCR.1.4<br>TDD                | CCR.1.5<br>TDD                |  |
| Reference channel  |         | CCR.1.1<br>TDD                | CCR.1.2<br>TDD                | CCR.1.3<br>TDD                | CCR.1.4<br>TDD                | CCR.1.5<br>TDD                |  |
| Channel bandwidth  | MHz     | Defined in<br>test case       | Defined in<br>test case       | Defined in<br>test case       | Defined in<br>test case       | Defined in<br>test case       |  |
| Subcarrier spacing   | kHz     | 15                            | 15                            | 15                            | 15                            | 15                            |  |
| Allocated resource blocks for<br>CORESET <sup>Note 3</sup>   |         | 24                            | 18                            | 24                            | 18                            | 18                            |  |
| Number of transmitter<br>antennas  |         | 1                             | 1                             | 1                             | 1                             | 1                             |  |
| Duration of CORESET  | symbols | 2                             | 2                             | 2                             | 2                             | 2                             |  |
| monitoringSymbolsWithinSlot  |         | 1100000<br>0000000            | 1100000<br>0000000            | 1100000<br>0000000            | 1100000<br>0000000            | 0011000<br>0000000            |  |
| REG bundle size  |         | 6                             | 6                             | 6                             | 6                             | 6                             |  |
| DMRS precoder granularity  |         | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size | Same as<br>REG<br>bundle size |  |
| CCE to REG mapping   |         | Interleaved                   | Interleaved                   | Interleaved                   | Interleaved                   | Interleaved                   |  |
| Interleave n_shift   |         | 0                             | 0                             | 0                             | 0                             | 0                             |  |
| Interleave size  |         | 2                             | 2                             | 2                             | 2                             | 2                             |  |
| Beamforming Pre-Coder  |         | N/A                           | N/A                           | N/A                           | N/A                           | N/A                           |  |
| Aggregation level  | CCE     | 4                             | 2                             | 8                             | 4                             | 4                             |  |
| DCI formats  |         | Note 1                        | Note 1                        | Note 1                        | Note 1                        | Note 1                        |  |
| Payload size (without CRC)   | bits    | Note 2                        | Note 2                        | Note 2                        | Note 2                        | Note 2                        |  |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration<br>Note 3: Allocated in the resource blocks where the associated RMC is scheduled. |         |                               |                               |                               |                               |                               |  |

Table A.3.1.3.2-2: Control Channel RMC for TDD with SCS=30KHz

| Parameter  | Unit    | Value                   |                         |                         |                         |  |  |
|--|---------|-------------------------|-------------------------|-------------------------|-------------------------|--|--|
|  |         | CCR.2.1<br>TDD          | CCR.2.2<br>TDD          | CCR.2.3<br>TDD          | CCR.2.4<br>TDD          |  |  |
| Reference channel  |         |                         |                         |                         |                         |  |  |
| Channel bandwidth  | MHz     | Defined in test case    | Defined in test case    | Defined in test case    | Defined in test case    |  |  |
| Subcarrier spacing   | kHz     | 30                      | 30                      | 30                      | 30                      |  |  |
| Allocated resource blocks for CORESET <sup>Note 3</sup>  |         | 24                      | 24                      | 18                      | 18                      |  |  |
| Number of transmitter antennas   |         | 1                       | 1                       | 1                       | 1                       |  |  |
| Duration of CORESET  | symbols | 2                       | 2                       | 2                       | 2                       |  |  |
| REG bundle size  |         | 6                       | 6                       | 6                       | 6                       |  |  |
| DMRS precoder granularity  |         | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |
| CCE to REG mapping   |         | Interleaved             | Interleaved             | Interleaved             | Interleaved             |  |  |
| Interleave n_shift   |         | 0                       | 0                       | 0                       | 0                       |  |  |
| Interleave size  |         | 2                       | 2                       | 2                       | 2                       |  |  |
| Beamforming Pre-Coder  |         | N/A                     | N/A                     | N/A                     | N/A                     |  |  |
| Aggregation level  | CCE     | 4                       | 8                       | 4                       | 2                       |  |  |
| DCI formats  |         | Note 1                  | Note 1                  | Note 1                  | Note 1                  |  |  |
| Payload size (without CRC)   | bits    | Note 2                  | Note 2                  | Note 2                  | Note 2                  |  |  |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration.<br>Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. |         |                         |                         |                         |                         |  |  |

Table A.3.1.3.2-3: Control Channel RMC for TDD with SCS=120KHz

| Parameter  | Unit | Value                            |                                  |                                  |                                  |                                  |                                  |                                  |
|--|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
|  |      | CCR.3.1<br>TDD                   | CCR.3.2<br>TDD                   | CCR.3.3<br>TDD                   | CCR.3.4<br>TDD                   | CCR.3.5<br>TDD                   | CCR.3.6<br>TDD                   | CCR.3.7<br>TDD                   |
| Reference channel  |      |                                  |                                  |                                  |                                  |                                  |                                  |                                  |
| Channel bandwidth  | MHz  | 100                              | 100                              | 100                              | 100                              | 100                              | 100                              | 100                              |
| Subcarrier spacing   | kHz  | 120                              | 120                              | 120                              | 120                              | 120                              | 120                              | 120                              |
| Allocated resource blocks for CORESET <sup>Note 3</sup>  |      | 24                               | 24                               | 24                               | 24                               | 24                               | 24                               | 48                               |
| Number of transmitter antennas   |      | 1                                | 1                                | 1                                | 1                                | 1                                | 1                                | 1                                |
| monitoringSlotPeriodicityAndOffset   |      | sl160<br>0                       | sl160<br>0                       | sl160<br>80                      | sl160<br>0                       | sl160<br>0                       | sl160<br>80                      | sl160<br>0                       |
| monitoringSlotPeriodicityAndOffset <sup>Note 4</sup>   |      | 1100000<br>0000000               | 0011000<br>0000000               | 1100000<br>0000000               | 1100000<br>0000000               | 0011000<br>0000000               | 1100000<br>0000000               | 1100000<br>0000000               |
| Duration of CORESET  | slot | 1                                | 1                                | 1                                | 1                                | 1                                | 1                                | 1                                |
| REG bundle size  |      | 6                                | 6                                | 6                                | 6                                | 6                                | 6                                | 6                                |
| DMRS precoder granularity  |      | Same as<br>REG<br>bundle<br>size | Same as<br>REG<br>bundle<br>size | Same as<br>REG<br>bundle<br>size | Same as<br>REG<br>bundle<br>size | Same as<br>REG<br>bundle<br>size | Same as<br>REG<br>bundle<br>size | Same as<br>REG<br>bundle<br>size |
| CCE to REG mapping   |      | Interleaved                      | Interleaved                      | Interleaved                      | Interleaved                      | Interleaved                      | Interleaved                      | Interleaved                      |
| Interleave n_shift   |      | 0                                | 0                                | 0                                | 0                                | 0                                | 0                                | 0                                |
| Interleave size  |      | 2                                | 2                                | 2                                | 2                                | 2                                | 2                                | 2                                |
| Beamforming Pre-Coder  |      | N/A                              | N/A                              | N/A                              | N/A                              | N/A                              | N/A                              | N/A                              |
| Aggregation level  | CCE  | 4                                | 4                                | 4                                | 8                                | 8                                | 8                                | 4                                |
| DCI formats  |      | Note 1                           | Note 1                           | Note 1                           | Note 1                           | Note 1                           | Note 1                           | Note 1                           |
| Payload size (without CRC)   | bits | Note 2                           | Note 2                           | Note 2                           | Note 2                           | Note 2                           | Note 2                           | Note 2                           |
| <p>Note 1: DCI format shall depend upon the test configuration.</p> <p>Note 2: Payload size shall depend upon the test configuration.</p> <p>Note 3: Allocated in the same resource blocks where the associated PDSCH RMC is scheduled.</p> <p>Note 4: <i>monitoringSlotPeriodicityAndOffset</i> is set to "sl1 0" if it is specifically stated that cell(s) configured with one of the control channel RMCs above shall transmit PDCCHs continuously.</p> |      |                                  |                                  |                                  |                                  |                                  |                                  |                                  |

## A.3.1.4 TDD UL/DL configuration

Table A.3.1.4-1: TDD UL/DL configuration for SCS=15kHz

| Parameter  | Unit | Value                      |  |  |
|--|------|----------------------------|--|--|
| Reference channel  |      | TDDConf.1.1                |  |  |
| <i>referenceSubcarrierSpacing</i>                        | kHz  | 15                         |  |  |
| TDD UL/DL pattern 1 <sup>Note 2</sup>                    |      | 'DSUU'<br>S='10DL:2GP:2UL' |  |  |
| <i>dl-UL-TransmissionPeriodicity</i>                     | ms   | 4                          |  |  |
| <i>nrofDownlinkSlots</i>                                 |      | 1                          |  |  |
| <i>nrofDownlinkSymbols</i>                               |      | 10                         |  |  |
| <i>nrofUplinkSlot</i>                                    |      | 2                          |  |  |
| <i>nrofUplinkSymbols</i>                                 |      | 2                          |  |  |
| TDD UL/DL pattern 2 <sup>Note 2</sup>                    |      | 'D'                        |  |  |
| <i>dl-UL-TransmissionPeriodicity</i>                     | ms   | 1                          |  |  |
| <i>nrofDownlinkSlots</i>                                 |      | 1                          |  |  |
| <i>nrofDownlinkSymbols</i>                               |      | 0                          |  |  |
| <i>nrofUplinkSlot</i>                                    |      | 0                          |  |  |
| <i>nrofUplinkSymbols</i>                                 |      | 0                          |  |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2]. |      |                            |  |  |
| Note 2: For information                                  |      |                            |  |  |

Table A.3.1.4-2: TDD UL/DL configuration for SCS=30kHz

| Parameter  | Unit | Value                       |                              |  |
|--|------|-----------------------------|------------------------------|--|
| Reference channel  |      | TDDConf.2.1                 | TDDConf.2.2                  |  |
| <i>referenceSubcarrierSpacing</i>                        | kHz  | 30                          | 30                           |  |
| TDD UL/DL pattern 1 <sup>Note 2</sup>                    |      | '3D1S4U'<br>S='6DL:4GP:4UL' | '1D1S2U'<br>S='11DL:1GP:2UL' |  |
| <i>dl-UL-TransmissionPeriodicity</i>                     | ms   | 4                           | 2                            |  |
| <i>nrofDownlinkSlots</i>                                 |      | 3                           | 1                            |  |
| <i>nrofDownlinkSymbols</i>                               |      | 6                           | 11                           |  |
| <i>nrofUplinkSlot</i>                                    |      | 4                           | 2                            |  |
| <i>nrofUplinkSymbols</i>                                 |      | 4                           | 2                            |  |
| TDD UL/DL pattern 2 <sup>Note 2</sup>                    |      | 'DD'                        | Not configured               |  |
| <i>dl-UL-TransmissionPeriodicity</i>                     | ms   | 1                           | Not configured               |  |
| <i>nrofDownlinkSlots</i>                                 |      | 2                           | Not configured               |  |
| <i>nrofDownlinkSymbols</i>                               |      | 0                           | Not configured               |  |
| <i>nrofUplinkSlot</i>                                    |      | 0                           | Not configured               |  |
| <i>nrofUplinkSymbols</i>                                 |      | 0                           | Not configured               |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2]. |      |                             |                              |  |
| Note 2: For information                                  |      |                             |                              |  |

Table A.3.1.4-3: TDD UL/DL configuration for SCS=120kHz

| Parameter  | Unit | Value                       |  |
|--|------|-----------------------------|--|
| Reference channel  |      | TDDConf.3.1                 |  |
| <i>referenceSubcarrierSpacing</i>                        | kHz  | 120                         |  |
| TDD UL/DL pattern 1 <sup>Note 2</sup>                    |      | 'DDDSU'<br>S='10DL:2GP:2UL' |  |
| <i>dl-UL-TransmissionPeriodicity</i>                     | ms   | 0.625                       |  |
| <i>nrofDownlinkSlots</i>                                 |      | 3                           |  |
| <i>nrofDownlinkSymbols</i>                               |      | 10                          |  |
| <i>nrofUplinkSlot</i>                                    |      | 1                           |  |
| <i>nrofUplinkSymbols</i>                                 |      | 2                           |  |
| TDD UL/DL pattern 2 <sup>Note 2</sup>                    |      | Not configured              |  |
| <i>dl-UL-TransmissionPeriodicity</i>                     | ms   | Not configured              |  |
| <i>nrofDownlinkSlots</i>                                 |      | Not configured              |  |
| <i>nrofDownlinkSymbols</i>                               |      | Not configured              |  |
| <i>nrofUplinkSlot</i>                                    |      | Not configured              |  |
| <i>nrofUplinkSymbols</i>                                 |      | Not configured              |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2]. |      |                             |  |
| Note 2: For information                                  |      |                             |  |

## A.3.2 OFDMA channel noise generator (OCNG)

### A.3.2.1 Generic OFDMA Channel Noise Generator (OCNG)

The OCNG pattern is used in a test for modelling allocations of unused resources in the channel bandwidth to virtual UEs (which are not under test). The OCNG pattern comprises PDCCH and PDSCH transmissions to the virtual UEs.

#### A.3.2.1.1 OCNG pattern 1: Generic OCNG pattern for all unused REs

Table A.3.2.1.1-1: OP.1: Generic OCNG pattern for all unused REs

| OCNG Parameters  | Control Region            | Data Region                                    |
|--|---------------------------|--|
| Resource allocation  | Unused REs (Note 1)       | Unused REs (Note 2)                            |
| Channel  | PDCCH                     | PDSCH  |
| Contents   | Virtual UE IDs            | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme  | Same as used in PDCCH RMC | Same as used in PDSCH RMC                      |
| Subcarrier spacing   | Same as used in PDCCH RMC | Same as used in PDSCH RMC                      |
| Aggregation level  | Same as used in PDCCH RMC | N/A  |
| Code rate  | Same as used in PDCCH RMC | Same as used in PDSCH RMC                      |
| Transmit Power   | Same as used in PDCCH RMC | Same as used in PDSCH RMC                      |
| CP length  | Same as used in PDCCH RMC | Same as used in PDSCH RMC                      |
| Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.  |                           |  |
| Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to $BW_{occupied}$ where specified in the test case. |                           |  |

## A.3.2.1.2 OCNG pattern 2: Generic OCNG pattern for all unused REs for 2AoA setup

Table A.3.2.1.2-2: OP.2: Generic OCNG pattern for all unused REs for 2AoA setup

| OCNG Parameters             | Control Region   | Data Region  |
|-----------------------------|--|--|
| Probe                       | Transmitting the serving beam  |  |
| Resource allocation         | Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.   | Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. |
| Channel                     | PDCCH  | PDSCH  |
| Contents                    | Virtual UE IDs   | Uncorrelated pseudo random QPSK modulated data   |
| Antenna transmission scheme | Same as used in PDCCH RMC  | Same as used in PDSCH RMC  |
| Subcarrier spacing          | Same as used in PDCCH RMC  | Same as used in PDSCH RMC  |
| Aggregation level           | Same as used in PDCCH RMC  | N/A  |
| Code rate                   | Same as used in PDCCH RMC  | Same as used in PDSCH RMC  |
| Transmit Power              | Same as used in PDCCH RMC  | Same as used in PDSCH RMC  |
| CP length                   | Same as used in PDCCH RMC  | Same as used in PDSCH RMC  |
| Note 1:                     | REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.  |  |
| Note 2:                     | REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to $BW_{occupied}$ where specified in the test case. |  |
| Note 3:                     | No OCNG is transmitted from the probe transmitting non-serving beam.   |  |

## A.3.2.1.3 OCNG pattern 3: Generic OCNG pattern for unused REs in the same bandwidth as CORESET

Table A.3.2.1.3-1: OP.3: Generic OCNG pattern for unused REs in the same BW as CORESET

| OCNG Parameters             | Control Region  | Data Region                                    |
|-----------------------------|---|--|
| Resource allocation         | Unused REs (Note 1)   | Unused REs (Note 2)                            |
| Channel                     | PDCCH   | PDSCH  |
| Contents                    | Virtual UE IDs  | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC   | Same as used in PDSCH RMC                      |
| Subcarrier spacing          | Same as used in PDCCH RMC   | Same as used in PDSCH RMC                      |
| Aggregation level           | Same as used in PDCCH RMC   | N/A  |
| Code rate                   | Same as used in PDCCH RMC   | Same as used in PDSCH RMC                      |
| Transmit Power              | Same as used in PDCCH RMC   | Same as used in PDSCH RMC                      |
| CP length                   | Same as used in PDCCH RMC   | Same as used in PDSCH RMC                      |
| Note 1:                     | REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.   |  |
| Note 2:                     | REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell. |  |

#### A.3.2.1.4 OCNG pattern 4: Generic OCNG pattern for all unused REs outside SSB slot(s)

**Table A.3.2.1.4-1: OP.4: Generic OCNG pattern for all unused REs outside SSB slot(s)**

| OCNG Parameters             | Control Region   | Data Region                                    |
|-----------------------------|--|--|
| Resource allocation         | Unused REs (Note 1)  | Unused REs (Note 2)                            |
| Channel                     | PDCCH  | PDSCH  |
| Contents                    | Virtual UE IDs   | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC  | Same as used in PDSCH RMC                      |
| Subcarrier spacing          | Same as used in PDCCH RMC  | Same as used in PDSCH RMC                      |
| Aggregation level           | Same as used in PDCCH RMC  | N/A  |
| Code rate                   | Same as used in PDCCH RMC  | Same as used in PDSCH RMC                      |
| Transmit Power              | Same as used in PDCCH RMC  | Same as used in PDSCH RMC                      |
| CP length                   | Same as used in PDCCH RMC  | Same as used in PDSCH RMC                      |
| Note 1:                     | REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell.  |  |
| Note 2:                     | REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell. |  |

#### A.3.2.1.5 OCNG pattern 5: Generic OCNG pattern for unused REs in the same bandwidth as CORESET for 2AoA setup

**Table A.3.2.1.5-1: OP.5: Generic OCNG pattern for unused REs in the same BW as CORESET for 2AoA setup**

| OCNG Parameters             | Control Region  | Data Region  |
|-----------------------------|---|--|
| Probe                       | Transmitting the serving beam   |  |
| Resource allocation         | Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.  | Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. |
| Channel                     | PDCCH   | PDSCH  |
| Contents                    | Virtual UE IDs  | Uncorrelated pseudo random QPSK modulated data   |
| Antenna transmission scheme | Same as used in PDCCH RMC   | Same as used in PDSCH RMC  |
| Subcarrier spacing          | Same as used in PDCCH RMC   | Same as used in PDSCH RMC  |
| Aggregation level           | Same as used in PDCCH RMC   | N/A  |
| Code rate                   | Same as used in PDCCH RMC   | Same as used in PDSCH RMC  |
| Transmit Power              | Same as used in PDCCH RMC   | Same as used in PDSCH RMC  |
| CP length                   | Same as used in PDCCH RMC   | Same as used in PDSCH RMC  |
| Note 1:                     | REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.   |  |
| Note 2:                     | REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell. |  |
| Note 3:                     | No OCNG is transmitted from the probe transmitting non-serving beam.  |  |



### A.3.2.2 Void

## A.3.3 Reference DRX configurations

### A.3.3.1 DRX Configuration 1: DRX cycle = 40 ms and TAT = 500 ms

**Table A.3.3.1-1: DRX.1: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms**

| Field                     | Value  |
|---------------------------|--|
| drx-onDurationTimer       | 1 ms   |
| drx-InactivityTimer       | 1 ms   |
| drx-RetransmissionTimerDL | 1 slot   |
| drx-RetransmissionTimerUL | 1 slot   |
| drx-LongCycleStartOffset  | 40 ms  |
| shortDRX                  | disable  |
| TimeAlignmentTimer        | 500 ms   |
| Note:                     | This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] |

### A.3.3.2 DRX Configuration 2: DRX cycle = 640 ms and TAT = 500 ms

**Table A.3.3.2-1: DRX.2: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms**

| Field                     | Value  |
|---------------------------|--|
| drx-onDurationTimer       | 1 ms   |
| drx-InactivityTimer       | 1 ms   |
| drx-RetransmissionTimerDL | 1 slot   |
| drx-RetransmissionTimerUL | 1 slot   |
| drx-LongCycleStartOffset  | 640 ms   |
| shortDRX                  | disable  |
| TimeAlignmentTimer        | 500 ms   |
| Note:                     | This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] |

### A.3.3.3 DRX Configuration 3: DRX cycle = 40 ms and TAT = Infinity

**Table A.3.3.3-1: DRX.3: DRX cycle = 40 ms and time alignment timer (TAT) = Infinity**

| Field                     | Value  |
|---------------------------|--|
| drx-onDurationTimer       | 6 ms   |
| drx-InactivityTimer       | 1 ms   |
| drx-RetransmissionTimerDL | 1 slot   |
| drx-RetransmissionTimerUL | 1 slot   |
| drx-LongCycleStartOffset  | 40 ms  |
| shortDRX                  | disable  |
| TimeAlignmentTimer        | Infinity   |
| Note:                     | This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] |

### A.3.3.4 DRX Configuration 4: DRX cycle = 160 ms and TAT = Infinity

**Table A.3.3.4-1: DRX.4: DRX cycle = 160 ms and time alignment timer (TAT) = Infinity**

| Field                    | Value   |
|--------------------------|---|
| drx-onDurationTimer      | psf2  |
| drx-InactivityTimer      | psf2  |
| drx-RetransmissionTimer  | Psf16   |
| longDRX-CycleStartOffset | sf160, 0  |
| shortDRX                 | disable   |
| TimeAlignmentTimer       | Infinity  |
| Note:                    | This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. |

### A.3.3.5 DRX Configuration 5: DRX cycle = 320 ms and TAT = Infinity

**Table A.3.3.5-1: DRX.5: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity**

| Field                    | Value   |
|--------------------------|---|
| drx-onDurationTimer      | psf6  |
| drx-InactivityTimer      | psf1920   |
| drx-RetransmissionTimer  | psf16   |
| longDRX-CycleStartOffset | sf320, 0  |
| shortDRX                 | disable   |
| TimeAlignmentTimer       | Infinity  |
| Note:                    | This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. |

### A.3.3.6 DRX Configuration 6: DRX cycle = 320 ms and TAT = 500 ms

**Table A.3.3.6-1: DRX.6: DRX cycle = 320 ms and time alignment timer (TAT) = 500 ms**

| Field                     | Value  |
|---------------------------|--|
| drx-onDurationTimer       | 1 ms   |
| drx-InactivityTimer       | 1 ms   |
| drx-RetransmissionTimerDL | 1 slot   |
| drx-RetransmissionTimerUL | 1 slot   |
| drx-LongCycleStartOffset  | 320 ms   |
| shortDRX                  | disable  |
| TimeAlignmentTimer        | 500 ms   |
| Note:                     | This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] |

### A.3.3.7 DRX Configuration 7: DRX cycle = 640 ms and TAT = Infinity

**Table A.3.3.7-1: DRX.7: DRX cycle = 640 ms and time alignment timer (TAT) = Infinity**

| Field                     | Value  |
|---------------------------|--|
| drx-onDurationTimer       | 6 ms   |
| drx-InactivityTimer       | 1 ms   |
| drx-RetransmissionTimerDL | 1 slot   |
| drx-RetransmissionTimerUL | 1 slot   |
| drx-LongCycleStartOffset  | 640 ms   |
| shortDRX                  | disable  |
| TimeAlignmentTimer        | Infinity   |
| Note:                     | This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] |

### A.3.3.8 DRX Configuration 8: DRX cycle = 320 ms and TAT = Infinity

**Table A.3.3.8-1: DRX.8: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity**

| Field                     | Value  |
|---------------------------|--|
| drx-onDurationTimer       | 6 ms   |
| drx-InactivityTimer       | 1 ms   |
| drx-RetransmissionTimerDL | 1 slot   |
| drx-RetransmissionTimerUL | 1 slot   |
| drx-LongCycleStartOffset  | 320 ms   |
| shortDRX                  | disable  |
| TimeAlignmentTimer        | Infinity   |
| Note:                     | This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] |

### A.3.3.9 DRX Configuration 9: DRX cycle = 40 ms and TAT = 500 ms

**Table A.3.3.9-1: DRX.9: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms**

| Field                    | Value   |
|--------------------------|---|
| drx-onDurationTimer      | psf2  |
| drx-InactivityTimer      | psf2  |
| drx-RetransmissionTimer  | psf16   |
| longDRX-CycleStartOffset | sf40, 0   |
| shortDRX                 | disable   |
| TimeAlignmentTimer       | 500 ms  |
| Note:                    | This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. |

### A.3.3.10 DRX Configuration 10: DRX cycle = 640 ms and TAT = 500 ms

**Table A.3.3.10-1: DRX.10: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms**

| Field                    | Value   |
|--------------------------|---|
| drx-onDurationTimer      | psf6  |
| drx-InactivityTimer      | psf2  |
| drx-RetransmissionTimer  | psf16   |
| longDRX-CycleStartOffset | sf640, 0  |
| shortDRX                 | disable   |
| TimeAlignmentTimer       | 500 ms  |
| Note:                    | This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. |

### A.3.3.11 DRX Configuration 11: DRX cycle = 20 ms and TAT = Infinity

**Table A.3.3.11-1: DRX.11: DRX cycle = 20 ms and time alignment timer (TAT) = Infinity**

| Field                     | Value  |
|---------------------------|--|
| drx-onDurationTimer       | 6 ms   |
| drx-InactivityTimer       | 1 ms   |
| drx-RetransmissionTimerDL | 1 slot   |
| drx-RetransmissionTimerUL | 1 slot   |
| drx-LongCycleStartOffset  | 20 ms  |
| shortDRX                  | disable  |
| TimeAlignmentTimer        | Infinity   |
| Note:                     | This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] |

### A.3.3.12 DRX Configuration 12: DRX cycle = 640 ms and TAT = Infinity

**Table A.3.3.12-1: DRX.12: DRX cycle = 640 ms and time alignment timer (TAT) = Infinity**

| Field                    | Value   |
|--------------------------|---|
| drx-onDurationTimer      | psf6  |
| drx-InactivityTimer      | psf2  |
| drx-RetransmissionTimer  | psf16   |
| longDRX-CycleStartOffset | sf640, 0  |
| shortDRX                 | disable   |
| TimeAlignmentTimer       | Infinity  |
| Note:                    | This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. |

## A.3.4 Test Cases with Different Channel Bandwidths

### A.3.4.1 Test Cases with Different E-UTRA Channel Bandwidths

#### A.3.4.1.1 Introduction

In Annex A test cases involving E-UTRA cell(s) may be defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement.

#### A.3.4.1.2 Principle of testing

If multiple test cases involving E-UTRA cell(s) are defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement that is E-UTRA channel bandwidth independent, then the UE needs to be tested with

only one channel bandwidth in each E-UTRA cell and with the same bandwidth in all the E-UTRA cells used in the test case.

## A.3.5 Test Cases for Synchronous and Asynchronous DC Operations

### A.3.5.1 EN-DC Test Cases for Synchronous and Asynchronous EN-DC Operations

#### A.3.5.1.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements for EN-DC operation in synchronous and asynchronous scenarios.

In Annex A test cases may be defined in both synchronous EN-DC and asynchronous EN-DC scenarios to verify the same type of RRM requirement.

#### A.3.5.1.2 Principle of Testing

If EN-DC test cases are defined in both synchronous and asynchronous EN-DC scenarios to verify the same type of RRM requirement then the UE capable of both synchronous and asynchronous EN-DC operations needs to be tested with one of the tests in either synchronous or asynchronous EN-DC scenarios.

## A.3.6 Antenna configurations

### A.3.6.1 Antenna configurations for FR1

Unless otherwise specified, NR FDD or NR TDD cells in all RRM Test cases in AWGN propagation condition are configured with Antenna Configuration 1x2.

#### A.3.6.1.1 Antenna connection for 4 Rx capable UEs

##### A.3.6.1.1.1 Introduction

All tests in clause A.4 and A.6 are specified for UEs supporting 2RX. In this clause, the antenna connection method for applying 2RX tests to UEs supporting 4RX antenna ports is specified. No tests are currently specified in clause A.4 or A.6 which are applicable only to 4RX antenna ports, so 4RX capable UEs are always tested by reusing tests which were originally specified for 2RX UEs.

##### A.3.6.1.1.2 Principle of testing

###### A.3.6.1.1.2.1 Single carrier tests

For 4RX capable UEs supporting at least one band where 2RX is supported and 4RX is not supported, the, all single carrier tests specified in clause A.4 and A.6 except those in A.4.7 and A.6.7 shall be tested on any band where 2RX is supported and 4RX is not supported with the antenna connection specified in A.3.6.1.1.2.4. For single carrier tests specified in clause A.4.7 or A.6.7, all tests shall be tested with the antenna connection specified in A.3.6.1.1.2.4 for bands where 2RX is supported and 4RX is not supported, and the antenna connection specified in A.3.6.1.1.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any band where 2RX is supported and 4RX is not supported, all tests specified in clauses A.4 and A.6 shall be tested using the antenna connection specified in clause A.3.6.1.1.2.5. For radio link monitoring tests, the SNR levels are modified according to table A.3.6.1.1.2.1-1 and table A.3.6.1.1.2.1-2

**Table A.3.6.1.1.2.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection**

| Test case | SNR during T3 (dB) |        |        |        |
|-----------|--------------------|--------|--------|--------|
|           | Test 1             | Test 2 | Test 3 | Test 4 |
| A.4.5.1.1 | -18                | N/A    | N/A    | N/A    |
| A.4.5.1.3 | -18                | N/A    | N/A    | N/A    |
| A.4.5.1.5 | -18                | N/A    | N/A    | N/A    |
| A.4.5.1.7 | -18                | N/A    | N/A    | N/A    |
| A.5.5.1.1 | -18                | N/A    | N/A    | N/A    |
| A.5.5.1.3 | -18                | N/A    | N/A    | N/A    |
| A.5.5.1.5 | -18                | N/A    | N/A    | N/A    |
| A.5.5.1.7 | -18                | N/A    | N/A    | N/A    |
| A.6.5.1.1 | -18                | N/A    | N/A    | N/A    |
| A.6.5.1.3 | -18                | N/A    | N/A    | N/A    |
| A.6.5.1.5 | -18                | N/A    | N/A    | N/A    |
| A.6.5.1.7 | -18                | N/A    | N/A    | N/A    |
| A.7.5.1.1 | -18                | N/A    | N/A    | N/A    |
| A.7.5.1.3 | -18                | N/A    | N/A    | N/A    |
| A.7.5.1.5 | -18                | N/A    | N/A    | N/A    |
| A.7.5.1.7 | -18                | N/A    | N/A    | N/A    |

**Table A.3.6.1.1.2.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection**

| Test case | SNR during T3 (dB) |        | SNR during T4 (dB) |        |
|-----------|--------------------|--------|--------------------|--------|
|           | Test 1             | Test 2 | Test 1             | Test 2 |
| A.4.5.1.2 | -18                | N/A    | -8                 | N/A    |
| A.4.5.1.4 | -18                | N/A    | -8                 | N/A    |
| A.4.5.1.6 | -18                | N/A    | -8                 | N/A    |
| A.4.5.1.8 | -18                | N/A    | -8                 | N/A    |
| A.5.5.1.2 | -18                | N/A    | -8                 | N/A    |
| A.5.5.1.4 | -18                | N/A    | -8                 | N/A    |
| A.5.5.1.6 | -18                | N/A    | -8                 | N/A    |
| A.5.5.1.8 | -18                | N/A    | -8                 | N/A    |
| A.6.5.1.2 | -18                | N/A    | -8                 | N/A    |
| A.6.5.1.4 | -18                | N/A    | -8                 | N/A    |
| A.6.5.1.6 | -18                | N/A    | -8                 | N/A    |
| A.6.5.1.8 | -18                | N/A    | -8                 | N/A    |
| A.7.5.1.2 | -18                | N/A    | -8                 | N/A    |
| A.7.5.1.4 | -18                | N/A    | -8                 | N/A    |
| A.7.5.1.6 | -18                | N/A    | -8                 | N/A    |
| A.7.5.1.8 | -18                | N/A    | -8                 | N/A    |

**Table A.3.6.1.1.2.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection**

| Test case | SNR for RS in set $q_0$ during T3, T4 and T5 (dB) |
|-----------|---|
|           | Test 1  |
| A.4.5.5.1 | -15   |
| A.4.5.5.2 | -15   |
| A.4.5.5.3 | -15   |
| A.4.5.5.4 | -15   |
| A.4.5.5.5 | -15   |
| A.4.5.5.6 | -15   |
| A.5.5.5.1 | -15   |
| A.5.5.5.2 | -15   |
| A.5.5.5.3 | -15   |
| A.5.5.5.4 | -15   |
| A.5.5.5.5 | -15   |
| A.5.5.5.6 | -15   |
| A.5.5.5.7 | -15   |
| A.6.5.5.1 | -15   |
| A.6.5.5.2 | -15   |
| A.6.5.5.3 | -15   |
| A.6.5.5.4 | -15   |
| A.6.5.5.5 | -15   |
| A.6.5.5.6 | -15   |
| A.7.5.5.1 | -15   |
| A.7.5.5.2 | -15   |
| A.7.5.5.3 | -15   |
| A.7.5.5.4 | -15   |
| A.7.5.5.5 | -15   |
| A.7.5.5.6 | -15   |
| A.7.5.5.7 | -15   |

**A.3.6.1.1.2.2 Carrier aggregation tests**

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.5 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

**A.3.6.1.1.2.3 EN-DC tests**

All EN-DC tests are performed using the antenna connection in clause A.3.6.1.1.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.7 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All EN-DC tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

**A.3.6.1.1.2.4 Antenna connection for bands where 2RX is supported**

For bands where 2RX is supported and 4RX is not supported, it is left to the UE declaration and antenna port configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 RX ports shall be connected with zero input. No test parameters or requirements are modified.

**A.3.6.1.1.2.5 Antenna connection for bands where 4RX is supported**

For bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.6.1.1.2.1 and A.3.6.1.1.2.2, no test parameters or requirements are modified.

#### A.3.6.1.1.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For E-UTRAN bands where 2RX is supported and 4RX is not supported, it is left to the UE declaration and antenna port configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 RX ports shall be connected with zero input. No test parameters or requirements are modified.

#### A.3.6.1.1.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For E-UTRAN bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.8.1.2.1 and A.3.8.1.2.2 of TS 36.133 [15], no test parameters or requirements are modified.

### A.3.6.2 Antenna configurations for FR2

Unless otherwise specified, the default Downlink Antenna Configuration for NR FR2 cells is 1x2.

In case of Downlink Antenna Configuration 2x2 for NR FR2 cells, unless otherwise specified, the downlink signal is transmitted over the two polarizations (V and H) of the dual polarized antenna of the test equipment.

In both cases, the downlink signal is received assuming 2 UE baseband receivers. As the UE is tested following the Blackbox Approach with regard to the UE Rx antennas, the exact UE Rx antenna configuration is not relevant for the test configuration and has no impact on the test implementation.

## A.3.6A Antenna configurations with unlicensed bands

### A.3.6A.1 Antenna configurations for FR1

Unless otherwise specified, NR unlicensed cells in all RRM Test cases in AWGN propagation condition are configured with Antenna Configuration 1x2.

#### A.3.6A.1.1 Antenna connection for 4 Rx capable UEs

##### A.3.6A.1.1.1 Introduction

All tests in clause A.13, A.10, A.11, and A.12 are specified for UEs supporting 2RX. In this clause, the antenna connection method for applying 2RX tests to UEs supporting 4RX antenna ports is specified. No tests are currently specified in clause A.13, A.10, A.11 or A.12 which are applicable only to 4RX antenna ports, so 4RX capable UEs are always tested by reusing tests which were originally specified for 2RX UEs.

##### A.3.6A.1.1.2 Principle of testing

###### A.3.6A.1.1.2.1 Single carrier tests

For 4RX capable UEs supporting at least one 2RX band, the, all single carrier tests specified in clause A.13, A.10, A.11 and A.12 except those in A.13.4, A.10.5, A.11.6 and A.12.5 shall be tested on any band where 2RX is supported with the antenna connection specified in A.3.6A.1.1.2.4. For single carrier tests specified in clause A.13.4, A.10.5, A.11.6 or A.12.5, all tests shall be tested with the antenna connection specified in A.3.6A.1.1.2.4 for bands where 2RX is supported, and the antenna connection specified in A.3.6A.1.1.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any 2RX band, all tests specified in clauses A.13, A.10, A.11 and A.12 shall be tested using the antenna connection specified in clause A.3.6A.1.1.2.5. For radio link monitoring tests, the SNR levels are modified according to table A.3.6A.1.1.2.1-1 and table A.3.6A.1.1.2.1-2



**Table A.3.6A.1.1.2.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection**

| Test case  | SNR during T3 (dB) |        |        |        |
|------------|--------------------|--------|--------|--------|
|            | Test 1             | Test 2 | Test 3 | Test 4 |
| A.10.3.1.2 | -18                | N/A    | N/A    | N/A    |
| A.10.3.1.4 | TBD                | N/A    | N/A    | N/A    |
| A.11.4.1.2 | -18                | N/A    | N/A    | N/A    |
| A.11.4.1.4 | TBD                | N/A    | N/A    | N/A    |

**Table A.3.6A.1.1.2.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection**

| Test case  | SNR during T3 (dB) |        | SNR during T4 (dB) |        |
|------------|--------------------|--------|--------------------|--------|
|            | Test 1             | Test 2 | Test 1             | Test 2 |
| A.10.3.1.3 | -18                | N/A    | -8                 | N/A    |
| A.10.3.1.5 | TBD                | N/A    | TBD                | N/A    |
| A.11.4.1.3 | -18                | N/A    | -8                 | N/A    |
| A.11.4.1.5 | TBD                | N/A    | TBD                | N/A    |

**Table A.3.6A.1.1.2.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection**

| Test case  | SNR for RS in set $q_0$ during T3, T4 and T5 (dB) |        |
|------------|---|--------|
|            | Test 1  | Test 2 |
| A.10.3.4.1 | -15   | N/A    |
| A.10.3.4.2 | -15   | N/A    |
| A.11.4.4.1 | -15   | N/A    |
| A.11.4.4.2 | -15   | N/A    |

#### A.3.6A.1.1.2.2 Carrier aggregation tests

All carrier aggregation tests are performed using the antenna connection in clause A.3.6A.1.1.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6A.1.1.2.5 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause A.3.6A.1.1.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6A.1.1.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

#### A.3.6A.1.1.2.3 EN-DC tests

All carrier aggregation tests are performed using the antenna connection in clause A.3.6A.1.1.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6A.1.1.2.7 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause A.3.6A.1.1.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6A.1.1.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

#### A.3.6A.1.1.2.4 Antenna connection for bands where 2RX is supported

For bands where 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input. No test parameters or requirements are modified.

#### A.3.6A.1.1.2.5 Antenna connection for bands where 4RX is supported

For bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.6A.1.1.2.1 and A.3.6A.1.1.2.2, no test parameters or requirements are modified.

### A.3.6A.1.1.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For bands where LTE 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input. No test parameters or requirements are modified.

### A.3.6A.1.1.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For bands where LTE 4RX is supported, all 4 RX antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.8.1.2.1 and A.3.8.1.2.2 of TS 36.133 [15], no test parameters or requirements are modified.

## A.3.7 EN-DC test setup

### A.3.7.1 Introduction

### A.3.7.2 E-UTRAN Serving Cell Parameters

#### A.3.7.2.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR1

Table A.3.7.2.1-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with all NR cells in FR1. Unless otherwise stated within the test, all measurements in Annex A.4 and A.5 are performed only on the NR carrier. The E-UTRA serving cell shall be configured to not interfere with NR operation and the E-UTRA serving cell signal power shall not be critical to the test purpose.

**Table A.3.7.2.1-1: E-UTRAN cell specific test parameters for tests with all NR cells in FR1**

| Parameter   | Unit | E-UTRAN Cell  |
|---|------|---|
| Duplex mode   |      | FDD or TDD  |
| TDD special subframe configuration <sup>Note1</sup>                                 |      | 6   |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |      | 1   |
| BW <sub>channel</sub>   |      | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100                    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |      | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD          |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |      | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD      |
| OCNG Patterns <sup>Note2</sup>  |      | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA   | dB   | 0   |
| PBCH_RB   | dB   |   |
| PSS_RA  | dB   |   |
| SSS_RA  | dB   |   |
| PCFICH_RB   | dB   |   |
| PHICH_RA  | dB   |   |
| PHICH_RB  | dB   |   |
| PDCCH_RA  | dB   |   |

|  |            |                                     |
|--|------------|-------------------------------------|
| PDCCH_RB   | dB         |                                     |
| PDSCH_RA   | dB         |                                     |
| PDSCH_RB   | dB         |                                     |
| OCNG_RA <sup>Note3</sup>   | dB         |                                     |
| OCNG_RB <sup>Note3</sup>   | dB         |                                     |
| N <sub>oc</sub> <sup>Note4</sup>   | dBm/15 kHz | -104                                |
| E <sub>s</sub> /N <sub>oc</sub>  | dB         | 17                                  |
| E <sub>s</sub> /I <sub>ot</sub>  | dB         | 17                                  |
| RSRP <sup>Note5</sup>  | dBm/15 kHz | -87                                 |
| SCH_RP <sup>Note5</sup>  | dBm/15 kHz | -87                                 |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/Ch BW  | -59.13+10log(N <sub>RB,c</sub> /50) |
| Propagation Condition  |            | AWGN                                |
| Antenna Configuration  |            | 1x2                                 |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: E<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |            |                                     |

**A.3.7.2.2 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR2**

Table A.3.7.2.2-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with one or more NR cells in FR2.

**Table A.3.7.2.2-1: E-UTRAN cell specific test parameters for tests with one or more NR cells in FR2**

| Parameter   | Unit | E-UTRAN Cell  |
|---|------|---|
| Duplex mode   |      | FDD or TDD  |
| TDD special subframe configuration <sup>Note1</sup>                                 |      | 6   |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |      | 1   |
| BW <sub>channel</sub>   | MHz  | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100                    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |      | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD          |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |      | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD      |
| OCNG Patterns <sup>Note2</sup>  |      | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA   | dB   |   |
| PBCH_RB   | dB   |   |
| PSS_RA  | dB   |   |
| SSS_RA  | dB   |   |
| PCFICH_RB   | dB   |   |
| PHICH_RA  | dB   |   |
| PHICH_RB  | dB   | 0   |

|   |    |
|---|----|
| PDCCH_RA  | dB |
| PDCCH_RB  | dB |
| PDSCH_RA  | dB |
| PDSCH_RB  | dB |
| OCNG_RA <sup>Note3</sup>  | dB |
| OCNG_RB <sup>Note3</sup>  | dB |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation. The Test System shall provide a stable and noise-free E-UTRA signal without need of precise propagation modelling, path loss and polarization control. Further details of the E-UTRA signal configuration are not defined as part of the cell specific test parameters, since the E-UTRA link is not under performance verification and shall not affect the test result unless otherwise specifically stated in the test case.</p> |    |

### A.3.7A NR FR1-FR2 test setup

Some Test cases in clause A.7 have NR cells in both FR1 and FR2. Unless otherwise stated within the test, the NR FR1 Cell signal is required only to provide a link to the UE under test. The Test System shall provide a stable and noise-free NR FR1 signal without need of precise propagation modelling, path loss and polarization control. Further details of the NR FR1 signal configuration are not defined as part of the cell specific test parameters, since the NR FR1 link is not under performance verification and shall not affect the test result unless otherwise specifically stated in the test case.

### A.3.7B EN-DC test setup with unlicensed bands

#### A.3.7B.1 Introduction

#### A.3.7B.2 E-UTRAN Serving Cell Parameters

##### A.3.7B.2.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) under CCA in FR1

Table A.3.7B.2.1-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with all NR cells under CCA in FR1. Unless otherwise stated within the test, all measurements in Annex A.4 and A.5 are performed only on the unlicensed NR carrier. The E-UTRA serving cell shall configured to not interfere with NR operation and the E-UTRA serving cell signal power shall not be critical to the test purpose.

**Table A.3.7B.2.1-1: E-UTRAN cell specific test parameters for tests with all NR cells user CCA in FR1**

| Parameter  | Unit | E-UTRAN Cell   |
|--|------|--|
| Duplex mode  |      | FDD or TDD   |
| TDD special subframe configuration <sup>Note1</sup>                    |      | 6  |
| TDD uplink-downlink configuration <sup>Note1</sup>                     |      | 1  |
| BW <sub>channel</sub>  |      | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100           |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |      | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |

|   |            |   |
|---|------------|---|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |            | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD      |
| OCNG Patterns <sup>Note2</sup>  |            | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA   | dB         | 0   |
| PBCH_RB   | dB         |   |
| PSS_RA  | dB         |   |
| SSS_RA  | dB         |   |
| PCFICH_RB   | dB         |   |
| PHICH_RA  | dB         |   |
| PHICH_RB  | dB         |   |
| PDCCH_RA  | dB         |   |
| PDCCH_RB  | dB         |   |
| PDSCH_RA  | dB         |   |
| PDSCH_RB  | dB         |   |
| OCNG_RA <sup>Note3</sup>  | dB         |   |
| OCNG_RB <sup>Note3</sup>  | dB         |   |
| $N_{oc}$ <sup>Note4</sup>   | dBm/15 kHz |   |
| $\bar{E}_s/N_{oc}$  | dB         | 17  |
| $\bar{E}_s/I_{ot}$  | dB         | 17  |
| RSRP <sup>Note5</sup>   | dBm/15 kHz | -87   |
| SCH_RP <sup>Note5</sup>   | dBm/15 kHz | -87   |
| $I_o$ <sup>Note5</sup>  | dBm/Ch BW  | $-59.13+10\log(N_{RB,c}/50)$  |
| Propagation Condition   |            | AWGN  |
| Antenna Configuration   |            | 1x2   |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>E_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |            |   |

### A.3.7C LTE-FR1/FR2 test setup

Some Test cases in clause A.5 have LTE and FR2 NR cells. Unless otherwise stated within the test, the LTE Cell signal is required only to provide a link to the UE under test. The Test System shall provide a stable and noise-free LTE signal without need of precise propagation modelling, path loss and polarization control. Further details of the LTE signal configuration are not defined as part of the cell specific test parameters, since the LTE link is not under performance verification and shall not affect the test result unless otherwise specifically stated in the test case.

### A.3.7D NE-DC test setup

#### A.3.7D.1 Introduction

#### A.3.7D.2 E-UTRAN Serving Cell Parameters

##### A.3.7D.2.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR1

The parameters are same as as specified in clause A.3.7.2.1.

## A.3.7D.2.2 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR2

The parameters are same as as specified in clause A.3.7.2.2.

## A.3.8 PRACH configurations

### A.3.8.1 Introduction

This clause provides the typical PRACH configurations used for RRM test cases defined in Annex A. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

### A.3.8.2 PRACH configurations in FR1

#### A.3.8.2.1 FR1 PRACH configuration 1

FR1 PRACH configuration 1 in this clause provides the typical PRACH configuration for SSB-based contention based random access in FR1.

**Table A.3.8.2.1-1: Parameters for FR1 PRACH configuration 1**

| Field                                     | Value  | Comment   |
|---|--|---|
| prach-ConfigurationIndex                  | 102  | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing                    | Same as UL carrier SCS                                     |   |
| totalNumberOfRA-Preambles                 | 48   | Total number of preambles used for contention based and contention free random access                                     |
| numberOfRA-PreamblesGroupA                | 48   | No group B.   |
| prach-RootSequenceIndex                   | 0  | Logic sequence index = 0, resulting in root sequence = 1.   |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48   | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB                           |
| msg1-FDM                                  | One  | One PRACH transmission occasions FDMed in one time instance.  |
| rsrp-ThresholdSSB                         | RSRP_51  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].  |
| ra-ContentionResolutionTimer              | sf48   | 48 sub-frames   |
| powerRampingStep                          | dB2  |   |
| preambleReceivedTargetPower               | dBm-120  |   |
| preambleTransMax                          | n6   | Max number of RA preamble transmission performed before declaring a failure is 6  |
| ra-ResponseWindow                         | sl10   | 10 slots  |
| zeroCorrelationZoneConfig                 | 11   | N-CS configuration, N <sub>cs</sub> = 23  |
| Backoff Parameter Index                   | 2  | 20ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| Note:                                     | For further information see clause 6.3.2 in TS 38.331 [2]. |   |

#### A.3.8.2.2 FR1 PRACH configuration 2

FR1 PRACH configuration 2 in this clause provides the typical PRACH configuration for SSB based non-contention based random access in FR1.

Table A.3.8.2.2-1: Parameters for FR1 PRACH configuration 2

| Field                       | Value  | Comment  |
|-----------------------------|--|--|
| prach-ConfigurationIndex    | 102  | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].  |
| msg1-SubcarrierSpacing      | Same as UL carrier SCS                                     |  |
| totalNumberOfRA-Preambles   | 48   | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA  | 48   | No group B.  |
| prach-RootSequenceIndex     | 0  | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-Occasion        | oneFourth  | OneFourth: 1 SSB associated with 4 RACH occasions  |
| msg1-FDM                    | One  | One PRACH transmission occasions FDMed in one time instance.   |
| powerRampingStep            | dB2  |  |
| preambleReceivedTargetPower | dBm-120  |  |
| preambleTransMax            | n6   | Max number of RA preamble transmission performed before declaring a failure is 6   |
| ra-ResponseWindow           | sl10   | 10 slots   |
| zeroCorrelationZoneConfig   | 11   | N-CS configuration, N <sub>cs</sub> = 23   |
| Backoff Parameter Index     | 2  | 20ms, as defined in table 7.2-1 in TS 38.321 [7].  |
| <i>ssb-ResourceList</i>     | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use <i>ssb-ResourceList</i> and <i>BFR-SSB-Resource</i> IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| <i>BFR-SSB-Resource</i>     | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use <i>ssb-ResourceList</i> and <i>BFR-SSB-Resource</i> IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR    |
| ra-ssb-OccasionMaskIndex    | 1  | PRACH occasion index 1 is allowed  |
| rsrp-ThresholdSSB           | RSRP_51  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].   |
| Note:                       | For further information see clause 6.3.2 in TS 38.331 [2]. |  |

### A.3.8.2.3 FR1 PRACH configuration 3

FR1 PRACH configuration 3 in this clause provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR1.

**Table A.3.8.2.3-1: Parameters for FR1 PRACH configuration 3**

| Field  | Value                        | Comment   |
|--|------------------------------|---|
| <i>prach-ConfigurationIndex</i>                                  | 102                          | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| <i>msg1-SubcarrierSpacing</i>                                    | Same as UL carrier SCS       |   |
| <i>totalNumberOfRA-Preambles</i>                                 | 48                           | Total number of preambles used for contention based and contention free random access                                     |
| <i>numberOfRA-PreamblesGroupA</i>                                | 48                           | No group B.   |
| <i>prach-RootSequenceIndex</i>                                   | 0                            | Logic sequence index = 0, resulting in root sequence = 1.   |
| <i>ssb-perRACH-Occasion</i>                                      | oneFourth                    | OneFourth: 1 SSB associated with 4 RACH occasions   |
| <i>msg1-FDM</i>  | One                          | One PRACH transmission occasions FDMed in one time instance.  |
| <i>powerRampingStep</i>  | dB2                          |   |
| <i>preambleReceivedTargetPower</i>                               | dBm-120                      |   |
| <i>preambleTransMax</i>  | n6                           | Max number of RA preamble transmission performed before declaring a failure is 6  |
| <i>ra-ResponseWindow</i>   | sl10                         | 10 slots  |
| <i>zeroCorrelationZoneConfig</i>                                 | 11                           | N-CS configuration, N <sub>CS</sub> = 23  |
| Backoff Parameter Index  | 2                            | 20ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| <i>csirs-ResourceList</i>  | <i>ra-PreambleIndex</i> = 50 | Associated with CSI-RS configured   |
| <i>ra-OccasionList</i>   | 1                            | RA occasions allowed corresponding to CSI-RS  |
| <i>rsrp-ThresholdCSI-RS</i>                                      | RSRP_51                      | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                              |   |

#### A.3.8.2.4 FR1 PRACH configuration 4

FR1 PRACH configuration 4 in this clause provides the PRACH configuration for CSI-RS based non-contention based random access in FR1 to convey BFR.



**Table A.3.8.2.4-1: Parameters for FR1 PRACH configuration 4**

| Field  | Value                 | Comment   |
|--|-----------------------|---|
| prach-ConfigurationIndex   | 102                   | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| totalNumberOfRA-Preambles  | 48                    | Total number of preambles used for contention based and contention free random access                                     |
| numberOfRA-PreamblesGroupA                                       | 48                    | No group B.   |
| prach-RootSequenceIndex  | 0                     | Logic sequence index = 0, resulting in root sequence = 1.   |
| ssb-perRACH-Occasion   | oneFourth             | OneFourth: 1 SSB associated with 4 RACH occasions   |
| msg1-FDM   | One                   | One PRACH transmission occasions FDMed in one time instance.  |
| powerRampingStep   | dB2                   |   |
| preambleReceivedTargetPower                                      | dBm-120               |   |
| preambleTransMax   | n200                  | Max number of RA preamble transmission performed before declaring a failure is 200  |
| ra-ResponseWindow  | sl1                   | 1 slot  |
| zeroCorrelationZoneConfig  | 11                    | N-CS configuration, N <sub>cs</sub> = 93  |
| Backoff Parameter Index  | 2                     | 20ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| BFR-CSIRS-Resource   | ra-PreambleIndex = 50 | Associated with CSI-RS configured   |
| ra-OccasionList  | 1                     | RA occasions allowed corresponding to CSI-RS  |
| rsrp-ThresholdSSB  | RSRP_51               | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                       |   |

### A.3.8.3 PRACH configurations in FR2

#### A.3.8.3.1 FR2 PRACH configuration 1

FR2 PRACH configuration 1 in this clause provides the typical PRACH configuration for SSB-based contention based random access in FR2.

**Table A.3.8.3.1-1: Parameters for FR2 PRACH configuration 1**

| Field  | Value                  | Comment  |
|--|------------------------|--|
| prach-ConfigurationIndex   | 190                    | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing   | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles  | 48                     | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA                                       | 48                     | No group B.  |
| prach-RootSequenceIndex  | 0                      | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB                        | oneFourth, n48         | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB                                |
| msg1-FDM   | One                    | One PRACH transmission occasions FDMed in one time instance.   |
| rsrp-ThresholdSSB  | RSRP_51                | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].   |
| ra-ContentionResolutionTimer                                     | sf48                   | 48 sub-frames  |
| powerRampingStep   | dB2                    |  |
| preambleReceivedTargetPower                                      | dBm-120                |  |
| preambleTransMax   | n6                     | Max number of RA preamble transmission performed before declaring a failure is 6   |
| ra-ResponseWindow  | sl10                   | 10 slots   |
| zeroCorrelationZoneConfig  | 11                     | N-CS configuration, N <sub>CS</sub> = 23   |
| Backoff Parameter Index  | 2                      | 20 ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                        |  |

### A.3.8.3.2 FR2 PRACH configuration 2

FR2 PRACH configuration 2 in this clause provides the typical PRACH configuration for SSB based non-contention based random access in FR2.

Table A.3.8.3.2-1: Parameters for FR2 PRACH configuration 2

| Field                       | Value  | Comment  |
|-----------------------------|--|--|
| prach-ConfigurationIndex    | 190  | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6].   |
| msg1-SubcarrierSpacing      | Same as UL carrier SCS                                     |  |
| totalNumberOfRA-Preambles   | 48   | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA  | 48   | No group B.  |
| prach-RootSequenceIndex     | 0  | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-Occasion        | oneFourth  | OneFourth: 1 SSB associated with 4 RACH occasions  |
| msg1-FDM                    | One  | One PRACH transmission occasions FDMed in one time instance.   |
| powerRampingStep            | dB2  |  |
| preambleReceivedTargetPower | dBm-120  |  |
| preambleTransMax            | n6   | Max number of RA preamble transmission performed before declaring a failure is 6   |
| ra-ResponseWindow           | sl10   | 10 slots   |
| zeroCorrelationZoneConfig   | 11   | N-CS configuration, N <sub>cs</sub> = 23   |
| Backoff Parameter Index     | 2  | 20 ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| <i>ssb-ResourceList</i>     | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use <i>ssb-ResourceList</i> and <i>BFR-SSB-Resource</i> IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| <i>BFR-SSB-Resource</i>     | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use <i>ssb-ResourceList</i> and <i>BFR-SSB-Resource</i> IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR    |
| ra-ssb-OccasionMaskIndex    | 1  | PRACH occasion index 1 is allowed  |
| rsrp-ThresholdSSB           | RSRP_51  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].   |
| Note:                       | For further information see clause 6.3.2 in TS 38.331 [2]. |  |

### A.3.8.3.3 FR2 PRACH configuration 3

FR2 PRACH configuration 3 in this clause provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR2.

**Table A.3.8.3.3-1: Parameters for FR2 PRACH configuration 3**

| Field  | Value                  | Comment  |
|--|------------------------|--|
| prach-ConfigurationIndex   | 190                    | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing   | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles  | 48                     | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA                                       | 48                     | No group B.  |
| prach-RootSequenceIndex  | 0                      | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-Occasion   | oneFourth              | OneFourth: 1 SSB associated with 4 RACH occasions  |
| msg1-FDM   | One                    | One PRACH transmission occasions FDMed in one time instance.   |
| powerRampingStep   | dB2                    |  |
| preambleReceivedTargetPower                                      | dBm-120                |  |
| preambleTransMax   | n6                     | Max number of RA preamble transmission performed before declaring a failure is 6   |
| ra-ResponseWindow  | sl10                   | 10 slots   |
| zeroCorrelationZoneConfig  | 11                     | N-CS configuration, N <sub>CS</sub> = 23   |
| Backoff Parameter Index  | 2                      | 20 ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| csirs-ResourceList   | ra-PreambleIndex = 50  | Associated with CSI-RS configured  |
| ra-OccasionList  | 1                      | RA occasions allowed corresponding to CSI-RS   |
| rsrp-ThresholdCSI-RS   | RSRP_51                | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].   |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                        |  |

#### A.3.8.3.4 FR2 PRACH configuration 4

FR2 PRACH configuration 4 in this clause provides the PRACH configuration for CSI-RS based non-contention based random access in FR2 to convey BFR.

**Table A.3.8.3.4-1: Parameters for FR2 PRACH configuration 4**

| Field  | Value                  | Comment  |
|--|------------------------|--|
| prach-ConfigurationIndex   | 190                    | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing   | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles  | 48                     | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA                                       | 48                     | No group B.  |
| prach-RootSequenceIndex  | 0                      | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-Occasion   | oneFourth              | OneFourth: 1 SSB associated with 4 RACH occasions  |
| msg1-FDM   | One                    | One PRACH transmission occasions FDMed in one time instance.   |
| powerRampingStep   | dB2                    |  |
| preambleReceivedTargetPower                                      | dBm-120                |  |
| preambleTransMax   | n200                   | Max number of RA preamble transmission performed before declaring a failure is 200.  |
| ra-ResponseWindow  | sl40                   | 40 slots   |
| zeroCorrelationZoneConfig  | 11                     | N-CS configuration, N <sub>CS</sub> = 23   |
| Backoff Parameter Index  | 2                      | 20 ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| BFR-CSI-RS-Resource  | ra-PreambleIndex = 50  | Associated with CSI-RS configured  |
| ra-OccasionList  | 1                      | RA occasions allowed corresponding to CSI-RS   |
| rsrp-ThresholdSSB  | RSRP_51                | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].   |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                        |  |

## A.3.8A PRACH configurations under CCA

### A.3.8A.1 Introduction

This clause provides the typical PRACH configurations used for RRM test cases defined in Annex A. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

### A.3.8A.2 PRACH configurations in FR1

#### A.3.8A.2.1 FR1 PRACH configuration 1 under CCA

FR1 PRACH configuration 1 under CCA in this clause provides the typical PRACH configuration for SSB-based contention based random access in FR1.

**Table A.3.8A.2.1-1: Parameters for FR1 PRACH configuration 1 under CCA**

| Field                                     | Value  | Comment   |
|---|--|---|
| prach-ConfigurationIndex                  | 102  | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing                    | Same as UL carrier SCS                                     |   |
| totalNumberOfRA-Preambles                 | 48   | Total number of preambles used for contention based and contention free random access                                     |
| numberOfRA-PreamblesGroupA                | 48   | No group B.   |
| prach-RootSequenceIndex                   | 0  | Logic sequence index = 0, resulting in root sequence = 1.   |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48   | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB                           |
| msg1-FDM                                  | One  | One PRACH transmission occasions FDMed in one time instance.  |
| rsrp-ThresholdSSB                         | RSRP_51  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].  |
| ra-ContentionResolutionTimer              | sf48   | 48 sub-frames   |
| powerRampingStep                          | dB2  |   |
| preambleReceivedTargetPower               | dBm-114  | Increased by 6 dB compared with FR1 PRACH configuration 1 for random access test with UL CCA failures.                    |
| preambleTransMax                          | n20  | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures             |
| ra-ResponseWindow                         | SI20   | 20 slots  |
| zeroCorrelationZoneConfig                 | 11   | N-CS configuration, N <sub>CS</sub> = 23  |
| Backoff Parameter Index                   | 2  | 20ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| Note:                                     | For further information see clause 6.3.2 in TS 38.331 [2]. |   |

### A.3.8A.2.2 FR1 PRACH configuration 2 under CCA

FR1 PRACH configuration 2 under CCA in this clause provides the typical PRACH configuration for SSB based non-contention based random access in FR1.

**Table A.3.8A.2.2-1: Parameters for FR1 PRACH configuration 2 under CCA**

| Field  | Value                  | Comment   |
|--|------------------------|---|
| prach-ConfigurationIndex   | 102                    | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].   |
| msg1-SubcarrierSpacing   | Same as UL carrier SCS |   |
| totalNumberOfRA-Preambles  | 48                     | Total number of preambles used for contention based and contention free random access   |
| numberOfRA-PreamblesGroupA                                       | 48                     | No group B.   |
| prach-RootSequenceIndex  | 0                      | Logic sequence index = 0, resulting in root sequence = 1.   |
| ssb-perRACH-Occasion   | oneFourth              | OneFourth: 1 SSB associated with 4 RACH occasions   |
| msg1-FDM   | One                    | One PRACH transmission occasions FDMed in one time instance.  |
| powerRampingStep   | dB2                    |   |
| preambleReceivedTargetPower                                      | dBm-114                | Increased by 6 dB compared with FR1 PRACH configuration 2 for random access test with UL CCA failures.  |
| preambleTransMax   | n20                    | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures   |
| ra-ResponseWindow  | sl20                   | 20 slots  |
| zeroCorrelationZoneConfig  | 11                     | N-CS configuration, N <sub>cs</sub> = 23  |
| Backoff Parameter Index  | 2                      | 20ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| <i>ssb-ResourceList</i>  | ra-PreambleIndex = 50  | Associated with SSB index 0. UE doesn't use <i>ssb-ResourceList</i> and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| <i>BFR-SSB-Resource</i>  | ra-PreambleIndex = 50  | Associated with SSB index 0. UE doesn't use <i>ssb-ResourceList</i> and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR    |
| ra-ssb-OccasionMaskIndex   | 1                      | PRACH occasion index 1 is allowed   |
| rsrp-ThresholdSSB  | RSRP_51                | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                        |   |

## A.3.9 BWP configurations

### A.3.9.1 Introduction

This clause provides the typical BWP configurations used for RRM test cases defined in Annex A. For downlink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.3.9.2 and for uplink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.3.9.3. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

## A.3.9.2 Downlink BWP configurations

### A.3.9.2.1 Initial BWP

**Table A.3.9.2.1-1: Downlink BWP patterns for initial BWP configuration**

| BWP Parameters  | Unit | Values                                  |  |  |
|---|------|---|--|--|
| Reference BWP   |      | DLBWP.0.1                               | DLBWP.0.2  |  |
| Starting PRB index  |      | 0                                       | RB <sub>a</sub> <sup>Note 1</sup>                      |  |
| Bandwidth   | RB   | Same as RF channel defined in each test | same as RMSI CORESET (CORESET #0) defined in each test |  |
| Note 1: RB <sub>c</sub> is the lowest PRB index to guarantee the BWP including CORESET #0 which is defined in Clause A.3.1.2. |      |   |  |  |

### A.3.9.2.2 Dedicated BWP

**Table A.3.9.2.2-1: Downlink BWP patterns for dedicated BWP configuration**

| BWP Parameters  | Unit | Values                                  |  |  |  |
|---|------|---|--|--|--|
| Reference BWP   |      | DLBWP.1.1                               | DLBWP.1.2  | DLBWP.1.3  | DLBWP.1.4  |
| Starting PRB index  |      | 0                                       | RB <sub>b</sub> <sup>Note 1</sup>  | RB <sub>a</sub> <sup>Note 2</sup>  | 0  |
| Bandwidth   | RB   | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz<br>24 for SSB SCS = 240KHz |
| Note 1: RB <sub>b</sub> is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RB <sub>J</sub> , RB <sub>J+1</sub> ,..., RB <sub>J+19</sub> ) which is defined in Clause A.3.10. |      |   |  |  |  |
| Note 2: RB <sub>a</sub> is the lowest PRB index to guarantee the BWP including SSB PRB index (RB <sub>J</sub> , RB <sub>J+1</sub> ,..., RB <sub>J+19</sub> ) which is defined in Clause A.3.10.                 |      |   |  |  |  |

## A.3.9.3 Uplink BWP configurations

### A.3.9.3.1 Initial BWP

**Table A.3.9.3.1-1: Uplink BWP patterns for initial BWP configuration**

| BWP Parameters   | Unit | Values                                  |  |  |
|--|------|---|--|--|
| Reference BWP  |      | ULBWP.0.1                               | ULBWP.0.2  |  |
| Starting PRB index   |      | 0                                       | RB <sub>c</sub> <sup>Note 1</sup>                      |  |
| Bandwidth  | RB   | Same as RF channel defined in each test | same as RMSI CORESET (CORESET #0) defined in each test |  |
| Note 1: RB <sub>c</sub> is same as RB <sub>c</sub> for DLBWP.0.2 as defined in Table A.3.9.2.1-1.. |      |   |  |  |



## A.3.9.3.2 Dedicated BWP

Table A.3.9.3.2-1: Uplink BWP patterns for dedicated BWP configuration

| BWP Parameters  | Unit | Values                                  |  |  |  |
|---|------|---|--|--|--|
|   |      | ULBWP.1.1                               | ULBWP.1.2  | ULBWP.1.3  | ULBWP.1.4  |
| Reference BWP   |      | 0                                       | $RB_b$ <sup>Note 1</sup>   | $RB_a$ <sup>Note 2</sup>   | 0  |
| Starting PRB index  |      | 0                                       | $RB_b$ <sup>Note 1</sup>   | $RB_a$ <sup>Note 2</sup>   | 0  |
| Bandwidth   | RB   | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz<br>24 for SSB SCS = 240KHz |
| Note 1: $RB_b$ is same as $RB_b$ for DLBWP.1.2 as defined in Table A.3.9.2.2-1. |      |   |  |  |  |
| Note 2: $RB_a$ is same as $RB_a$ for DLBWP.1.3 as defined in Table A.3.9.2.2-1. |      |   |  |  |  |

## A.3.10 SSB Configurations

## A.3.10.1 SSB Configurations for FR1

## A.3.10.1.1 SSB pattern 1 in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

Table A.3.10.1.1-1: SSB.1 FR1: SSB Pattern 1 for SSB SCS=15 kHz in 10 MHz channel

| SSB Parameters  | Values  |
|---|---|
| Channel bandwidth   | 10 MHz  |
| SSB SCS   | 15 kHz  |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |
| Number of SSBs per SS-burst   | 1   |
| SS/PBCH block index   | 0   |
| Symbol numbers containing SSB <sup>Note 2</sup>   | 2-5   |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |
| RB numbers containing SSB within channel BW   | ( $RB_J, RB_{J+1}, \dots, RB_{J+19}$ ) <sup>Note 1</sup>    |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |

## A.3.10.1.2 SSB pattern 2 in FR1: SSB allocation for SSB SCS=30 kHz in 40 MHz

Table A.3.10.1.2-1: SSB.2 FR1: SSB Pattern 2 for SSB SCS=30 kHz in 40 MHz channel

| SSB Parameters   | Values  |
|--|---|
| Channel bandwidth  | 40 MHz  |
| SSB SCS  | 30 kHz  |
| SSB periodicity ( $T_{SSB}$ )  | 20 ms   |
| Number of SSBs per SS-burst  | 1   |
| SS/PBCH block index  | 0   |
| Symbol numbers containing SSB <sup>Note 3</sup>  | 4-7 or 2-5 <sup>Note 2</sup>                                |
| Slot numbers containing SSB <sup>Note 3</sup>  | 0   |
| SFN containing SSB   | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |
| RB numbers containing SSB within channel BW  | ( $RB_J, RB_{J+1}, \dots, RB_{J+19}$ ) <sup>Note 1</sup>    |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].      |   |
| Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen. |   |
| Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves                        |   |

## A.3.10.1.3 SSB pattern 3 in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

Table A.3.10.1.3-1: SSB.3 FR1: SSB Pattern 3 for SSB SCS=15 kHz in 10 MHz channel

| SSB Parameters  | Values  |      |
|---|---|------|
| Channel bandwidth   | 10 MHz  |      |
| SSB SCS   | 15 kHz  |      |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |      |
| Number of SSBs per SS-burst   | 2   |      |
| SS/PBCH block index   | 0   | 1    |
| Symbol numbers containing SSB <sup>Note 2</sup>   | 2-5   | 8-11 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   | 0    |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |      |
| RB numbers containing SSB within channel BW   | ( $RB_J, RB_{J+1}, \dots, RB_{J+19}$ ) <sup>Note 1</sup>    |      |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |      |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |      |

## A.3.10.1.4 SSB pattern 4 in FR1: SSB allocation for SSB SCS=30 kHz in 40 MHz

Table A.3.10.1.4-1: SSB.4 FR1: SSB Pattern 4 for SSB SCS=30 kHz in 40 MHz channel

| SSB Parameters   | Values   |      |
|--|--|------|
| Channel bandwidth  | 40 MHz   |      |
| SSB SCS  | 30 kHz   |      |
| SSB periodicity ( $T_{SSB}$ )  | 20 ms  |      |
| Number of SSBs per SS-burst  | 2  |      |
| SS/PBCH block index  | 0  | 1    |
| Symbol numbers containing SSB <sup>Note 3</sup>  | 4-7 or 2-5 <sup>Note 2</sup>                           | 8-11 |
| Slot numbers containing SSB <sup>Note 3</sup>  | 0  | 0    |
| SFN containing SSB   | SFN mod $(\max(T_{SSB}, 10\text{ms})/10\text{ms}) = 0$ |      |
| RB numbers containing SSB within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+19})^{\text{Note 1}}$   |      |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].      |  |      |
| Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen. |  |      |
| Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                       |  |      |

## A.3.10.1.5 SSB pattern 5 in FR1: SSB allocation for SSB SCS=15 kHz starting from odd SFN in 10 MHz

Table A.3.10.1.5-1: SSB.5 FR1: SSB Pattern 5 for SSB SCS=15 kHz in 10 MHz channel

| SSB Parameters  | Values   |  |
|---|--|--|
| Channel bandwidth   | 10 MHz   |  |
| SSB SCS   | 15 kHz   |  |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms  |  |
| Number of SSBs per SS-burst   | 1  |  |
| SS/PBCH block index   | 0  |  |
| Symbol numbers containing SSB <sup>Note 2</sup>   | 2-5  |  |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0  |  |
| SFN containing SSB  | SFN mod $(\max(T_{SSB}, 10\text{ms})/10\text{ms}) = 1$ |  |
| RB numbers containing SSB within channel BW   | $(RB_J, RB_{J+1}, \dots, RB_{J+19})^{\text{Note 1}}$   |  |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |  |  |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |  |  |

### A.3.10.1.6 SSB pattern 6 in FR1: SSB allocation for SSB SCS=30 kHz starting from odd SFN in 40 MHz

**Table A.3.10.1.6-1: SSB.6 FR1: SSB Pattern 6 for SSB SCS=30 kHz in 40 MHz channel**

| SSB Parameters                                  | Values   |
|---|--|
| Channel bandwidth                               | 40 MHz   |
| SSB SCS   | 30 kHz   |
| SSB periodicity ( $T_{SSB}$ )                   | 20 ms  |
| Number of SSBs per SS-burst                     | 1  |
| SS/PBCH block index                             | 0  |
| Symbol numbers containing SSB <sup>Note 3</sup> | 4-7 or 2-5 <sup>Note 2</sup>   |
| Slot numbers containing SSB <sup>Note 3</sup>   | 0  |
| SFN containing SSB                              | SFN mod $(\max(T_{SSB}, 10\text{ms})/10\text{ms}) = 1$   |
| RB numbers containing SSB within channel BW     | $(RB_J, RB_{J+1}, \dots, RB_{J+19})^{\text{Note 1}}$   |
| Note 1:   | RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].      |
| Note 2:   | Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen. |
| Note 3:   | These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                       |

### A.3.10.2 SSB Configurations for FR2

#### A.3.10.2.1 SSB pattern 1 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

**Table A.3.10.2.1-1: SSB.1 FR2: SSB Pattern 1 for SSB SCS = 120 kHz in 100 MHz channel with 2 SSBs per SS-burst**

| SSB Parameters                                   | Values  |      |
|--|---|------|
| Channel bandwidth                                | 100 MHz   |      |
| SSB SCS  | 120 kHz   |      |
| SSB periodicity ( $T_{SSB}$ )                    | 20 ms   |      |
| Number of SSBs per SS-burst                      | 2   |      |
| SS/PBCH block index                              | 0   | 1    |
| Symbol numbers containing SSBs <sup>Note 2</sup> | 4-7   | 8-11 |
| Slot numbers containing SSB <sup>Note 2</sup>    | 0   | 0    |
| SFN containing SSB                               | SFN mod $(\max(T_{SSB}, 10\text{ms})/10\text{ms}) = 0$  |      |
| RB numbers containing SSBs within channel BW     | $(RB_J, RB_{J+1}, \dots, RB_{J+19})^{\text{Note 1}}$  |      |
| Note 1:  | RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |      |
| Note 2:  | These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |      |

## A.3.10.2.2 SSB pattern 2 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

**Table A.3.10.2.2-1: SSB.2 FR2: SSB Pattern 2 for SSB SCS = 240 kHz in 100 MHz channel with 2 SSBs per SS-burst**

| SSB Parameters  | Values  |            |
|---|---|------------|
| Channel bandwidth   | 100 MHz   |            |
| SSB SCS   | 240 kHz   |            |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |            |
| Number of SSBs per SS-burst   | 2   |            |
| SS/PBCH block index   | 0   | 1          |
| Symbol numbers containing SSBs <sup>Note 2</sup>  | 8-11  | 12-13, 0-1 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   | 0, 1       |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |            |
| RB numbers containing SSBs within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+39})$ <sup>Note 1</sup>      |            |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |            |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |            |

## A.3.10.2.3 SSB pattern 3 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

**Table A.3.10.2.3-1: SSB.3 FR2: SSB Pattern 3 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst**

| SSB Parameters  | Values  |  |
|---|---|--|
| Channel bandwidth   | 100 MHz   |  |
| SSB SCS   | 120 kHz   |  |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |  |
| Number of SSBs per SS-burst   | 1   |  |
| SS/PBCH block index   | 0   |  |
| Symbol numbers containing SSBs <sup>Note 2</sup>  | 4-7   |  |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   |  |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |  |
| RB numbers containing SSBs within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+19})$ <sup>Note 1</sup>      |  |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |  |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |  |

## A.3.10.2.4 SSB pattern 4 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

**Table A.3.10.2.4-1: SSB.4 FR2: SSB Pattern 4 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst**

| SSB Parameters  | Values  |  |
|---|---|--|
| Channel bandwidth   | 100 MHz   |  |
| SSB SCS   | 240 kHz   |  |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |  |
| Number of SSBs per SS-burst   | 1   |  |
| SS/PBCH block index   | 0   |  |
| Symbol numbers containing SSBs <sup>Note 2</sup>  | 8-11  |  |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   |  |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |  |
| RB numbers containing SSBs within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+39})$ <sup>Note 1</sup>      |  |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |  |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |  |

## A.3.10.2.5 SSB pattern 5 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

**Table A.3.10.2.5-1: SSB.5 FR2: SSB Pattern 5 for SSB SCS = 120 kHz in 100 MHz channel with 2 SSBs per SS-burst**

| SSB Parameters  | Values  |     |
|---|---|-----|
| Channel bandwidth   | 100 MHz   |     |
| SSB SCS   | 120 kHz   |     |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |     |
| Number of SSBs per SS-burst   | 2   |     |
| SS/PBCH block index   | 2   | 3   |
| Symbol numbers containing SSBs <sup>Note 2</sup>  | 2-5   | 6-9 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 1   | 1   |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |     |
| RB numbers containing SSBs within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+19})$ <sup>Note 1</sup>      |     |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |     |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |     |

## A.3.10.2.6 SSB pattern 6 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

**Table A.3.10.2.6-1: SSB.6 FR2: SSB Pattern 6 for SSB SCS = 240 kHz in 100 MHz channel with 2 SSBs per SS-burst**

| SSB Parameters  | Values  |     |
|---|---|-----|
| Channel bandwidth   | 100 MHz   |     |
| SSB SCS   | 240 kHz   |     |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |     |
| Number of SSBs per SS-burst   | 2   |     |
| SS/PBCH block index   | 2   | 3   |
| Symbol numbers containing SSBs <sup>Note 2</sup>  | 2-5   | 6-9 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 1   | 1   |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |     |
| RB numbers containing SSBs within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+39})$ <sup>Note 1</sup>      |     |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |     |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |     |

## A.3.10.2.7 SSB pattern 7 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

**Table A.3.10.2.7-1: SSB.7 FR2: SSB Pattern 7 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst**

| SSB Parameters  | Values  |
|---|---|
| Channel bandwidth   | 100 MHz   |
| SSB SCS   | 120 kHz   |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |
| Number of SSBs per SS-burst   | 1   |
| SS/PBCH block index   | 1   |
| Symbol numbers containing SSBs <sup>Note 2</sup>  | 8-11  |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |
| RB numbers containing SSBs within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+19})$ <sup>Note 1</sup>      |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |

## A.3.10.2.8 SSB pattern 8 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10.2.8-1: SSB.8 FR2: SSB Pattern 8 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst

| SSB Parameters  | Values  |     |
|---|---|-----|
| Channel bandwidth   | 100 MHz   |     |
| SSB SCS   | 240 kHz   |     |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |     |
| Number of SSBs per SS-burst   | 1   |     |
| SS/PBCH block index   | 1   |     |
| Symbol numbers containing SSBs <sup>Note 2</sup>  | 12-13   | 0-1 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   | 1   |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |     |
| RB numbers containing SSBs within channel BW  | $(RB_J, RB_{J+1}, \dots, RB_{J+39})$ <sup>Note 1</sup>      |     |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |     |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |     |

## A.3.10A SSB Configurations under CCA

## A.3.10A.1 SSB Configurations under CCA for FR1

## A.3.10A.1.1 SSB pattern 1 under CCA for semi-static channel access: SSB allocation for SSB SCS=30kHz in 40MHz

Table A.3.10A.1.1-1: SSB.1 CCA: SSB Pattern 1 for SSB SCS=30 kHz in 40 MHz channel

| SSB Parameters  | Values  |
|---|---|
| Channel bandwidth   | 40 MHz  |
| SSB SCS   | 30 kHz  |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |
| Number of SSB indexes per SS-burst ( $N_{SSB}^{QCL}$ )  | 1   |
| Number of SS/PBCH block candidates per SSB index  | 1   |
| SS/PBCH block candidate position  | 0   |
| SS/PBCH block index   | 0   |
| Symbol numbers containing SSB <sup>Note 2</sup>   | 2-5   |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |
| RB numbers containing SSB within channel BW   | $(RB_J, RB_{J+1}, \dots, RB_{J+19})$ <sup>Note 1</sup>      |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves                   |   |

### A.3.10A.1.2 SSB pattern 2 under CCA for dynamic channel access: SSB allocation for SSB SCS=30kHz in 40MHz

**Table A.3.10A.1.2-1: SSB.2 CCA: SSB Pattern 2 for SSB SCS=30 kHz in 40 MHz channel**

| SSB Parameters  | Values  |     |
|---|---|-----|
| Channel bandwidth   | 40 MHz  |     |
| SSB SCS   | 30 kHz  |     |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |     |
| Number of SSB indexes per SS-burst ( $N_{SSB}^{QCL}$ )  | 1   |     |
| Number of SS/PBCH block candidates per SSB index  | 2   |     |
| SS/PBCH block candidate position  | 0   | 2   |
| SS/PBCH block index   | 0   | 0   |
| Symbol numbers containing SSB <sup>Note 2</sup>   | 2-5   | 2-5 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   | 1   |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |     |
| RB numbers containing SSB within channel BW   | $(RB_J, RB_{J+1}, \dots, RB_{J+19})^{\text{Note 1}}$        |     |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |     |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves                   |   |     |

### A.3.10A.1.3 SSB pattern 3 under CCA for semi-static channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3.10.1.3-1: SSB.3 CCA: SSB Pattern 3 for SSB SCS=30 kHz in 40 MHz channel**

| SSB Parameters  | Values  |      |
|---|---|------|
| Channel bandwidth   | 40 MHz  |      |
| SSB SCS   | 30 kHz  |      |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |      |
| Number of SSB indexes per SS-burst ( $N_{SSB}^{QCL}$ )  | 2   |      |
| Number of SS/PBCH block candidates per SSB index  | 1   |      |
| SS/PBCH block candidate position  | 0   | 1    |
| SS/PBCH block index   | 0   | 1    |
| Symbol numbers containing SSB <sup>Note 2</sup>   | 2-5   | 8-11 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   | 0    |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |      |
| RB numbers containing SSB within channel BW   | $(RB_J, RB_{J+1}, \dots, RB_{J+19})^{\text{Note 1}}$        |      |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |      |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |      |



### A.3.10A.1.4 SSB pattern 4 under CCA for dynamic channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3.10.1.4-1: SSB.4 CCA: SSB Pattern 4 for SSB SCS=30 kHz in 40 MHz channel**

| SSB Parameters  | Values  |     |      |      |
|---|---|-----|------|------|
| Channel bandwidth   | 40 MHz  |     |      |      |
| SSB SCS   | 30 kHz  |     |      |      |
| SSB periodicity ( $T_{SSB}$ )   | 20 ms   |     |      |      |
| Number of SSB indexes per SS-burst ( $N_{SSB}^{QCL}$ )  | 2   |     |      |      |
| Number of SS/PBCH block candidates per SSB index  | 2   |     |      |      |
| SS/PBCH block candidate position  | 0   | 2   | 1    | 3    |
| SS/PBCH block index   | 0   | 0   | 1    | 1    |
| Symbol numbers containing SSB <sup>Note 2</sup>   | 2-5   | 2-5 | 8-11 | 8-11 |
| Slot numbers containing SSB <sup>Note 2</sup>   | 0   | 1   | 0    | 1    |
| SFN containing SSB  | SFN mod<br>( $\max(T_{SSB}, 10\text{ms})/10\text{ms}$ ) = 0 |     |      |      |
| RB numbers containing SSB within channel BW   | $(RB_J, RB_{J+1}, \dots, RB_{J+19})$ <sup>Note 1</sup>      |     |      |      |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13]. |   |     |      |      |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.                  |   |     |      |      |

## A.3.11 SMTC Configurations

### A.3.11.1 SMTC pattern 1: SMTC period = 20 ms with SMTC duration = 1 ms

**Table A.3.11.1-1: SMTC.1: SMTC Pattern 1 for SMTC period = 20 ms and duration = 1 ms**

| SMTC Parameters  | Values |
|------------------|--------|
| SMTC periodicity | 20 ms  |
| SMTC offset      | 0 ms   |
| SMTC duration    | 1 ms   |

### A.3.11.2 SMTC pattern 2: SMTC period = 20 ms with SMTC duration = 5 ms

**Table A.3.11.2-1: SMTC.2: SMTC Pattern 2 for SMTC period = 20 ms and duration = 5 ms**

| SMTC Parameters  | Values |
|------------------|--------|
| SMTC periodicity | 20 ms  |
| SMTC offset      | 0 ms   |
| SMTC duration    | 5 ms   |

### A.3.11.3 SMTC pattern 3: SMTC period = 160 ms with SMTC duration = 1 ms

**Table A.3.11.3-1: SMTC.3: SMTC Pattern 3 for SMTC period = 20 ms and duration = 5 ms**

| SMTC Parameters  | Values |
|------------------|--------|
| SMTC periodicity | 160 ms |
| SMTC offset      | 0 ms   |
| SMTC duration    | 1 ms   |

### A.3.11.4 SMTC pattern 4: SMTC period = 20 ms with SMTC duration = 1 ms

**Table A.3.11.4-1: SMTC.4: SMTC Pattern 4 for SMTC period = 20 ms and duration = 1 ms**

| SMTC Parameters  | Values |
|------------------|--------|
| SMTC periodicity | 20 ms  |
| SMTC offset      | 10 ms  |
| SMTC duration    | 1 ms   |

### A.3.11.5 SMTC pattern 5: SMTC period = 20 ms with SMTC duration = 5 ms

**Table A.3.11.5-1: SMTC.5: SMTC Pattern 5 for SMTC period = 20 ms and duration = 5 ms**

| SMTC Parameters  | Values |
|------------------|--------|
| SMTC periodicity | 20 ms  |
| SMTC offset      | 10 ms  |
| SMTC duration    | 5 ms   |

### A.3.11.6 SMTC pattern 6: SMTC period = 20 ms with SMTC duration = 5 ms

**Table A.3.11.6-1: SMTC.6: SMTC Pattern 6 for SMTC period = 20 ms and duration = 5 ms**

| SMTC Parameters  | Values |
|------------------|--------|
| SMTC periodicity | 20 ms  |
| SMTC offset      | 17 ms  |
| SMTC duration    | 5 ms   |

## A.3.12 Test Cases with Different CC Configurations

### A.3.12.1 EN-DC Test Cases with Different EN-DC Configurations

#### A.3.12.1.1 Introduction

In Annex A EN-DC test cases may be defined for two component carriers (CCs) as well as for more than two CCs to verify the same RRM requirement.

#### A.3.12.1.2 Principle of testing

If multiple EN-DC test cases are defined for two CCs as well as for more than two CCs to verify the same type of RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with the maximum number of CCs in EN-DC supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with two CCs in EN-DC supported by the UE.

*Editor's: The maximum number of CCs that can be used in FR2 tests in EN-DC would depend on the test equipment capability.*

### A.3.12.2 Carrier Aggregation Test Cases with Different CA Configurations

#### A.3.12.2.1 Introduction

In Annex A carrier aggregation test cases may be defined for two CCs as well as for more than two CCs to verify the same RRM requirement.

### A.3.12.2.2 Principle of testing

If multiple carrier aggregation test cases are defined for two CCs as well as for more than two CCs to verify the same RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with the maximum number of CCs in CA supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with at least two CCs in CA supported by the UE.

*Editor's: The maximum number of CCs that can be used in FR2 tests in CA would depend on the test equipment capability.*

## A.3.13 Test Cases in SA and EN-DC Operations

### A.3.13.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements in standalone (SA) or EN-DC operations.

In Annex A test cases may be defined in SA and EN-DC operations to verify the same RRM requirement.

*Editor's note: this clause may need to define further for NE-DC and NR-DC test cases, which subjects to the test cases defined in the future.*

### A.3.13.2 Principle of Testing

If test cases are defined in both SA and EN-DC operations to verify the same RRM requirement then the UE capable of both SA and EN-DC operations needs to verify that RRM requirement by performing test case(s) in either SA operation or in EN-DC operation.

If test cases are defined in both SA and EN-DC operations to verify at least one common RRM requirement then the UE capable of both SA and EN-DC operations needs to verify RRM requirements by performing test case(s) in either SA operation or in EN-DC operation provided that the performed test case(s):

- verifies the largest number of RRM requirements and
- verifies at least all RRM requirements covered in the test case(s), which is not performed.

## A.3.13A Test Cases involving E-UTRA/FR1 and FR2 carriers

### A.3.13A.1 Introduction

The following applies to UE compliant to this version of the specification when undergoing tests with a mix of E-UTRA/NR FR1 and NR FR2 carriers in clauses A.5, A.7 and A.8.

### A.3.13A.2 Principle of Testing in EN-DC

For test cases in clause A.5 listed in Table A.3.13A.2-1, the following applies:

- UE does not have to pass the test case

**Table A.3.13A.2-1: Test cases UE does not have to pass in current version of specification (EN-DC)**

| Clause      | Test case slogan   |
|-------------|--|
| A.5.5.2.7   | E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching                       |
| A.5.5.3.2   | SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle  |
| A.5.5.3.5   | SCell Activation and deactivation of SCell in FR2  |
| A.5.5.3.6   | Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2 |
| A.5.5.6.4.2 | E-UTRAN – NR FR1 PSCell SCell dormancy switch of two FR2 SCells outside active time        |

### A.3.13A.3 Principle of Testing in SA

For test cases in clause A.7 listed in Table A.3.13A.3-1, the following applies:

- UE does not have to pass the test case

**Table A.3.13A.3-1: Test cases UE does not have to pass in current version of specification (SA)**

| Clause      | Test case slogan  |
|-------------|---|
| A.7.5.3.2   | SCell Activation and deactivation for FR1+FR2 inter-band with target SCell in FR2                               |
| A.7.5.6.1.2 | NR FR1- NR FR2 DL active BWP switch of PCell with non-DRX in SA   |
| A.7.5.6.4.2 | NR FR1 PCell SCell dormancy switch of two FR2 SCells outside active time  |
| A.7.6.2.5   | SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1) |
| A.7.6.2.6   | SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1)     |
| A.7.6.2.7   | SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1)    |
| A.7.6.2.8   | SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1)        |

### A.3.13A.4 Principle of Testing in E-UTRA

For test cases in clause A.8 listed in Table A.3.13A.4-1, the following applies:

- UE does not have to pass the test case.

**Table A.3.13A.4-1: Test cases UE does not have to pass in current version of specification (E-UTRA)**

| Clause    | Test case slogan   |
|-----------|--|
| A.8.4.2.5 | NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is not used |
| A.8.4.2.6 | NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is used     |
| A.8.4.2.7 | NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used    |
| A.8.4.2.8 | NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is used        |

## A.3.13B Test Cases for EN-DC and NE-DC Operations

### A.3.13B.1 Active BWP switch Test Cases for EN-DC and NE-DC Operations

#### A.3.13B.1.1 Introduction

This clause defines a principle which is applicable to test cases verifying active BWP switch requirements for EN-DC operation and NE-DC operations.

In Annex A test cases are defined for both EN-DC and NE-DC operations to verify the same type of RRM requirement.

### A.3.13B.1.2 Principle of Testing

UE capable of both EN-DC and NE-DC operations needs to be tested with one of the tests in either EN-DC or NE-DC operations.

## A.3.13B.2 SFTD accuracy Test Cases for EN-DC and NE-DC Operations

### A.3.13B.2.1 Introduction

This clause defines a principle which is applicable to test cases verifying SFTD accuracy requirements for EN-DC operation and NE-DC operations.

In Annex A test cases are defined for both EN-DC and NE-DC operations to verify the same type of RRM requirement.

### A.3.13B.2.2 Principle of Testing

UE capable of both EN-DC and NE-DC operations needs to be tested with one of the tests in either EN-DC or NE-DC operations.

## A.3.14 CSI-RS configurations

### A.3.14.1 FDD

**Table A.3.14.1-1: CSI-RS Reference Measurement Channels for SCS=15kHz**

|                            | <b>CSI-RS.1.1<br/>FDD</b> | <b>CSI-RS.1.2<br/>FDD</b> | <b>CSI-RS.1.3<br/>FDD</b> | <b>CSI-RS.1.4<br/>FDD</b> | <b>CSI-RS.1.5<br/>FDD</b> | <b>CSI-RS.1.6<br/>FDD</b> |
|----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| <b>Resource Type</b>       | <b>periodic</b>           | <b>periodic</b>           | <b>aperiodic</b>          | <b>aperiodic</b>          | <b>aperiodic</b>          | <b>periodic</b>           |
| <b>Resource Set Config</b> |                           |                           |                           |                           |                           |                           |
| nzp-CSI-ResourceSetId      | 0                         | 0                         | 0                         | 0                         | 0                         | 0                         |
| repetition                 | n.a.                      | off                       | off                       | on                        | off                       | n.a.                      |
| aperiodicTriggeringOffset  | n.a.                      | n.a.                      | 6                         | 4                         | 4                         | n.a.                      |
| trs-Info                   | n.a.                      | n.a.                      | n.a.                      | n.a.                      | n.a.                      | n.a.                      |

| Resource Config  |                   |                    |                    |                    |  |                   |                   |
|--|-------------------|--------------------|--------------------|--------------------|--|-------------------|-------------------|
| nzp-CSI-RS-ResourceId  | 0 for resource #0 | 0 for resource #0  | 0 for resource #0  | 0 for resource #0  | 0 for resource #0                          | 0 for resource #0 |                   |
|  |                   |                    |                    | 1 for resource #1  |  |                   |                   |
|  |                   |                    |                    | 2 for resource #2  |  |                   |                   |
|  |                   |                    |                    | 3 for resource #3  |  |                   |                   |
|  | 0 for resource #0 | 1 for resource #1  | 1 for resource #1  | 1 for resource #1  | 4 for resource #4                          | 1 for resource #1 | 0 for resource #0 |
|  |                   |                    |                    |                    | 5 for resource #5                          |                   |                   |
|  |                   |                    |                    |                    | 6 for resource #6                          |                   |                   |
|  |                   |                    |                    |                    | 7 for resource #7                          |                   |                   |
| powerControlOffset   | 0                 | 0                  | 0                  | 0                  | 0  | 0                 |                   |
| powerControlOffsetSS   | db0               | db0                | db0                | db0                | db0  | db0               |                   |
| scramblingID   | 0                 | 0                  | 0                  | 0                  | 0  | 0                 |                   |
| Period (slots)   | slot5             | slot10             | n.a.               | n.a.               | n.a.                                       | slot40            |                   |
| Offset   | 1                 | 1                  | n.a.               | n.a.               | n.a.                                       | 1                 |                   |
| qcl-InfoPeriodicCSI-RS   | TCI.State.0       | TCI.State.0        | n.a.               | n.a.               | n.a.                                       | TCI.State.0       |                   |
|  |                   | TCI.State.1        |                    |                    |  |                   |                   |
| frequencyDomainAllocation  | 000001            | 0001               | 0001               | 0001               | 000001                                     | 000001            |                   |
| nrofPorts  | 2                 | 1                  | 1                  | 1                  | 1  | 2                 |                   |
| firstOFDMSymbolInTimeDomain  | 4 for resource #0 | 6 for resource #0  | 6 for resource #0  | 0 for resource #0  | Specified in the test case for resource #0 | 5 for resource #0 |                   |
|  |                   |                    |                    | 1 for resource #1  |  |                   |                   |
|  |                   |                    |                    | 2 for resource #2  |  |                   |                   |
|  |                   |                    |                    | 3 for resource #3  |  |                   |                   |
|  | 4 for resource #0 | 10 for resource #1 | 10 for resource #1 | 10 for resource #1 | 4 for resource #4                          | n.a.              | 5 for resource #0 |
|  |                   |                    |                    |                    | 5 for resource #5                          |                   |                   |
|  |                   |                    |                    |                    | 6 for resource #6                          |                   |                   |
|  |                   |                    |                    |                    | 7 for resource #7                          |                   |                   |
| cdm-Type   | FD-CDM2           | noCDM              | noCDM              | noCDM              | noCDM                                      | FD-CDM2           |                   |
| density  | 1                 | 3                  | 3                  | 3                  | 3  | 1                 |                   |
| startingRB   | 0                 | 0                  | 0                  | 0                  | 0  | 0                 |                   |
| nrofRBs  | 276 (Note 1)      | 276 (Note 1)       | 276 (Note 1)       | 276 (Note 1)       | 276 (Note 1)                               | 276 (Note 1)      |                   |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |                   |                    |                    |                    |  |                   |                   |

**Table A.3.14.1-1A: CSI-RS Reference Measurement Channels for SCS=15kHz**

|                            | CSI-RS.1.1A FDD    | CSI-RS.1.2A FDD    | CSI-RS.1.3A FDD    |
|----------------------------|--------------------|--------------------|--------------------|
| Resource Type              | periodic           | aperiodic          | periodic           |
| <b>Resource Set Config</b> |                    |                    |                    |
| nzp-CSI-ResourceSetId      | 1                  | 1                  | 1                  |
| repetition                 | off                | off                | off                |
| aperiodicTriggeringOffset  | n.a.               | 6                  | n.a.               |
| trs-Info                   | n.a.               | n.a.               | n.a.               |
| <b>Resource Config</b>     |                    |                    |                    |
| nzp-CSI-RS-ResourceId      | 12 for resource #0 | 22 for resource #0 | 14 for resource #0 |
|                            | 13 for resource #1 | 23 for resource #1 | 15 for resource #1 |

|  |                    |                    |                    |
|--|--------------------|--------------------|--------------------|
| powerControlOffset   | 0                  | 0                  | 0                  |
| powerControlOffsetSS   | db0                | db0                | db0                |
| scramblingID   | 0                  | 0                  | 0                  |
| Period (slots)   | slot20             | n.a.               | slot10             |
| Offset   | 1                  | n.a.               | 2                  |
| qcl-InfoPeriodicCSI-RS   | n.a.               | n.a.               | n.a.               |
| frequencyDomainAllocation  | 0001               | 0001               | 0001               |
| nrofPorts  | 1                  | 1                  | 1                  |
| firstOFDMSymbolInTimeDomain  | 6 for resource #0  | 7 for resource #0  | 6 for resource #0  |
|  | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| cdm-Type   | noCDM              | noCDM              | noCDM              |
| density  | 3                  | 3                  | 3                  |
| startingRB   | 0                  | 0                  | 0                  |
| nrofRBs  | 276 (Note 1)       | 276 (Note 1)       | 276 (Note 1)       |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |                    |                    |                    |

### A.3.14.2 TDD

Table A.3.14.2-1: CSI-RS Reference Measurement Channels for SCS=15kHz

|                             | CSI-RS.1.1 TDD    | CSI-RS.1.2 TDD     | CSI-RS.1.3 TDD     | CSI-RS.1.4 TDD    | CSI-RS.1.5 TDD    |
|-----------------------------|-------------------|--------------------|--------------------|-------------------|-------------------|
| Resource Type               | periodic          | periodic           | aperiodic          | aperiodic         | periodic          |
| <b>Resource Set Config</b>  |                   |                    |                    |                   |                   |
| nzp-CSI-ResourceSetId       | 0                 | 0                  | 0                  | 0                 | 0                 |
| repetition                  | n.a.              | off                | off                | on                | n.a.              |
| aperiodicTriggeringOffset   | n.a.              | n.a.               | 4                  | 4                 | n.a.              |
| trs-Info                    | n.a.              | n.a.               | n.a.               | n.a.              | n.a.              |
| <b>Resource Config</b>      |                   |                    |                    |                   |                   |
| nzp-CSI-RS-ResourceId       | 0 for resource #0 | 0 for resource #0  | 0 for resource #0  | 0 for resource #0 | 0 for resource #0 |
|                             |                   |                    |                    | 1 for resource #1 |                   |
|                             |                   |                    |                    | 2 for resource #2 |                   |
|                             |                   |                    |                    | 3 for resource #3 |                   |
|                             |                   | 1 for resource #1  | 1 for resource #1  | 4 for resource #4 |                   |
|                             |                   |                    |                    | 5 for resource #5 |                   |
|                             |                   |                    |                    | 6 for resource #6 |                   |
|                             |                   | 7 for resource #7  |                    |                   |                   |
| powerControlOffset          | 0                 | 0                  | 0                  | 0                 | 0                 |
| powerControlOffsetSS        | db0               | db0                | db0                | db0               | db0               |
| scramblingID                | 0                 | 0                  | 0                  | 0                 | 0                 |
| Period (slots)              | slot5             | slot10             | n.a.               | n.a.              | slot40            |
| Offset                      | 1                 | 1                  | n.a.               | n.a.              | 1                 |
| qcl-InfoPeriodicCSI-RS      | TCI.State.0       | TCI.State.0        | n.a.               | n.a.              | TCI.State.0       |
|                             |                   | TCI.State.1        |                    |                   |                   |
| frequencyDomainAllocation   | 000001            | 0001               | 0001               | 0001              | 000001            |
| nrofPorts                   | 2                 | 1                  | 1                  | 1                 | 2                 |
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 6 for resource #0  | 6 for resource #0  | 0 for resource #0 | 5 for resource #0 |
|                             |                   |                    |                    | 1 for resource #1 |                   |
|                             |                   |                    |                    | 2 for resource #2 |                   |
|                             |                   |                    |                    | 3 for resource #3 |                   |
|                             |                   | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 |                   |
|                             |                   |                    |                    | 5 for resource #5 |                   |
|                             |                   |                    |                    | 6 for resource #6 |                   |
|                             |                   | 7 for resource #7  |                    |                   |                   |

|            |  |              |              |              |              |
|------------|--|--------------|--------------|--------------|--------------|
| cdm-Type   | FD-CDM2  | noCDM        | noCDM        | noCDM        | FD-CDM2      |
| density    | 1  | 3            | 3            | 3            | 1            |
| startingRB | 0  | 0            | 0            | 0            | 0            |
| nrofRBs    | 276 (Note 1)   | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1:    | If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |              |              |              |              |

**Table A.3.14.2-1A: CSI-RS Reference Measurement Channels for SCS=15kHz**

|                             | CSI-RS.1.1A TDD  | CSI-RS.1.2A TDD    | CSI-RS.1.3A TDD    |
|-----------------------------|--|--------------------|--------------------|
| Resource Type               | periodic   | aperiodic          | periodic           |
| Resource Set Config         |  |                    |                    |
| nzp-CSI-ResourceSetId       | 1  | 1                  | 1                  |
| repetition                  | off  | off                | off                |
| aperiodicTriggeringOffset   | n.a.   | 6                  | n.a.               |
| trs-Info                    | n.a.   | n.a.               | n.a.               |
| Resource Config             |  |                    |                    |
| nzp-CSI-RS-ResourceId       | 12 for resource #0   | 22 for resource #0 | 14 for resource #0 |
|                             | 13 for resource #1   | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset          | 0  | 0                  | 0                  |
| powerControlOffsetSS        | db0  | db0                | db0                |
| scramblingID                | 0  | 0                  | 0                  |
| Period (slots)              | slot20   | n.a.               | slot10             |
| Offset                      | 1  | n.a.               | 2                  |
| qcl-InfoPeriodicCSI-RS      | n.a.   | n.a.               | n.a.               |
| frequencyDomainAllocation   | 0001   | 0001               | 0001               |
| nrofPorts                   | 1  | 1                  | 1                  |
| firstOFDMsymbolInTimeDomain | 6 for resource #0  | 7 for resource #0  | 6 for resource #0  |
|                             | 10 for resource #1   | 11 for resource #1 | 10 for resource #1 |
| cdm-Type                    | noCDM  | noCDM              | noCDM              |
| density                     | 3  | 3                  | 3                  |
| startingRB                  | 0  | 0                  | 0                  |
| nrofRBs                     | 276 (Note 1)   | 276 (Note 1)       | 276 (Note 1)       |
| Note 1:                     | If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |                    |                    |



Table A.3.14.2-2: CSI-RS Reference Measurement Channels for SCS=30kHz

|                             | CSI-RS.2.1<br>TDD  | CSI-RS.2.2<br>TDD          | CSI-RS.2.3<br>TDD | CSI-RS.2.4<br>TDD | CSI-RS.2.5<br>TDD                          | CSI-RS.2.6<br>TDD |
|-----------------------------|--|----------------------------|-------------------|-------------------|--|-------------------|
| Resource Type               | periodic   | periodic                   | aperiodic         | aperiodic         | aperiodic                                  | periodic          |
| Resource Set Config         |  |                            |                   |                   |  |                   |
| nzp-CSI-ResourceSetId       | 0  | 0                          | 0                 | 0                 | 0  | 0                 |
| repetition                  | n.a.   | off                        | off               | on                | off  | n.a.              |
| aperiodicTriggeringOffset   | n.a.   | n.a.                       | 6                 | 4                 | 4  | n.a.              |
| trs-Info                    | n.a.   | n.a.                       | n.a.              | n.a.              | n.a.                                       | n.a.              |
| Resource Config             |  |                            |                   |                   |  |                   |
| nzp-CSI-RS-ResourceId       | 0 for resource #0  | 0 for resource #0          | 0 for resource #0 | 0 for resource #0 | 0 for resource #0                          | 0 for resource #0 |
|                             |  | 1 for resource #1          | 1 for resource #1 | 1 for resource #1 | 1 for resource #1                          |                   |
|                             |  | 2 for resource #2          |                   |                   |  |                   |
|                             |  | 3 for resource #3          |                   |                   |  |                   |
|                             |  | 4 for resource #4          |                   |                   |  |                   |
|                             |  | 5 for resource #5          |                   |                   |  |                   |
|                             |  | 6 for resource #6          |                   |                   |  |                   |
|                             |  | 7 for resource #7          |                   |                   |  |                   |
| powerControlOffset          | 0  | 0                          | 0                 | 0                 | 0  | 0                 |
| powerControlOffsetSS        | db0  | db0                        | db0               | db0               | db0  | db0               |
| scramblingID                | 0  | 0                          | 0                 | 0                 | 0  | 0                 |
| Period (slots)              | slot10   | slot20                     | n.a.              | n.a.              | n.a.                                       | slot80            |
| Offset                      | 2  | 2                          | n.a.              | n.a.              | n.a.                                       | 2                 |
| qcl-InfoPeriodicCSI-RS      | TCI.State.0  | TCI.State.0<br>TCI.State.1 | n.a.              | n.a.              | n.a.                                       | TCI.State.0       |
| frequencyDomainAllocation   | 000001   | 0001                       | 0001              | 0001              | 000001                                     | 000001            |
| nrofPorts                   | 2  | 1                          | 1                 | 1                 | 1  | 2                 |
| firstOFDMsymbolInTimeDomain | 5 for resource #0  | 6 for resource #0          | 6 for resource #0 | 0 for resource #0 | Specified in the test case for resource #0 | 5 for resource #0 |
|                             |  | 1 for resource #1          | 1 for resource #1 | 1 for resource #1 |  |                   |
|                             |  | 2 for resource #2          |                   |                   |  |                   |
|                             |  | 3 for resource #3          |                   |                   |  |                   |
|                             |  | 4 for resource #4          |                   |                   |  |                   |
|                             |  | 5 for resource #5          |                   |                   |  |                   |
|                             |  | 6 for resource #6          |                   |                   |  |                   |
|                             |  | 7 for resource #7          |                   |                   |  |                   |
| cdm-Type                    | FD-CDM2  | noCDM                      | noCDM             | noCDM             | noCDM                                      | FD-CDM2           |
| density                     | 1  | 3                          | 3                 | 3                 | 3  | 1                 |
| startingRB                  | 0  | 0                          | 0                 | 0                 | 0  | 0                 |
| nrofRBs                     | 276 (Note 1)   | 276 (Note 1)               | 276 (Note 1)      | 276 (Note 1)      | 276 (Note 1)                               | 276 (Note 1)      |
| Note 1:                     | If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |                            |                   |                   |  |                   |

Table A.3.14.2-2A: CSI-RS Reference Measurement Channels for SCS=30kHz

|                             | CSI-RS.2.1A TDD  | CSI-RS.2.2A TDD    | CSI-RS.2.3A TDD    |
|-----------------------------|--|--------------------|--------------------|
| Resource Type               | periodic   | aperiodic          | periodic           |
| Resource Set Config         |  |                    |                    |
| nzp-CSI-ResourceSetId       | 1  | 1                  | 1                  |
| repetition                  | off  | off                | off                |
| aperiodicTriggeringOffset   | n.a.   | 6                  | n.a.               |
| trs-Info                    | n.a.   | n.a.               | n.a.               |
| Resource Config             |  |                    |                    |
| nzp-CSI-RS-ResourceId       | 12 for resource #0   | 22 for resource #0 | 14 for resource #0 |
|                             | 13 for resource #1   | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset          | 0  | 0                  | 0                  |
| powerControlOffsetSS        | db0  | db0                | db0                |
| scramblingID                | 0  | 0                  | 0                  |
| Period (slots)              | slot40   | n.a.               | slot20             |
| Offset                      | 2  | n.a.               | 4                  |
| qcl-InfoPeriodicCSI-RS      | n.a.   | n.a.               | n.a.               |
| frequencyDomainAllocation   | 0001   | 0001               | 0001               |
| nrofPorts                   | 1  | 1                  | 1                  |
| firstOFDMsymbolInTimeDomain | 6 for resource #0  | 7 for resource #0  | 6 for resource #0  |
|                             | 10 for resource #1   | 11 for resource #1 | 10 for resource #1 |
| cdm-Type                    | noCDM  | noCDM              | noCDM              |
| density                     | 3  | 3                  | 3                  |
| startingRB                  | 0  | 0                  | 0                  |
| nrofRBs                     | 276 (Note 1)   | 276 (Note 1)       | 276 (Note 1)       |
| Note 1:                     | If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |                    |                    |

**Table A.3.14.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz**

|  | CSI-RS.3.1<br>TDD | CSI-RS.3.2<br>TDD          | CSI-RS.3.3<br>TDD  | CSI-RS.3.4<br>TDD | CSI-RS.3.5 TDD    |
|--|-------------------|----------------------------|--------------------|-------------------|-------------------|
| Resource Type  | periodic          | periodic                   | aperiodic          | aperiodic         | <b>periodic</b>   |
| <b>Resource Set Config</b>   |                   |                            |                    |                   |                   |
| nzp-CSI-ResourceSetId  | 0                 | 0                          | 0                  | 0                 | 0                 |
| repetition   | n.a.              | off                        | off                | on                | n.a.              |
| aperiodicTriggeringOffset  | n.a.              | n.a.                       | 4                  | 4                 | n.a.              |
| trs-Info   | n.a.              | n.a.                       | n.a.               | n.a.              | n.a.              |
| <b>Resource Config</b>   |                   |                            |                    |                   |                   |
| nzp-CSI-RS-ResourceId  | 0 for resource #0 | 0 for resource #0          | 0 for resource #0  | 0 for resource #0 | 0 for resource #0 |
|  |                   |                            |                    | 1 for resource #1 |                   |
|  |                   |                            |                    | 2 for resource #2 |                   |
|  |                   |                            |                    | 3 for resource #3 |                   |
|  |                   |                            | 1 for resource #1  | 4 for resource #4 |                   |
|  |                   |                            |                    | 5 for resource #5 |                   |
|  |                   |                            |                    | 6 for resource #6 |                   |
|  |                   |                            |                    | 7 for resource #7 |                   |
| powerControlOffset   | 0                 | 0                          | 0                  | 0                 | 0                 |
| powerControlOffsetSS   | db0               | db0                        | db0                | db0               | db0               |
| scramblingID   | 0                 | 0                          | 0                  | 0                 | 0                 |
| Period (slots)   | slot40            | slot80                     | n.a.               | n.a.              | slot320           |
| Offset   | 8                 | 8                          | n.a.               | n.a.              | 8                 |
| qcl-InfoPeriodicCSI-RS   | TCI.State.0       | TCI.State.0<br>TCI.State.1 | n.a.               | n.a.              | TCI.State.0       |
| frequencyDomainAllocation  | 000001            | 0001                       | 0001               | 0001              | 000001            |
| nrofPorts  | 2                 | 1                          | 1                  | 1                 | 1                 |
| firstOFDMSymbolInTimeDomain  | 5 for resource #0 | 6 for resource #0          | 6 for resource #0  | 0 for resource #0 | 5 for resource #0 |
|  |                   |                            |                    | 1 for resource #1 |                   |
|  |                   |                            |                    | 2 for resource #2 |                   |
|  |                   |                            |                    | 3 for resource #3 |                   |
|  |                   |                            | 10 for resource #1 | 4 for resource #4 |                   |
|  |                   |                            |                    | 5 for resource #5 |                   |
|  |                   |                            |                    | 6 for resource #6 |                   |
|  |                   |                            |                    | 7 for resource #7 |                   |
| cdm-Type   | FD-CDM2           | noCDM                      | noCDM              | noCDM             | FD-CDM2           |
| density  | 1                 | 3                          | 3                  | 3                 | 1                 |
| startingRB   | 0                 | 0                          | 0                  | 0                 | 0                 |
| nrofRBs  | 276 (Note 1)      | 276 (Note 1)               | 276 (Note 1)       | 276 (Note 1)      | 276 (Note 1)      |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |                   |                            |                    |                   |                   |

**Table A.3.14.2-3A: CSI-RS Reference Measurement Channels for SCS=120kHz**

| Resource Type               | CSI-RS.3.1A TDD<br>periodic  | CSI-RS.3.2A TDD<br>aperiodic | CSI-RS.3.3A TDD<br>periodic |
|-----------------------------|--|------------------------------|-----------------------------|
| <b>Resource Set Config</b>  |  |                              |                             |
| nzp-CSI-ResourceSetId       | 1  | 1                            | 1                           |
| repetition                  | off  | off                          | off                         |
| aperiodicTriggeringOffset   | n.a.   | 6                            | n.a.                        |
| trs-Info                    | n.a.   | n.a.                         | n.a.                        |
| <b>Resource Config</b>      |  |                              |                             |
| nzp-CSI-RS-ResourceId       | 12 for resource #0   | 22 for resource #0           | 14 for resource #0          |
|                             | 13 for resource #1   | 23 for resource #1           | 15 for resource #1          |
| powerControlOffset          | 0  | 0                            | 0                           |
| powerControlOffsetSS        | db0  | db0                          | db0                         |
| scramblingID                | 0  | 0                            | 0                           |
| Period (slots)              | slot160  | n.a.                         | slot80                      |
| Offset                      | 8  | n.a.                         | 16                          |
| qcl-InfoPeriodicCSI-RS      | n.a.   | n.a.                         | n.a.                        |
| frequencyDomainAllocation   | 0001   | 0001                         | 0001                        |
| nrofPorts                   | 1  | 1                            | 1                           |
| firstOFDMSymbolInTimeDomain | 6 for resource #0  | 7 for resource #0            | 6 for resource #0           |
|                             | 10 for resource #1   | 11 for resource #1           | 10 for resource #1          |
| cdm-Type                    | noCDM  | noCDM                        | noCDM                       |
| density                     | 3  | 3                            | 3                           |
| startingRB                  | 0  | 0                            | 0                           |
| nrofRBs                     | 276 (Note 1)   | 276 (Note 1)                 | 276 (Note 1)                |
| Note 1:                     | If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. |                              |                             |

## A.3.15 Angle of Arrival (AoA) for FR2 RRM test cases

This clause specifies the AoA setups for FR2 RRM test cases in clause A.5 and A.7. The applicable AoA setup is defined in each test case in clause A.5 and A.7.

### A.3.15.1 Setup 1: Single AoA in Rx beam peak direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, are aligned to the UE Rx beam peak direction (as defined in TS 38.101-2 [19]).

### A.3.15.2 Setup 2: Single AoA in non Rx beam peak direction

#### A.3.15.2.1 Setup 2a: Single AoA in non Rx beam peak direction without change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The direction (AoA) of the signals shall not be changed between test iterations.

#### A.3.15.2.2 Setup 2b: Single AoA in non Rx beam peak direction with change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. For UE power class 3, the direction (AoA) of the signals shall be changed for each test iteration (for UE power classes other than 3, this is FFS).

### A.3.15.3 Setup 3: 2 AoAs

There are 2 active probes in the test. The DL signals, and noise if applicable, transmitted from the two active probes, align to directions (AoAs) which are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The relative angular offset between the directions (AoAs) of the 2 active probes, shall be changed for each test iteration. The applicable set of relative angular offsets between the 2 active probes is given in Table 3.15.3-1 for each UE power class.

Editor Note: If RAN5 finds the changing of angular offset between the directions (AoAs) of the 2 active probes per test iteration to be infeasible from the perspectives of EIS spherical coverage and other impacts, e.g.: testing time, then the test setup will be revised.

**Table 3.15.3-1: Set of relative angular offsets between active probes for each power class**

| UE Power class | Relative angular offset between active probes |
|----------------|---|
| 1              | FFS   |
| 2              | FFS   |
| 3              | 30°, 60°, 90°, 120° and 150°                  |
| 4              | FFS   |

### A.3.15.4 Setup 4: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak

#### A.3.15.4.1 Setup 4a: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak without change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [19]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The direction (AoA) of the non Rx beam peak signal shall not be changed between test iterations.

#### A.3.15.4.2 Setup 4b: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak with change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [19]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class.

For UE power class 3, the relative angular offset between the directions (AoAs) of the 2 active probes shall be changed for each test iteration, within the probe alignment described above. The applicable set of relative angular offsets between the 2 active probes is given in Table 3.15.3-1 for each UE power class.

## A.3.16 TCI State Configuration

### A.3.16.1 Introduction

This clause provides the configurations for TCI states towards either SSB or CSI-RS. The TCI states defined in this clause are configured in each test when applicable to indicate that certain DL signals are QCL'ed with the referenceSignal configured in the TCI states.

## A.3.16.2 TCI states

**Table A.3.16.2-1: TCI States**

| Parameter  | TCI.State.0 | TCI.State.1 | TCI.State.2  | TCI.State.3  |
|--|-------------|-------------|--|--|
| tcid-StateId   | Id0         | Id1         | Id2  | Id3  |
| qcl-Type1  | typeC       | typeC       | typeA  | typeA  |
| qcl-Type2 <sup>Note1</sup>   | typeD       | typeD       | typeD  | typeD  |
| referenceSignal  | SSB0        | SSB1        | Resource #4 in TRS resource set 1 <sup>Note3</sup> | Resource #4 in TRS resource set 2 <sup>Note3</sup> |
| Note 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2<br>Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.<br>Note 3: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. |             |             |  |  |

**Table A.3.16.2-2: Void**

## A.3.17 Configurations of CSI-RS for tracking

### A.3.17.1 Configuration of CSI-RS for tracking for FR1

#### A.3.17.1.1 FDD

**Table A.3.17.1.1-1: CSI-RS for tracking for SCS=15kHz**

| Parameter   | Unit  | Value  |
|---|-------|--|
| Reference channel   |       | TRS.1.1 FDD  |
| Bandwidth   |       | BW of Active BWP <sup>Note 1</sup>   |
| SCS   | kHz   | 15   |
| First subcarrier index in the PRB used for CSI-RS   |       | $k_0=0$ for CSI-RS resource 1,2,3,4  |
| First OFDM symbol in the slot used for CSI-RS   |       | $l_0 = 5$ for CSI-RS resource 1 and 3<br>$l_0 = 9$ for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X)  |       | 1 for CSI-RS resource 1,2,3,4  |
| CDM Type  |       | 'No CDM' for CSI-RS resource 1,2,3,4   |
| Density ( $\rho$ )  |       | 3 for CSI-RS resource 1,2,3,4  |
| CSI-RS periodicity  | slots | 20 for CSI-RS resource 1,2,3,4   |
| CSI-RS offset   | slots | 10 for CSI-RS resource 1 and 2<br>11 for CSI-RS resource 3 and 4               |
| EPRE ratio to SSS   | dB    | 0 <sup>Note 2</sup>  |
| TCI state   |       | TCI.State.0  |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases<br>Note 2: Unless otherwise specified in the test case |       |  |

**Table A.3.17.1.1-2: CSI-RS for tracking for SCS=30kHz**

| Parameter  | Unit  | Value  |
|--|-------|--|
| Reference channel  |       | TRS.1.2 FDD  |
| Bandwidth  |       | BW of Active BWP <sup>Note 1</sup>   |
| SCS  | kHz   | 30   |
| First subcarrier index in the PRB used for CSI-RS  |       | $k_0=0$ for CSI-RS resource 1,2,3,4  |
| First OFDM symbol in the slot used for CSI-RS  |       | $l_0 = 5$ for CSI-RS resource 1 and 3<br>$l_0 = 9$ for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X)   |       | 1 for CSI-RS resource 1,2,3,4  |
| CDM Type   |       | 'No CDM' for CSI-RS resource 1,2,3,4   |
| Density ( $\rho$ )   |       | 3 for CSI-RS resource 1,2,3,4  |
| CSI-RS periodicity   | slots | 40 for CSI-RS resource 1,2,3,4   |
| CSI-RS offset  | slots | 20 for CSI-RS resource 1 and 2<br>21 for CSI-RS resource 3 and 4               |
| EPRE ratio to SSS  | dB    | 0 <sup>Note 2</sup>  |
| TCI state  |       | TCI.State.0  |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |       |  |
| Note 2: Unless otherwise specified in the test case  |       |  |

## A.3.17.1.2 TDD

**Table A.3.17.1.2-1: CSI-RS for tracking for SCS=15kHz**

| Parameter  | Unit  | Value  |
|--|-------|--|
| Reference channel  |       | TRS.1.1 TDD  |
| Bandwidth  |       | BW of Active BWP <sup>Note 1</sup>   |
| SCS  | kHz   | 15   |
| First subcarrier index in the PRB used for CSI-RS  |       | $k_0=0$ for CSI-RS resource 1,2,3,4  |
| First OFDM symbol in the slot used for CSI-RS  |       | $l_0 = 5$ for CSI-RS resource 1 and 3<br>$l_0 = 9$ for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X)   |       | 1 for CSI-RS resource 1,2,3,4  |
| CDM Type   |       | 'No CDM' for CSI-RS resource 1,2,3,4   |
| Density ( $\rho$ )   |       | 3 for CSI-RS resource 1,2,3,4  |
| CSI-RS periodicity   | slots | 20 for CSI-RS resource 1,2,3,4   |
| CSI-RS offset  | slots | 10 for CSI-RS resource 1 and 2<br>11 for CSI-RS resource 3 and 4               |
| EPRE ratio to SSS  | dB    | 0 <sup>Note 2</sup>  |
| TCI state  |       | TCI.State.0  |
| Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |       |  |

**Table A.3.17.1.2-2: CSI-RS for tracking for SCS=30kHz**

| Parameter  | Unit  | Value  |
|--|-------|--|
| Reference channel  |       | TRS.1.2 TDD  |
| Bandwidth  |       | BW of Active BWP <sup>Note 1</sup>   |
| SCS  | kHz   | 30   |
| First subcarrier index in the PRB used for CSI-RS  |       | $k_0=0$ for CSI-RS resource 1,2,3,4  |
| First OFDM symbol in the slot used for CSI-RS  |       | $l_0 = 5$ for CSI-RS resource 1 and 3<br>$l_0 = 9$ for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X)   |       | 1 for CSI-RS resource 1,2,3,4  |
| CDM Type   |       | 'No CDM' for CSI-RS resource 1,2,3,4   |
| Density ( $\rho$ )   |       | 3 for CSI-RS resource 1,2,3,4  |
| CSI-RS periodicity   | slots | 40 for CSI-RS resource 1,2,3,4   |
| CSI-RS offset  | slots | 20 for CSI-RS resource 1 and 2<br>21 for CSI-RS resource 3 and 4               |
| EPRE ratio to SSS  | dB    | 0 <sup>Note 2</sup>  |
| TCI state  |       | TCI.State.0  |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |       |  |
| Note 2: Unless otherwise specified in the test case  |       |  |

## A.3.17.2 Configuration of CSI-RS for tracking for FR2

### A.3.17.2.1 TDD

**Table A.3.17.2.1-1: CSI-RS for tracking for SCS=120kHz Set 1**

| Parameter  | Unit  | Value  |
|--|-------|--|
| Reference channel  |       | TRS.2.1 TDD  |
| Bandwidth  |       | BW of Active BWP <sup>Note 1,3</sup>   |
| SCS  | kHz   | 120  |
| First subcarrier index in the PRB used for CSI-RS  |       | $k_0=0$ for CSI-RS resource 1,2,3,4  |
| First OFDM symbol in the slot used for CSI-RS  |       | $l_0 = 1$ for CSI-RS resource 1 and 3<br>$l_0 = 5$ for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X)   |       | 1 for CSI-RS resource 1,2,3,4  |
| CDM Type   |       | 'No CDM' for CSI-RS resource 1,2,3,4   |
| Density ( $\rho$ )   |       | 3 for CSI-RS resource 1,2,3,4  |
| CSI-RS periodicity   | slots | 80 for CSI-RS resource 1,2,3,4   |
| CSI-RS offset  | slots | 40 for CSI-RS resource 1 and 2<br>41 for CSI-RS resource 3 and 4               |
| EPRE ratio to SSS  | dB    | 0 <sup>Note 2</sup>  |
| TCI state  |       | TCI.State.0  |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases<br>Note 2: Unless otherwise specified in the test case<br>Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. |       |  |

**Table A.3.17.2.1-2: CSI-RS for tracking for SCS=120kHz Set 2**

| Parameter  | Unit  | Value  |
|--|-------|--|
| Reference channel  |       | TRS.2.2 TDD  |
| Bandwidth  |       | BW of Active BWP <sup>Note 1,3</sup>   |
| SCS  | kHz   | 120  |
| First subcarrier index in the PRB used for CSI-RS  |       | $k_0=0$ for CSI-RS resource 1,2,3,4  |
| First OFDM symbol in the slot used for CSI-RS  |       | $l_0 = 2$ for CSI-RS resource 1 and 3<br>$l_0 = 6$ for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X)   |       | 1 for CSI-RS resource 1,2,3,4  |
| CDM Type   |       | 'No CDM' for CSI-RS resource 1,2,3,4   |
| Density ( $\rho$ )   |       | 3 for CSI-RS resource 1,2,3,4  |
| CSI-RS periodicity   | slots | 80 for CSI-RS resource 1,2,3,4   |
| CSI-RS offset  | slots | 40 for CSI-RS resource 1 and 2<br>41 for CSI-RS resource 3 and 4               |
| EPRE ratio to SSS  | dB    | 0 <sup>Note 2</sup>  |
| TCI state  |       | TCI.State.1  |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases<br>Note 2: Unless otherwise specified in the test case<br>Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. |       |  |

## A.3.18 Additional definitions related to OTA testing for FR2 RRM test cases

### A.3.18.1 Introduction

FR2 RRM test cases are performed over the air (OTA). This clause provides additional definitions and clarifications on the OTA measurements and metrics defined or referred in the test cases.

### A.3.18.2 PRACH Power Measurement

PRACH power is measured as EIRP(Link=Link angle, Meas=Link angle) as defined in clause 3.1 of TS 38.101-2 [19].



## A.3.19 Test applicability for DAPS handover

### A.3.19.1 Introduction

In Annex A test cases for DAPS handover may be defined with cells in on same or different carrier frequency to verify intra-frequency, intra-band inter-frequency and inter-band inter-frequency DAPS handover RRM requirements, respectively.

### A.3.19.2 Principle of testing

To verify intra-frequency DAPS handover requirements

- The UE capable of intra-frequency asynchronous DAPS handover on any band needs to be tested only in asynchronous scenario.
- The UE not capable of intra-frequency asynchronous DAPS handover on any band but capable of synchronous DAPS handover on some band needs to be tested only in synchronous scenario.

To verify intra-band inter-frequency DAPS handover requirements

- The UE capable of intra-band inter-frequency asynchronous DAPS handover on any band needs to be tested only in asynchronous scenario.
- The UE not capable of intra-band inter-frequency asynchronous DAPS handover on any band but capable of intra-band inter-frequency synchronous DAPS handover on some band needs to be tested only in synchronous scenario.

To verify inter-band inter-frequency DAPS handover requirements

- The UE capable of inter-band inter-frequency asynchronous DAPS handover on any band combination needs to be tested only in asynchronous scenario.
- The UE not capable of inter-band inter-frequency asynchronous DAPS handover on any band combination but capable of inter-band inter-frequency synchronous DAPS handover on some band combination needs to be tested only in synchronous scenario.

## A.3.20 MsgA configurations

### A.3.20.1 Introduction

This clause provides the typical PRACH and PUSCH configurations for MsgA used for RRM test cases defined in Annex A. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

### A.3.20.2 MsgA configurations in FR1

#### A.3.20.2.1 FR1 MsgA configuration 1

FR1 MsgA configuration 1 in this clause provides the typical MsgA configuration for SSB-based contention based random access for 2-step RA type in FR1.

**Table A.3.20.2.1-1: Parameters for FR1 MsgA configuration 1**

| Field  | Value  | Comment   |
|--|--|---|
| msgA-prach-ConfigurationIndex                  | 102  | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msgA-SubcarrierSpacing                         | Same as UL carrier SCS                                     |   |
| msgA-totalNumberOfRA-Preambles                 | 48   | Total number of preambles used for contention based and contention free random access                                     |
| numberOfRA-PreamblesGroupA                     | 48   | No group B.   |
| msgA-PRACH-RootSequenceIndex                   | 0  | Logic sequence index = 0, resulting in root sequence = 1.   |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48   | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB                           |
| msgA-RO-FDM                                    | One  | One PRACH transmission occasions FDMed in one time instance.  |
| ra-ContentionResolutionTimer                   | sf48   | 48 sub-frames   |
| msgA-PreamblePowerRampingStep                  | dB2  |   |
| msgA-PreambleReceivedTargetPower               | dBm-120  |   |
| preambleTransMax                               | n6   | Max number of RA preamble transmission performed before declaring a failure is 6  |
| msgB-ResponseWindow                            | sl10   | 10 slots  |
| msgA-ZeroCorrelationZoneConfig                 | 11   | N-CS configuration, N <sub>cs</sub> = 23  |
| Backoff Parameter Index                        | 2  | 20ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| msgA-MCS                                       | 1  | MCS index for MsgA PUSCH  |
| nrofSlotsMsgA-PUSCH                            | 1  | Number of slots containing one or multiple PUSCH occasions  |
| nrofMsgA-PO-PerSlot                            | 1  | Number of time domain PUSCH occasions in each slot  |
| msgA-PUSCH-TimeDomainOffset                    | 1  | A single time offset with respect to the start of each PRACH slot, counted as the number of slots                         |
| PUSCH start symbol                             | 0  |   |
| PUSCH allocation length                        | 14   |   |
| mappingTypeMsgA-PUSCH                          | typeA  |   |
| nrofPRBs-PerMsgA-PO                            | 2  | Number of RBs per PUSCH occasion  |
| nrofMsgA-PO-FDM                                | One  | The number of MsgA PUSCH occasions FDMed in one time instance   |
| msgA-DMRS-AdditionalPosition                   | pos1   | Position for additional DM-RS   |
| msgA-PUSCH-NrofPorts                           | 1  | Configure 1 port per CDM group  |
| msgA-DeltaPreamble                             | 3  | Power offset of msgA PUSCH relative to the preamble received target power   |
| msgA-Alpha                                     | alpha1   | Alpha value for MsgA PUSCH. Set 1   |
| deltaMCS                                       | Disabled   | Whether to apply delta MCS  |
| Note:  | For further information see clause 6.3.2 in TS 38.331 [2]. |   |

### A.3.20.2.2 FR1 MsgA configuration 2

FR1 PRACH configuration 2 in this clause provides the typical MsgA configuration for SSB based non-contention based random access for 2-step RA type in FR1.

Table A.3.20.2.2-1: Parameters for FR1 MsgA configuration 2

| Field                            | Value  | Comment  |
|----------------------------------|--|--|
| msgA-prach-ConfigurationIndex    | 102  | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].  |
| msgA-SubcarrierSpacing           | Same as UL carrier SCS                                     |  |
| msgA-totalNumberOfRA-Preambles   | 48   | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA       | 48   | No group B.  |
| msgA-PRACH-RootSequenceIndex     | 0  | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-Occasion             | oneFourth  | OneFourth: 1 SSB associated with 4 RACH occasions  |
| msgA-RO-FDM                      | One  | One PRACH transmission occasions FDMed in one time instance.   |
| msgA-PreamblePowerRampingStep    | dB2  |  |
| msgA-PreambleReceivedTargetPower | dBm-120  |  |
| preambleTransMax                 | n6   | Max number of RA preamble transmission performed before declaring a failure is 6   |
| msgB-ResponseWindow              | sl10   | 10 slots   |
| msgA-ZeroCorrelationZoneConfig   | 11   | N-CS configuration, Ncs = 23   |
| Backoff Parameter Index          | 2  | 20ms, as defined in table 7.2-1 in TS 38.321 [7].  |
| ssb-ResourceList                 | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource                 | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR    |
| ra-ssb-OccasionMaskIndex         | 1  | PRACH occasion index 1 is allowed  |
| msgA-MCS                         | 1  | MCS index for MsgA PUSCH   |
| nrofSlotsMsgA-PUSCH              | 1  | Number of slots containing one or multiple PUSCH occasions   |
| nrofMsgA-PO-PerSlot              | 1  | Number of time domain PUSCH occasions in each slot   |
| msgA-PUSCH-TimeDomainOffset      | 1  | A single time offset with respect to the start of each PRACH slot, counted as the number of slots  |
| PUSCH start symbol               | 0  |  |
| PUSCH allocation length          | 14   |  |
| mappingTypeMsgA-PUSCH            | typeA  |  |
| nrofPRBs-PerMsgA-PO              | 2  | Number of RBs per PUSCH occasion   |
| nrofMsgA-PO-FDM                  | One  | The number of MsgA PUSCH occasions FDMed in one time instance  |
| msgA-DMRS-AdditionalPosition     | pos1   | Position for additional DM-RS  |
| msgA-PUSCH-NrofPorts             | 1  | Configure 1 port per CDM group   |
| msgA-DeltaPreamble               | 3  | Power offset of msgA PUSCH relative to the preamble received target power  |
| msgA-Alpha                       | alpha1   | Alpha value for MsgA PUSCH. Set 1  |
| deltaMCS                         | Disabled   | Whether to apply delta MCS   |
| Note:                            | For further information see clause 6.3.2 in TS 38.331 [2]. |  |

## A.3.20.3 MsgA configurations in FR2

### A.3.20.3.1 FR2 MsgA configuration 1

FR2 MsgA configuration 1 in this clause provides the typical MsgA configuration for SSB-based contention based random access for 2-step RA type in FR2.

**Table A.3.20.3.1-1: Parameters for FR2 MsgA configuration 1**

| Field  | Value                  | Comment   |
|--|------------------------|---|
| msgA-prach-ConfigurationIndex                                    | 190                    | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configurations defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msgA-SubcarrierSpacing   | Same as UL carrier SCS |   |
| msgA-totalNumberOfRA-Preambles                                   | 48                     | Total number of preambles used for contention based and contention free random access   |
| numberOfRA-PreamblesGroupA                                       | 48                     | No group B.   |
| msgA-PRACH-RootSequenceIndex                                     | 0                      | Logic sequence index = 0, resulting in root sequence = 1.   |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB                   | oneFourth, n48         | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention-based preambles per SSB                                 |
| msgA-RO-FDM  | One                    | One PRACH transmission occasions FDMed in one time instance.  |
| ra-ContentionResolutionTimer                                     | sf48                   | 48 sub-frames   |
| msgA-PreamblePowerRampingStep                                    | dB2                    |   |
| msgA-PreambleReceivedTargetPower                                 | dBm-120                |   |
| preambleTransMax   | n6                     | Max number of RA preamble transmission performed before declaring a failure is 6  |
| msgB-ResponseWindow  | sl10                   | 10 slots  |
| msgA-ZeroCorrelationZoneConfig                                   | 11                     | N-CS configuration, N <sub>cs</sub> = 23  |
| Backoff Parameter Index  | 2                      | 20 ms, as defined in table 7.2-1 in TS 38.321 [7].  |
| msgA-MCS   | 1                      | MCS index for MsgA PUSCH  |
| nrofSlotsMsgA-PUSCH  | 1                      | Number of slots containing one or multiple PUSCH occasions  |
| nrofMsgA-PO-PerSlot  | 1                      | Number of time domain PUSCH occasions in each slot  |
| msgA-PUSCH-TimeDomainOffset                                      | 1                      | A single time offset with respect to the start of each PRACH slot, counted as the number of slots                               |
| PUSCH start symbol   | 0                      |   |
| PUSCH allocation length  | 10                     |   |
| mappingTypeMsgA-PUSCH  | typeA                  |   |
| nrofPRBs-PerMsgA-PO  | 2                      | Number of RBs per PUSCH occasion  |
| nrofMsgA-PO-FDM  | One                    | The number of MsgA PUSCH occasions FDMed in one time instance   |
| msgA-DMRS-AdditionalPosition                                     | pos1                   | Position for additional DM-RS   |
| msgA-PUSCH-NrofPorts   | 1                      | Configure 1 port per CDM group  |
| msgA-DeltaPreamble   | 3                      | Power offset of msgA PUSCH relative to the preamble received target power   |
| msgA-Alpha   | alpha1                 | Alpha value for MsgA PUSCH. Set 1   |
| deltaMCS   | Disabled               | Whether to apply delta MCS  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                        |   |

### A.3.20.3.2 FR2 MsgA configuration 2

FR2 MsgA configuration 2 in this clause provides the typical MsgA configuration for SSB based non-contention based random access for 2-step RA type in FR2.

Table A.3.20.3.2-1: Parameters for FR2 MsgA configuration 2

| Field                            | Value  | Comment  |
|----------------------------------|--|--|
| msgA-prach-ConfigurationIndex    | 190  | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configurations defined in table 6.3.3.2-4 in TS 38.211 [6].  |
| msgA-SubcarrierSpacing           | Same as UL carrier SCS                                     |  |
| totalNumberOfRA-Preambles        | 48   | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA       | 48   | No group B.  |
| msgA-PRACH-RootSequenceIndex     | 0  | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-Occasion             | oneFourth  | OneFourth: 1 SSB associated with 4 RACH occasions  |
| msgA-RO-FDM                      | One  | One PRACH transmission occasions FDMed in one time instance.   |
| msgA-PreamblePowerRampingStep    | dB2  |  |
| msgA-PreambleReceivedTargetPower | dBm-120  |  |
| preambleTransMax                 | n6   | Max number of RA preamble transmission performed before declaring a failure is 6   |
| msgB-ResponseWindow              | sl10   | 10 slots   |
| msgA-ZeroCorrelationZoneConfig   | 11   | N-CS configuration, N <sub>cs</sub> = 23   |
| Backoff Parameter Index          | 2  | 20 ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| ssb-ResourceList                 | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource                 | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR    |
| ra-ssb-OccasionMaskIndex         | 1  | PRACH occasion index 1 is allowed  |
| msgA-MCS                         | 1  | MCS index for MsgA PUSCH   |
| nrofSlotsMsgA-PUSCH              | 1  | Number of slots containing one or multiple PUSCH occasions   |
| nrofMsgA-PO-PerSlot              | 1  | Number of time domain PUSCH occasions in each slot   |
| msgA-PUSCH-TimeDomainOffset      | 1  | A single time offset with respect to the start of each PRACH slot, counted as the number of slots  |
| PUSCH start symbol               | 0  |  |
| PUSCH allocation length          | 10   |  |
| mappingTypeMsgA-PUSCH            | typeA  |  |
| nrofPRBs-PerMsgA-PO              | 2  | Number of RBs per PUSCH occasion   |
| nrofMsgA-PO-FDM                  | One  | The number of MsgA PUSCH occasions FDMed in one time instance  |
| msgA-DMRS-AdditionalPosition     | pos1   | Position for additional DM-RS  |
| msgA-PUSCH-NrofPorts             | 1  | Configure 1 port per CDM group   |
| msgA-DeltaPreamble               | 3  | Power offset of msgA PUSCH relative to the preamble received target power  |
| msgA-Alpha                       | alpha1   | Alpha value for MsgA PUSCH. Set 1  |
| deltaMCS                         | Disabled   | Whether to apply delta MCS   |
| Note:                            | For further information see clause 6.3.2 in TS 38.331 [2]. |  |

## A.3.20A MsgA configurations under CCA

### A.3.20A.1 Introduction

This clause provides the typical PRACH and PUSCH configurations for MsgA used for RRM test cases defined in Annex A. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

### A.3.20A.2 MsgA configurations in FR1

#### A.3.20A.2.1 FR1 MsgA configuration 1 under CCA

FR1 MsgA configuration 1 under CCA in this clause provides the typical MsgA configuration for SSB-based contention based random access for 2-step RA type in FR1.

**Table A.3.20A.2.1-1: Parameters for FR1 MsgA configuration 1 under CCA**

| Field  | Value  | Comment   |
|--|--|---|
| msgA-prach-ConfigurationIndex                  | 102  | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msgA-SubcarrierSpacing                         | Same as UL carrier SCS                                     |   |
| msgA-totalNumberOfRA-Preambles                 | 48   | Total number of preambles used for contention based and contention free random access                                     |
| numberOfRA-PreamblesGroupA                     | 48   | No group B.   |
| msgA-PRACH-RootSequenceIndex                   | 0  | Logic sequence index = 0, resulting in root sequence = 1.   |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48   | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB                           |
| msgA-RO-FDM                                    | One  | One PRACH transmission occasions FDMed in one time instance.  |
| ra-ContentionResolutionTimer                   | sf48   | 48 sub-frames   |
| msgA-PreamblePowerRampingStep                  | dB2  |   |
| msgA-PreambleReceivedTargetPower               | dBm-114  | Increased by 6 dB compared with FR1 MsgA configuration 1 for random access test with UL CCA failures.                     |
| preambleTransMax                               | n20  | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures             |
| msgB-ResponseWindow                            | sl20   | 20 slots  |
| msgA-ZeroCorrelationZoneConfig                 | 11   | N-CS configuration, Ncs = 23  |
| Backoff Parameter Index                        | 2  | 20ms, as defined in table 7.2-1 in TS 38.321 [7].   |
| msgA-MCS                                       | 1  | MCS index for MsgA PUSCH  |
| nrofSlotsMsgA-PUSCH                            | 1  | Number of slots containing one or multiple PUSCH occasions  |
| nrofMsgA-PO-PerSlot                            | 1  | Number of time domain PUSCH occasions in each slot  |
| msgA-PUSCH-TimeDomainOffset                    | 1  | A single time offset with respect to the start of each PRACH slot, counted as the number of slots                         |
| PUSCH start symbol                             | 0  |   |
| PUSCH allocation length                        | 14   |   |
| mappingTypeMsgA-PUSCH                          | typeA  |   |
| nrofPRBs-PerMsgA-PO                            | 2  | Number of RBs per PUSCH occasion  |
| nrofMsgA-PO-FDM                                | One  | The number of MsgA PUSCH occasions FDMed in one time instance   |
| msgA-DMRS-AdditionalPosition                   | pos1   | Position for additional DM-RS   |
| msgA-PUSCH-NrofPorts                           | 1  | Configure 1 port per CDM group  |
| msgA-DeltaPreamble                             | 3  | Power offset of msgA PUSCH relative to the preamble received target power   |
| msgA-Alpha                                     | alpha1   | Alpha value for MsgA PUSCH. Set 1   |
| deltaMCS                                       | Disabled   | Whether to apply delta MCS  |
| Note:  | For further information see clause 6.3.2 in TS 38.331 [2]. |   |

### A.3.20A.2.2 FR1 MsgA configuration 2 under CCA

FR1 PRACH configuration 2 under CCA in this clause provides the typical MsgA configuration for SSB based non-contention based random access for 2-step RA type in FR1.

Table A.3.20A.2.2-1: Parameters for FR1 MsgA configuration 2 under CCA

| Field                            | Value  | Comment  |
|----------------------------------|--|--|
| msgA-prach-ConfigurationIndex    | 102  | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].  |
| msgA-SubcarrierSpacing           | Same as UL carrier SCS                                     |  |
| msgA-totalNumberOfRA-Preambles   | 48   | Total number of preambles used for contention based and contention free random access  |
| numberOfRA-PreamblesGroupA       | 48   | No group B.  |
| msgA-PRACH-RootSequenceIndex     | 0  | Logic sequence index = 0, resulting in root sequence = 1.  |
| ssb-perRACH-Occasion             | oneFourth  | OneFourth: 1 SSB associated with 4 RACH occasions  |
| msgA-RO-FDM                      | One  | One PRACH transmission occasions FDMed in one time instance.   |
| msgA-PreamblePowerRampingStep    | dB2  |  |
| msgA-PreambleReceivedTargetPower | dBm-114  | Increased by 6 dB compared with FR1 MsgA configuration 2 for random access test with UL CCA failures.  |
| preambleTransMax                 | n20  | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures  |
| msgB-ResponseWindow              | sl20   | 20 slots   |
| msgA-ZeroCorrelationZoneConfig   | 11   | N-CS configuration, $N_{CS} = 23$  |
| Backoff Parameter Index          | 2  | 20ms, as defined in table 7.2-1 in TS 38.321 [7].  |
| ssb-ResourceList                 | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource                 | ra-PreambleIndex = 50                                      | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR    |
| ra-ssb-OccasionMaskIndex         | 1  | PRACH occasion index 1 is allowed  |
| msgA-MCS                         | 1  | MCS index for MsgA PUSCH   |
| nrofSlotsMsgA-PUSCH              | 1  | Number of slots containing one or multiple PUSCH occasions   |
| nrofMsgA-PO-PerSlot              | 1  | Number of time domain PUSCH occasions in each slot   |
| msgA-PUSCH-TimeDomainOffset      | 1  | A single time offset with respect to the start of each PRACH slot, counted as the number of slots  |
| PUSCH start symbol               | 0  |  |
| PUSCH allocation length          | 14   |  |
| mappingTypeMsgA-PUSCH            | typeA  |  |
| nrofPRBs-PerMsgA-PO              | 2  | Number of RBs per PUSCH occasion   |
| nrofMsgA-PO-FDM                  | One  | The number of MsgA PUSCH occasions FDMed in one time instance  |
| msgA-DMRS-AdditionalPosition     | pos1   | Position for additional DM-RS  |
| msgA-PUSCH-NrofPorts             | 1  | Configure 1 port per CDM group   |
| msgA-DeltaPreamble               | 3  | Power offset of msgA PUSCH relative to the preamble received target power  |
| msgA-Alpha                       | alpha1   | Alpha value for MsgA PUSCH. Set 1  |
| deltaMCS                         | Disabled   | Whether to apply delta MCS   |
| Note:                            | For further information see clause 6.3.2 in TS 38.331 [2]. |  |



## A.3.21 V2X sidelink communication

### A.3.21.1 Introduction

This clause also defines the principle and the reference configurations that are applicable to test cases verifying RRM core requirements for V2X sidelink communication.

### A.3.21.2 Reference resource pool configurations for V2X Sidelink Communication

**Table A.3.21.2-1: V2X sidelink SL-BWP configuration for NR**

| Field                        | Value                             | Comment  |
|------------------------------|-----------------------------------|--|
| SL-BWP-ConfigCommon-r16      |                                   |  |
| sl-BWP-Generic-r16           |                                   |  |
| sl-LengthSymbols-r16         | sym14                             | All 14 symbols in a slot without S-SSB are used for sidelink                                     |
| sl-StartSymbol-r16           | sym0                              | Symbol #0 is the starting symbol used for sidelink in a slot without S-SSB                       |
| sl-BWP-PoolConfigCommon-r16  |                                   |  |
| sl-RxPool-r16                |                                   | Indicates the resource pool for reception on the configured BWP.<br>1 entry                      |
| SL-ResourcePool-r16[1]       | Set according to Table A.3.21.2-2 | Entry 1  |
| sl-TxPoolSelectedNormal-r16  |                                   | Indicates the resources pool for mode 2 sidelink communication on the configured BWP.<br>1 entry |
| SL-ResourcePoolConfig-r16[1] |                                   | Entry 1  |
| sl-ResourcePool-r16          | Set according to Table A.3.21.2-2 |  |
| sl-TxPoolExceptional-r16     | Not present                       |  |

Table A.3.21.2-2: V2X sidelink resource pool configuration for NR

| Field                                  | Value  | Comment   |
|--|--|---|
| SL-ResourcePool-r16                    |  |   |
| sl-PSCCH-Config-r16                    | Set according to Table A.3.21.3-1                |   |
| sl-PSSCH-Config-r16                    | Set according to Table A.3.21.3-2                |   |
| sl-PSFCH-Config-r16                    | Not present                                      |   |
| sl-SyncAllowed-r16                     |  | Indicates the allowed synchronization reference(s) which is (are) allowed to use the configured resource pool.  |
| gnss-Sync-r16                          | true   |   |
| gnbEnb-Sync-r16                        | true   |   |
| ue-Sync-r16                            | true   |   |
| sl-SubchannelSize-r16                  | n10  | Subchannel bandwidth is 10 RB   |
| sl-StartRB-Subchannel-r16              | 0  | The offset of lowest RB index of the subchannel with the lowest index in the resource pool with respect to the lowest RB index of a SL BWP  |
| sl-NumSubchannel-r16                   | 1  | Number of subchannels in resource pool  |
| sl-UE-SelectedConfigRP-r16             |  |   |
| sl-Thres-RSRP-List-r16                 | Set according to the specific test configuration | Indicates a list of 64 thresholds, and the threshold should be selected based on the priority in the decoded SCI and the priority in the SCI to be transmitted. A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above a threshold. |
| sl-MultiReserveResource-r16            | Not present                                      |   |
| sl-MaxNumPerReserve-r16                | n2   | At most 2 PSCCH/PSSCH resources can be reserved by a single SCI.  |
| sl-SensingWindow-r16                   | ms100  | Length of resource sensing window specified in TS 38.214 [26] subclause 8.1.4. which is 100ms.  |
| sl-SelectionWindowList-r16             |  | Parameter that determines the end of the selection window for each priority level<br>8 entries  |
| SL-SelectionWindowConfig-r16[k,k=1..8] |  | entry k   |
| sl-Priority-r16                        | k  | for priority level = k  |
| sl-SelectionWindow-r16                 | n20  | Length of resource selection window specified in TS 38.214 [26] subclause 8.1.4. which is $20 \cdot 2^\mu$ slots, where $\mu=0,1,2,3$ refers to SCS 15,30,60,120 kHz respectively   |
| sl-ResourceReservePeriodList-r16       | Not present                                      |   |
| sl-RS-ForSensing-r16                   | pssch  | PSSCH-RSRP measurement is used in the sensing operation.  |
| sl-RxParametersNcell                   | Not present                                      |   |
| sl-ZoneConfigMCR-List-r16              | Not present                                      |   |
| sl-PreemptionEnable-r16                | enabled  |   |
| sl-MinMaxMCS-List-r16                  |  | 1 entry   |
| SL-MinMaxMCS-Config-r16[1]             |  | Entry 1   |
| sl-MCS-Table-r16                       | qam64  | TS 38.214 [26] Table 5.1.3.1-1 is the MCS table used in the resource pool.  |
| sl-TimeResource-r16                    | 1111111111<br>1111111111                         | Every slot in a period of 20 slots during a SFN or DFN cycle can be used for sidelink   |
| SL-TxPercentageList-r16                |  |   |
| SL-TxPercentageConfig-r16              |  |   |
| sl-TxPercentage-r16                    | p20  | Indicates the portion of candidate single-slot PSSCH resources over the total resources. Value p20 corresponds to 20%, and so on.   |

Table A.3.21.2-3: V2X sidelink UE autonomous resource selection configuration for NR

| Field                        | Value       | Comment   |
|------------------------------|-------------|---|
| SL-UE-SelectedConfig-r16     |             |   |
| sl-PSSCH-TxConfigList-r16    |             | 1 entry   |
| SL-PSSCH-TxConfig-r16[1]     |             | Entry 1   |
| sl-TypeTxSync-r16            | Not present | When this field is absent, the configuration is applicable for all synchronization reference types.   |
| sl-ThresUE-Speed-r16         | kmph200     | UE shall apply the parameters in sl-ParametersAboveThres-r16 if UE absolute speed is higher than 200 km/h, otherwise UE shall apply the parameters in sl-ParametersBelowThres-r16 |
| sl-ParametersAboveThres-r16  |             |   |
| sl-MinMCS-PSSCH-r16          | 0           | The minimum MCS index value can be used for PSSCH transmission.   |
| sl-MaxMCS-PSSCH-r16          | 15          | The maximum MCS index value can be used for PSSCH transmission.   |
| sl-MinSubChannelNumPSSCH-r16 | 1           | The minimum number of subchannels can be used for PSSCH transmission.   |
| sl-MaxSubchannelNumPSSCH-r16 | 1           | The maximum number of subchannels can be used for PSSCH transmission.   |
| sl-MaxTxTransNumPSSCH-r16    | 1           | The maximum transmission number for PSSCH (including new transmission and retransmission).  |
| sl-MaxTxPower-r16            | Not present | Not applicable  |
| sl-ParametersBelowThres-r16  |             |   |
| sl-MinMCS-PSSCH-r16          | 4           | Same as above   |
| sl-MaxMCS-PSSCH-r16          | 25          | Same as above   |
| sl-MinSubChannelNumPSSCH-r16 | 1           | Same as above   |
| sl-MaxSubchannelNumPSSCH-r16 | 1           | Same as above   |
| sl-MaxTxTransNumPSSCH-r16    | 1           | Same as above   |
| sl-MaxTxPower-r16            | Not present | Same as above   |
| sl-ProbResourceKeep-r16      | v0dot8      | The probability of UE keeping current resource is 80% when the resource reselection counter reaches 0 (see TS 38.321 [7]).  |
| sl-ReselectAfter-r16         | n1          | Resource reselection is triggered after 1 sidelink transmission is skipped (see TS 38.321 [7]).   |

### A.3.21.3 Reference measurement channels for V2X Sidelink Communication

**Table A.3.21.3-1: PSCCH Reference Measurement Channels**

| Parameter  |                                  | Unit | Value   |
|--|----------------------------------|------|---|
| Reference channel  |                                  |      | CC.1A HD  |
| Channel bandwidth  |                                  | MHz  | Note2   |
| Number of PSCCH symbols per slot   |                                  |      | 2   |
| Number of PSCCH RB   |                                  |      | 10  |
| Modulation   |                                  |      | QPSK  |
| Information Bit Payload (without CRC)  |                                  | Bits | 26  |
| Information Bit  | Number of DMRS ports             |      | 0 (1 port)  |
|  | Priority                         |      | As set by higher layers                               |
|  | Resource reservation period      |      | N/A   |
|  | Modulation and coding scheme     |      | Set as the PSSCH MCS specified in the test            |
|  | DMRS pattern                     |      | 0 (2 DMRS)  |
|  | 2 <sup>nd</sup> stage SCI format |      | 00 (SCI format 2-A)                                   |
|  | Beta offset indicator            |      | Set as specified in the test                          |
|  | Frequency resource assignment    |      | Set as per PSSCH RB allocation specific in the test   |
|  | Time resource assignment         |      | Set as per PSSCH slot allocation specific in the test |
| Reserved bits  |                                  |      | Set all these bits to 0                               |
| Transport block CRC  |                                  | Bits | 24  |
| Binary Channel Bits (see Note 1)   |                                  | Bits | 360   |
| Note 1: Binary channel bits calculated under assumption of 2 CP-OFDM symbols per subframe. |                                  |      |   |
| Note 2: Channel bandwidth depends on test configuration.                                   |                                  |      |   |

**Table A.3.21.3-2: PSSCH Reference Measurement Channels**

| Parameter   |  | Unit | Value    |
|---|--|------|----------|
| Reference channel   |  |      | CD.1A HD |
| Sidelink transmission mode                                  |  |      | 2        |
| Channel bandwidth   |  | MHz  | Note1    |
| Allocated PSSCH resource blocks                             |  |      | 10       |
| Number of PSSCH symbols per slot                            |  |      | 10       |
| Modulation  |  |      | QPSK     |
| Target Code Rate  |  |      | 1/3      |
| Information Bit Payload (Transport block size)              |  | Bits | 672      |
| Transport block CRC   |  | Bits | 24       |
| Number of PSSCH HARQ retransmissions                        |  |      | 0        |
| Binary Channel Bits   |  | Bits | 2160     |
| Note 1: Channel bandwidth depends on test configuration.    |  |      |          |
| Note 2: 2nd state SCI and PSFCH are not allocated per slot. |  |      |          |

## A.3.22 CSI-IM configurations

### A.3.22.1 FDD

**Table A.3.22.1-1: CSI-IM Reference Measurement Channels for SCS=15kHz**

| Resource Type              | CSI-IM.1.1 FDD    | CSI-IM.1.2 FDD     | CSI-IM.1.3 FDD    |
|----------------------------|-------------------|--------------------|-------------------|
|                            | periodic          | aperiodic          | periodic          |
| <b>Resource Set Config</b> |                   |                    |                   |
| csi-IM-ResourceSetId       | 0                 | 0                  | 0                 |
| <b>Resource Config</b>     |                   |                    |                   |
| csi-IM-ResourceId          | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |

|  |                    |                    |                    |
|--|--------------------|--------------------|--------------------|
|  | 1 for resource #1  | 11 for resource #1 | 3 for resource #1  |
| csi-IM-ResourceElementPattern  | pattern1           | pattern1           | pattern1           |
| subcarrierLocation-p1  | s0                 | s0                 | s0                 |
| symbolLocation-p1  | 6 for resource #0  | 7 for resource #0  | 6 for resource #0  |
|  | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots)   | slot20             | n.a.               | slot10             |
| Offset   | 1                  | n.a.               | 2                  |
| startingRB   | 0                  | 0                  | 0                  |
| nrofRBs  | 276 (Note 1)       | 276 (Note 1)       | 276 (Note 1)       |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. |                    |                    |                    |

### A.3.22.2 TDD

**Table A.3.22.2-1: CSI-IM Reference Measurement Channels for SCS=15kHz**

| Resource Type  | CSI-IM.1.1 TDD<br>periodic | CSI-IM.1.2 TDD<br>aperiodic | CSI-IM.1.3 TDD<br>periodic |
|--|----------------------------|-----------------------------|----------------------------|
| <b>Resource Set Config</b>   |                            |                             |                            |
| csi-IM-ResourceSetId   | 0                          | 0                           | 0                          |
| <b>Resource Config</b>   |                            |                             |                            |
| csi-IM-ResourceId  | 0 for resource #0          | 10 for resource #0          | 2 for resource #0          |
|  | 1 for resource #1          | 11 for resource #1          | 3 for resource #1          |
| csi-IM-ResourceElementPattern  | pattern1                   | pattern1                    | pattern1                   |
| subcarrierLocation-p1  | s0                         | s0                          | s0                         |
| symbolLocation-p1  | 6 for resource #0          | 7 for resource #0           | 6 for resource #0          |
|  | 10 for resource #1         | 11 for resource #1          | 10 for resource #1         |
| Period (slots)   | slot20                     | n.a.                        | slot10                     |
| Offset   | 1                          | n.a.                        | 2                          |
| startingRB   | 0                          | 0                           | 0                          |
| nrofRBs  | 276 (Note 1)               | 276 (Note 1)                | 276 (Note 1)               |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. |                            |                             |                            |

**Table A.3.22.2-2: CSI-IM Reference Measurement Channels for SCS=30kHz**

| Resource Type                 | CSI-IM.2.1 TDD<br>periodic | CSI-IM.2.2 TDD<br>aperiodic | CSI-IM.2.3 TDD<br>periodic |
|-------------------------------|----------------------------|-----------------------------|----------------------------|
| <b>Resource Set Config</b>    |                            |                             |                            |
| csi-IM-ResourceSetId          | 0                          | 0                           | 0                          |
| <b>Resource Config</b>        |                            |                             |                            |
| csi-IM-ResourceId             | 0 for resource #0          | 10 for resource #0          | 2 for resource #0          |
|                               | 1 for resource #1          | 11 for resource #1          | 3 for resource #1          |
| csi-IM-ResourceElementPattern | pattern1                   | pattern1                    | pattern1                   |

|  |                    |                    |                    |
|--|--------------------|--------------------|--------------------|
| subcarrierLocation-p1  | s0                 | s0                 | s0                 |
| symbolLocation-p1  | 6 for resource #0  | 7 for resource #0  | 6 for resource #0  |
|  | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots)   | slot40             | n.a.               | slot40             |
| Offset   | 2                  | n.a.               | 4                  |
| startingRB   | 0                  | 0                  | 0                  |
| nrofRBs  | 276 (Note 1)       | 276 (Note 1)       | 276 (Note 1)       |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. |                    |                    |                    |

**Table A.3.22.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz**

|  | CSI-IM.3.1 TDD     | CSI-IM.3.2 TDD     | CSI-IM.3.3 TDD     |
|--|--------------------|--------------------|--------------------|
| Resource Type  | periodic           | aperiodic          | periodic           |
| Resource Set Config  |                    |                    |                    |
| csi-IM-ResourceSetId   | 0                  | 0                  | 0                  |
| Resource Config  |                    |                    |                    |
| csi-IM-ResourceId  | 0 for resource #0  | 10 for resource #0 | 2 for resource #0  |
|  | 1 for resource #1  | 11 for resource #1 | 3 for resource #1  |
| csi-IM-ResourceElementPattern  | pattern1           | pattern1           | pattern1           |
| subcarrierLocation-p1  | s0                 | s0                 | s0                 |
| symbolLocation-p1  | 6 for resource #0  | 7 for resource #0  | 6 for resource #0  |
|  | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots)   | slot160            | n.a.               | slot80             |
| Offset   | 8                  | n.a.               | 16                 |
| startingRB   | 0                  | 0                  | 0                  |
| nrofRBs  | 276 (Note 1)       | 276 (Note 1)       | 276 (Note 1)       |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. |                    |                    |                    |

## A.3.23 Spatial Relation Configuration

### A.3.23.1 Introduction

This clause provides the configurations for spatial relation towards either SSB or CSI-RS. The spatial relation defined in this clause are configured in each test when applicable to indicate spatial setting for certain UL signals with the referenceSignal configured in the spatial relation.

### A.3.23.2 Spatial Relation

**Table A.3.23.2-1: PUCCH Spatial Relation**

| Parameter   | PUCCH.SRI.0 | PUCCH.SRI.1 |
|---|-------------|-------------|
| pucch-SpatialRelationInfoId   | Id0         | Id1         |
| referenceSignal   | SSB0        | SSB1        |
| PUCCH-PathlossReferenceRS   | SSB0        | SSB1        |
| Note 1: referenceSignal configurations towards which the spatial relation are configured in a test-specific manner. |             |             |

**Table A.3.23.2-2: SRS Spatial Relation**

| Parameter   | SRS.SRI0 | SRS.SRI1 |
|---|----------|----------|
| srs-SpatialRelationInfoId   | Id0      | Id1      |
| referenceSignal   | SSB0     | SSB1     |
| Note 1: referenceSignal configurations towards which the spatial relation are configured in a test-specific manner. |          |          |

## A.3.24 SRS configuration

**Table A.3.24-1: Sounding Reference Symbol Configuration for SCS=15kHz**

|                                  | SRS.1 TDD        | POS-SRS.1                      |  |
|----------------------------------|------------------|--------------------------------|--|
| Field                            | Value            |                                | Comment  |
| c-SRS                            | 12               | Same as NRB,c in the test case |  |
| b-SRS                            | 0                | n.a.                           |  |
| b-hop                            | 0                | n.a.                           | Frequency hopping is disabled                              |
| groupOrSequenceHopping           | neither          | neither                        | No group or sequence hopping                               |
| freqDomainPosition               | 0                | 0                              | Frequency domain position of SRS                           |
| freqDomainShift                  | 0                | 0                              |  |
| pathlossReferenceRS<br>ssb-Index | 0                | 0                              | SSB #0 is used for SRS path loss estimation                |
| usage                            | antennaSwitching | n.a.                           |  |
| startPosition                    | 5                | 5                              | resourceMapping setting                                    |
| nrofSymbols                      | 4                | 4                              | SRS symbols belong to the same SRS resource.               |
| repetitionFactor                 | n1               | n.a.                           | without repetition.  |
| transmissionComb                 | n2               | n4                             |  |
| combOffset                       | 0                | 0                              | transmissionComb setting                                   |
| cyclicShift                      | 0                | 0                              |  |
| nrofSRS-Ports                    | port1            | port1                          | Number of antenna ports used for SRS resource transmission |
| resourceType                     | Periodic         | Periodic                       |  |
| periodicityAndOffset-p           | sl40, 2          | sl160, 20                      | SRS transmission periodicity                               |

**Table A.3.24-2: Sounding Reference Symbol Configuration for SCS=30kHz**

|                                  | <b>SRS.2 TDD</b> | <b>POS-SRS.2</b>               |  |
|----------------------------------|------------------|--------------------------------|--|
| <b>Field</b>                     | <b>Value</b>     |                                | <b>Comment</b>   |
| c-SRS                            | 24               | Same as NRB,c in the test case |  |
| b-SRS                            | 0                | n.a.                           |  |
| b-hop                            | 0                | n.a.                           | Frequency hopping is disabled                              |
| groupOrSequenceHopping           | neither          | neither                        | No group or sequence hopping                               |
| freqDomainPosition               | 0                | 0                              | Frequency domain position of SRS                           |
| freqDomainShift                  | 0                | 0                              |  |
| pathlossReferenceRS<br>ssb-Index | 0                | 0                              | SSB #0 is used for SRS path loss estimation                |
| usage                            | antennaSwitching | n.a.                           |  |
| startPosition                    | 5                | 5                              | resourceMapping setting                                    |
| nrofSymbols                      | 4                | 4                              | SRS symbols belong to the same SRS resource.               |
| repetitionFactor                 | n1               | n.a.                           | without repetition.  |
| transmissionComb                 | n2               | n4                             |  |
| combOffset-n2                    | 0                | 0                              | transmissionComb setting                                   |
| cyclicShift-n2                   | 0                | 0                              |  |
| nrofSRS-Ports                    | port1            | port1                          | Number of antenna ports used for SRS resource transmission |
| resourceType                     | Periodic         | Periodic                       |  |
| periodicityAndOffset-p           | sl80, 4          | Sl320, 40                      | SRS transmission periodicity                               |



**Table A.3.24-3: Sounding Reference Symbol Configuration for SCS=120kHz**

|                                  | <b>SRS.3 TDD</b> | <b>POS-SRS.3</b>               |  |
|----------------------------------|------------------|--------------------------------|--|
| <b>Field</b>                     | <b>Value</b>     |                                | <b>Comment</b>   |
| c-SRS                            | 17               | Same as NRB,c in the test case |  |
| b-SRS                            | 0                | n.a.                           |  |
| b-hop                            | 0                | n.a.                           | Frequency hopping is disabled                              |
| groupOrSequenceHopping           | neither          | neither                        | No group or sequence hopping                               |
| freqDomainPosition               | 0                | 0                              | Frequency domain position of SRS                           |
| freqDomainShift                  | 0                | 0                              |  |
| pathlossReferenceRS<br>ssb-Index | 0                | 0                              | SSB #0 is used for SRS path loss estimation                |
| usage                            | antennaSwitching | n.a.                           |  |
| startPosition                    | 5                | 5                              | resourceMapping setting                                    |
| nrofSymbols                      | 4                | 4                              | SRS symbols belong to the same SRS resource.               |
| repetitionFactor                 | n1               | n.a.                           | without repetition.  |
| transmissionComb                 | n2               | n4                             |  |
| combOffset-n2                    | 0                | 0                              | transmissionComb setting                                   |
| cyclicShift-n2                   | 0                | 0                              |  |
| nrofSRS-Ports                    | port1            | port1                          | Number of antenna ports used for SRS resource transmission |
| resourceType                     | Periodic         | Periodic                       |  |
| periodicityAndOffset-p           | sl320, 16        | Sl1280, 160                    | SRS transmission periodicity                               |

## A.3.25 Channel bandwidth (CBW) configurations

### A.3.25.1 DL UE specific CBW

**Table A.3.25.1-1: DL CBW patterns for UE specific CBW configuration**

| <b>BWP Parameters</b>  | <b>Unit</b> | <b>Values</b>                           |   |
|--|-------------|---|---|
| Reference CBW  |             | DLCBW.1.1                               | DLCBW.1.2                               |
| OffsetToCarrier  | RB          | 0                                       | RB <sub>x</sub> <sup>Note 1</sup>       |
| carrierBandwidth   | RB          | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: RB <sub>x</sub> is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RB <sub>x</sub> has to be within the CBW of BS. |             |   |   |

## A.3.25.2 UL UE specific CBW

**Table A.3.25.2-1: UL CBW patterns for UE specific CBW configuration**

| BWP Parameters   | Unit | Values                                  |   |
|--|------|---|---|
| Reference CBW  |      | ULCBW.1.1                               | ULCBW.1.2                               |
| OffsetToCarrier  | RB   | 0                                       | RB <sub>x</sub> <sup>Note 1</sup>       |
| carrierBandwidth   | RB   | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: RB <sub>x</sub> is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RB <sub>x</sub> has to be within the CBW of BS. |      |   |   |

## A.3.26 CCA model

### A.3.26.1 Introduction

The CCA model is used in some RRM test cases with at least one cell on a carrier frequency with CCA. The intention with the CCA model is to emulate in the test equipment the behaviour of a gNB or UE which performs channel measurement to check that the channel is clear prior to performing one or more downlink or uplink transmissions.

### A.3.26.2 CCA model for operation on a carrier frequency with CCA in FR1

#### A.3.26.2.1 DL CCA model

The same DL CCA model is applicable regardless of whether DRX cycle is used or not with the following differences: - The counter,  $l_{CCA}$ , is used to monitor the number of unavailable DBT samples within an evaluation window,  $W_{CCA\_DL}$ . DBT samples outside of the evaluation window  $W_{CCA\_DL}$  are discarded.

- If DRX cycle is not used then prior to each DBT window, the test equipment shall determine whether the DL CCA attempt is successful (i.e., the corresponding signals have to be transmitted), based on probability  $P_{CCA\_DL}$  of successful DL CCA configured in the corresponding test case. If DRX cycle is not used, then the DL CCA model shall increment the counter  $l_{CCA}$  for every unavailable DBT sample due to DL CCA failure.
- If DRX cycle is used, then the DL CCA model shall increment the counter,  $l_{CCA}$ , once per DRX cycle for a DRX cycle if the first DBT sample in that DRX cycle is unavailable due to DL CCA failure. DL CCA failures in a DRX cycle are determined as follows:
  - The test system *in the first DBT window of each DRX cycle* determines whether the DL CCA attempt is successful or not using the principle as follows:
    - If the DL CCA is successful then the test system shall transmit in all DBT windows within that DRX cycle.
    - If the DL CCA is not successful then the test system shall not transmit in any of the DBT windows within that DRX cycle. In this case  $l_{CCA}$  is increased by 1.
  - The parameters,  $L_{CCA\_DL}$ ,  $L_{CCA\_UL}$ ,  $W_{CCA\_DL}$  and  $W_{CCA\_UL}$  can be used as in non-DRX tests.

If the CCA attempt is successful for a transmission, then the test equipment shall transmit also other remaining transmissions, according to the configuration, within the same DBT window.

If the CCA attempt is not successful for a transmission within the DBT window, the test equipment shall determine whether the CCA attempt is successful for the next configured transmission, based on probability  $P_{CCA\_DL}$ .

The probability can be different in different time intervals  $T_i$  during a test case. One probability value (per cell) applies at any time point during a test; one or more probability values can be configured in the entire test, one value  $P_{CCA\_DL}$  per time interval  $T_i$  where  $i \geq 1$ , and the multiple time intervals (when  $i > 1$ ) do not overlap (e.g.,  $P_{CCA\_DL}=1.0$  in  $T_1$  and  $P_{CCA\_DL}=0.75$  in  $T_2$ ).

For semi-static channel access configuration, a single value  $P_{CCA\_DL}$  is used to configure the probability of CCA success in different time intervals  $T_i$  during a test realization. An additional limit  $L_{CCA\_DL}$  is used to determine the maximum number of unavailable DBT samples within an evaluation window  $W_{CCA\_DL}$ . If the number of unavailable DBT samples

on the last  $W_{CCA\_DL}$  DBT samples is larger or equal to  $L_{CCA\_DL}$ , the CCA attempt is considered successful for transmission.

For dynamic channel access configuration, the parameters  $P_{CCA\_DL\_1}$  and  $P_{CCA\_DL\_2}$  are used to configure the probability of CCA success on the first and second SSB candidate positions, respectively, in different time intervals  $T_i$  during a test realization. An additional limit  $L_{CCA\_DL}$  is used to determine the maximum number of unavailable DBT samples within an evaluation window  $W_{CCA\_DL}$ . If the number of unavailable DBT samples on the last  $W_{CCA\_DL}$  DBT samples is larger or equal to  $L_{CCA\_DL}$ , the CCA attempt is considered successful for transmission.

For semi-static channel access configuration or for dynamic channel access configuration where one candidate SSB position is modeled, prior to each discovery burst transmission window within a time interval  $T_i$  of the test, the test equipment shall:

- 1 - Generate a uniform random variable  $p1$  from the range [0, 1] for the first candidate position.
- 2 - Transmit the discovery burst based on  $p1$  in the first candidate position. If  $p1 \leq P_{CCA\_DL}$ , the discovery burst is transmitted at the first candidate SSB location; else if  $l_{CCA}$  is larger than or equal to  $L_{CCA\_DL}$ , the discovery burst is transmitted at the first candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle.

For dynamic channel access configuration where two candidate SSB positions are modelled, prior to each discovery burst transmission window within a time interval  $T_i$  of the test, the test equipment shall:

- 1 - Generate a uniform random variable  $p1$  from the range [0, 1] for the first candidate position.
- 2 - Transmit the discovery burst based on  $p1$  in the first candidate position: if  $p1 \leq P_{CCA\_DL1}$ , the discovery burst is transmitted at first candidate SSB location, else the test equipment shall:
  - a - Generate a uniform random variable  $p2$  from the range [0, 1] for the second candidate SSB position.
  - b - Transmit the discovery burst based on  $p2$  in the second candidate position. If  $p2 \leq P_{CCA\_DL2}$ , the discovery burst is transmitted at the second candidate SSB location; else if  $l_{CCA}$  is larger than or equal to  $L_{CCA\_DL}$ , the discovery burst is transmitted at the second candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle.

The above steps are repeated for each discovery burst transmission window in each time interval  $T_i$  of the test. The limit  $L_{CCA\_DL}$  and window  $W_{CCA\_DL}$  is a configuration parameter for each test case.

In many test cases, the requirement under a test depends on the number of configured SSB transmissions which are not available during the test due to CCA failure, so the test equipment shall track how many such signal occasions are not transmitted in DL during the test period.

### A.3.26.2.2 UL CCA model

For UL CCA, the modelling approach is based on probability  $P_{CCA\_UL}$  of successful CCA. Probability  $P_{CCA\_UL}$  is configured in the corresponding test case, based on a set  $S_{CCA\_UL}$  of possible values including 75 % and 87% as typical values for dynamic and semi-static channel access configurations, 0% to model consistent UL CCA failures, and 100% to model no UL CCA failures.

Consistent UL CCA failures are modelled by configuring a low value for  $P_{CCA\_UL}$ , e.g.,  $P_{CCA\_UL} = 0\%$ .

In the same time interval  $T_i$  during the same test case,  $P_{CCA\_UL}$  can be different from  $P_{CCA\_DL}$ .

The probability can be different in different time intervals  $T_i$  during a test case. One probability value applies at any time point during a test; one or more probability values can be configured in the entire test, one value  $P_{CCA\_UL}$  per time interval  $T_i$  where  $I \geq 1$ , and the multiple time intervals (when  $I > 1$ ) do not overlap (e.g.,  $P_{CCA\_UL} = 1.0$  in  $T_1$  and  $P_{CCA\_UL} = 0.75$  in  $T_2$ ).

$T_{CCA}$   $\mu s$  prior to each UL transmission burst in the test, the test equipment (TE) shall generate a uniform random variable  $p$  from the range [0, 1]. If  $p < P_{CCA\_UL}$ , the TE transmits an OCNG noise pattern with an energy level  $X$  within the UE BW scheduled/configured for the UL transmission for at-least  $T_{CCA}$   $\mu s$ . Where  $T_{CCA}$   $\mu s$  is energy detection time for accessing the uplink channel as defined in section 5.1.1 of TS 37.106 [36]. Where:

- X is 3 dB above the energy detection threshold defined in section 5.1.1 of TS 37.106 [36].
- $T_{CCA}$  is the channel sensing period depending on CCA category for the next UL transmission.

The TE shall count the number of UL CCA failures, and no further UL CCA failures are modeled if the number of failures exceeds the limit  $L_{CCA\_UL}$  within a window  $W_{CCA\_UL}$ . For each UL CCA failure generated by the model, the TE shall monitor the corresponding UL resource for the desired UL signal, and based on when and/or whether the TE received the desired UL signal, it deems the test case to pass or fail.

In many cases, the requirement under a test depends on the number of configured signal occasions which are not available during the test, so the test equipment shall track how many such signal occasions are not transmitted in UL during the test period.

## A.3.27 Test Cases with at Least One Cell on a Carrier Frequency with CCA

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.1 Introduction

### A.3.27.2 NR Standalone Tests with NR SCell under CCA and All Other NR Cells in FR1

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.3 EN-DC Tests with NR PSCell under CCA and Other NR Cells in FR1

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.4 NR Standalone Tests with NR PCell under CCA and Other NR Cells in FR1

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.5 E-UTRA Standalone Tests with at Least One NR Cell under CCA

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

## A.3.28 Discovery Burst Transmission Window configuration under CCA

### A.3.28.1 DBT Window pattern 1: DBT Window period = 20 ms with DBT Window duration = 1 ms

**Table A.3.28.1-1: DBT.1: DBT Window Pattern 1 for DBT Window period = 20 ms and duration = 1 ms**

| SMTc Parameters                                 | Values |
|---|--------|
| Discovery burst transmission window periodicity | 20 ms  |
| Discovery burst transmission window offset      | 0 ms   |
| Discovery burst transmission window duration    | 1 ms   |

## A.3.29 Testing principles for UE capable of only NR bands with shared spectrum access

### A.3.29.1 Introduction

In annex A test cases are defined involving one or more NR cells operating on NR band(s) with shared spectrum channel access. The NR bands with shared spectrum channel access are defined in clause 5.2 of TS 38-101-1 [18].

### A.3.29.2 Principle of testing for UE capable of EN-DC with only NR bands with shared spectrum access

In Annex A, test cases in table A.3.29.2-1 are defined for UE capable of EN-DC with only NR band(s) with shared spectrum access and are not required for UE supporting also other NR band(s) (i.e. band with no shared spectrum access). The EN-DC configurations are defined in clause of 5.5B of TS 38.101-3 [20].

**Table A.3.29.2-1: Test cases applicable to UE supporting EN-DC with only NR bands with shared spectrum access**

| Test category        | Section      | Test case   |
|----------------------|--------------|---|
| Active BWP switching | A.10.3.5.2.1 | E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC                |
|                      | A.10.3.5.2.2 | E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC |
|                      | A.10.3.5.3.1 | E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC                |

### A.3.29.3 Principle of testing for UE capable of SA operation with only NR bands with shared spectrum access

In Annex A, test cases in table A.3.29.3-1 are defined for UE capable of NR SA operation with only NR band(s) with shared spectrum access and are not required for UE supporting also other NR band(s) (i.e. band with no shared spectrum access).

**Table A.3.29.3-1: Test cases applicable to UE supporting SA operation with only NR bands with shared spectrum access**

| Test category        | Section      | Test case   |
|----------------------|--------------|---|
| Active BWP switching | A.11.4.5.2.1 | NR FR1- NR FR1 DL active BWP switch of PCell with non-DRX in SA |
|                      | A.11.4.5.2.2 | NR FR1 DL active BWP switch with non-DRX in SA                  |
|                      | A.11.4.5.3.1 | NR FR1 DL active BWP switch of Cell with non-DRX in SA          |
|                      |              |   |

## A.3.30 CSI-RS configurations for RRM

### A.3.30.1 FDD

Table A.3.30.1-1: CSI-RS RRM Reference Measurement Channels for SCS=15kHz

|  | CSI-RS.RRM.FR1.1 FDD |
|--|----------------------|
| <b>CSI-RS-ResourceConfigMobility</b>   |                      |
| subcarrierSpacing, kHz   | 15                   |
| <b>CSI-RS-CellMobility</b>   |                      |
| cellId <sup>note1</sup>  | 0                    |
| nrofPRBs   | 48                   |
| startPRB   | 0                    |
| density  | 3                    |
| <b>CSI-RS-Resource-Mobility</b>  |                      |
| csi-RS-Index   | 0                    |
| slotConfig: ms20 <sup>note2</sup>  | slot1                |
| associatedSSB  | True                 |
| ssb-Index <sup>note3</sup>   | 0                    |
| isQuasiColocated   | True                 |
| firstOFDMsymbolInTimeDomain <sup>note4</sup>   | 10                   |
| sequenceGenerationConfig   | 0                    |
| <b>Others</b>  |                      |
| nrofPorts  | 1                    |
| CDM Type   | NoCDM                |
| EPRE ratio to SSS, dB  | 0                    |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise |                      |

## A.3.30.2 TDD

Table A.3.30.2-1: CSI-RS RRM Reference Measurement Channels for SCS=15kHz

|  | CSI-RS.RRM.FR1.1 TDD |
|--|----------------------|
| <b>CSI-RS-ResourceConfigMobility</b>   |                      |
| subcarrierSpacing, kHz   | 15                   |
| <b>CSI-RS-CellMobility</b>   |                      |
| cellId <sup>note1</sup>  | 0                    |
| nrofPRBs   | 48                   |
| startPRB   | 0                    |
| density  | 3                    |
| <b>CSI-RS-Resource-Mobility</b>  |                      |
| csi-RS-Index   | 0                    |
| slotConfig: ms20 <sup>note2</sup>  | slot1                |
| associatedSSB  | True                 |
| ssb-Index <sup>note3</sup>   | 0                    |
| isQuasiColocated   | True                 |
| firstOFDMSymbolInTimeDomain <sup>note4</sup>   | 10                   |
| sequenceGenerationConfig   | 0                    |
| <b>Others</b>  |                      |
| nrofPorts  | 1                    |
| CDM Type   | NoCDM                |
| EPRE ratio to SSS, dB  | 0                    |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise |                      |

Table A.3.30.2-2: CSI-RS RRM Reference Measurement Channels for SCS=30kHz

|  | CSI-RS.RRM.FR1.2 TDD |
|--|----------------------|
| <b>CSI-RS-ResourceConfigMobility</b>   |                      |
| subcarrierSpacing, kHz   | 30                   |
| <b>CSI-RS-CellMobility</b>   |                      |
| cellId <sup>note1</sup>  | 0                    |
| nrofPRBs   | 48                   |
| startPRB   | 0                    |
| density  | 3                    |
| <b>CSI-RS-Resource-Mobility</b>  |                      |
| csi-RS-Index   | 0                    |
| slotConfig: ms20 <sup>note2</sup>  | slot1                |
| associatedSSB  | True                 |
| ssb-Index <sup>note3</sup>   | 0                    |
| isQuasiColocated   | True                 |
| firstOFDMSymbolInTimeDomain <sup>note4</sup>   | 10                   |
| sequenceGenerationConfig   | 0                    |
| <b>Others</b>  |                      |
| nrofPorts  | 1                    |
| CDM Type   | NoCDM                |
| EPRE ratio to SSS, dB  | 0                    |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise |                      |

Table A.3.30.2-3: CSI-RS RRM Reference Measurement Channels for SCS=120kHz

| CSI-RS.RRM.FR2.1 TDD   |       |
|--|-------|
| <b>CSI-RS-ResourceConfigMobility</b>   |       |
| subcarrierSpacing, kHz   | 120   |
| <b>CSI-RS-CellMobility</b>   |       |
| cellId <sup>note1</sup>  | 0     |
| nrofPRBs   | 48    |
| startPRB   | 0     |
| density  | 3     |
| <b>CSI-RS-Resource-Mobility</b>  |       |
| csi-RS-Index   | 0     |
| slotConfig: ms20 <sup>note2</sup>  | slot1 |
| associatedSSB  | True  |
| ssb-Index <sup>note3</sup>   | 0     |
| isQuasiColocated   | True  |
| firstOFDMSymbolInTimeDomain <sup>note4</sup>   | 10    |
| sequenceGenerationConfig   | 0     |
| <b>Others</b>  |       |
| nrofPorts  | 1     |
| CDM Type   | NoCDM |
| EPRE ratio to SSS, dB  | 0     |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise |       |

## A.3.31 PRS Configurations

### A.3.31.1. PRS Configurations for FR1

#### A.3.31.1.1. PRS pattern 1 in FR1: SCS=15 KHz

Table A.3.31.1.1 -1: PRS.1 FR1: PRS Pattern 1 for SSB SCS=15 KHz

| PRS Parameters                                      | Values      |             |             |             |
|---|-------------|-------------|-------------|-------------|
|   | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.3 FR1 | PRS.1.4 FR1 |
| Reference channel                                   | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.3 FR1 | PRS.1.4 FR1 |
| Resource index in resource set                      | 0           | 0           | 0           | 1           |
| PRS periodicity                                     | 160ms       |             |             |             |
| PRS Resource set slot offset <sup>Note 1</sup>      | 10 ms       |             |             |             |
| PRS Resource slot offset (slot) <sup>Note 1</sup>   | 0           | 4           | 0           | 4           |
| PRS RE offset <sup>Note 1</sup>                     | 0           | 0           | 1           | 0           |
| SCS   | 15kHz       |             |             |             |
| PRS comb size                                       | 2           | 4           | 2           | 4           |
| Number of PRS symbol                                | 4           | 4           | 4           | 4           |
| Repetition factor                                   | 2           | 1           | 2           | 1           |
| PRS resource time gap (slot)                        | 1           | 1           | 1           | 1           |
| RB numbers containing PRS within channel BW         | 0-23        | 0-103       | 0-23        | 0-103       |
| PRS Start PRB                                       | 0           |             |             |             |
| Note 1: Unless otherwise specified in the test case |             |             |             |             |



## A.3.31.1.2. PRS pattern 2 in FR1: SCS=30 KHz

Table A.3.31.1.2 -1: PRS.2 FR1: PRS Pattern 2 for SCS=30 KHz

| PRS Parameters                                      | Values      |             |             |             |   |   |
|---|-------------|-------------|-------------|-------------|---|---|
| Reference channel                                   | PRS.2.1 FR1 | PRS.2.2 FR1 | PRS.2.3 FR1 | PRS.2.4 FR1 |   |   |
| Resource index in resource set                      | 0           | 0           | 0           | 1           | 0 | 1 |
| PRS periodicity                                     | 160ms       |             |             |             |   |   |
| PRS Resource set slot offset <sup>Note 1</sup>      | 10 ms       |             |             |             |   |   |
| PRS Resource slot offset (slot) <sup>Note 1</sup>   | 0           | 4           | 0           | 4           |   |   |
| PRS RE offset <sup>Note 1</sup>                     | 0           |             | 0           | 1           | 0 | 1 |
| SCS   | 30kHz       |             |             |             |   |   |
| PRS comb size                                       | 2           | 4           | 2           | 4           |   |   |
| Number of PRS symbol                                | 4           | 4           | 4           | 4           |   |   |
| Repetition factor                                   | 2           | 1           | 2           | 1           |   |   |
| PRS resource time gap (slot)                        | 1           | 1           | 1           | 1           |   |   |
| RB numbers containing PRS within channel BW         | 0-23        | 0-131       | 0-23        | 0-131       |   |   |
| PRS Start PRB                                       | 0           |             |             |             |   |   |
| Note 1: Unless otherwise specified in the test case |             |             |             |             |   |   |

## A.3.31.2. PRS Configurations for FR2

## A.3.31.2.1. PRS pattern 1 in FR2: SCS=120 KHz

Table A.3.31.2.1-1: PRS.1 FR2: PRS Pattern 1 for SCS=120 KHz

| PRS Parameters                                      | Values      |             |             |             |   |   |
|---|-------------|-------------|-------------|-------------|---|---|
| Reference channel                                   | PRS.1.1 FR2 | PRS.1.2 FR2 | PRS.1.3 FR2 | PRS.1.4 FR2 |   |   |
| Resource index in resource set                      | 0           | 0           | 0           | 1           | 0 | 1 |
| PRS periodicity                                     | 160ms       |             |             |             |   |   |
| PRS Resource set slot offset <sup>Note 1</sup>      | 10 ms       |             |             |             |   |   |
| PRS Resource slot offset (slot) <sup>Note 1</sup>   | 0           | 4           | 0           | 4           |   |   |
| PRS RE offset <sup>Note 1</sup>                     | 0           |             | 0           | 1           | 0 | 1 |
| SCS   | 120kHz      |             |             |             |   |   |
| PRS comb size                                       | 2           | 4           | 2           | 4           |   |   |
| Number of PRS symbol                                | 4           | 4           | 4           | 4           |   |   |
| Repetition factor                                   | 2           | 1           | 2           | 1           |   |   |
| PRS resource time gap (slot)                        | 1           | 1           | 1           | 1           |   |   |
| RB numbers containing PRS within channel BW         | 0-31        | 0-127       | 0-31        | 0-127       |   |   |
| PRS Start PRB                                       | 0           |             |             |             |   |   |
| Note 1: Unless otherwise specified in the test case |             |             |             |             |   |   |

## A.4 EN-DC tests with all NR cells in FR1

### A.4.1 Void

### A.4.2 Void

### A.4.3 RRC\_CONNECTED state mobility

#### A.4.3.1 Void

#### A.4.3.2 RRC Connection Mobility Control

##### A.4.3.2.1 Void

##### A.4.3.2.2 Random Access

###### A.4.3.2.2.1 4-step RA type contention based random access test in FR1 for PSCell in EN-DC

###### A.4.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.1.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.1.1-2.

**Table A.4.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR1 for PSCell in EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 4      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.4.3.2.2.1.1-2: General test parameters for contention based random access test in FR1 for PSCell in EN-DC**

| Parameter  |                      | Unit       | Test-1                    | Comments                                     |  |
|--|----------------------|------------|---------------------------|--|--|
| SSB Configuration  | Config 1,2           |            | SSB pattern 3 in FR1      | As defined in A.3.10                         |  |
|  | Config 3,4           |            | SSB pattern 4 in FR1      |  |  |
|  |                      |            |                           |  |  |
| Duplex Mode for Cell 2   | Config 1,2           |            | FDD                       |  |  |
|  | Config 3,4           |            | TDD                       |  |  |
| TDD Configuration  | Config 3,4           |            | TDDConf.2.1               |  |  |
| OCNG Pattern <sup>Note 1</sup>   |                      |            | OCNG pattern 1            | As defined in A.3.2.1.                       |  |
| PDSCH parameters<br><sup>Note 4</sup>  | Config 1,2           |            | SR.1.1 FDD                | As defined in A.3.1.1.                       |  |
|  | Config 3,4           |            | SR.2.1 TDD                |  |  |
| RMSI CORESET<br>Reference Channel  | Config 1,2           |            | CR.1.1 FDD                |  |  |
|  | Config 3,4           |            | CR.2.1 TDD                |  |  |
| Dedicated CORESET<br>Reference Channel   | Config 1,2           |            | CCR.1.1 FDD               |  |  |
|  | Config 3,4           |            | CCR.2.1 TDD               |  |  |
| NR RF Channel Number   |                      |            | 1                         |  |  |
| EPRE ratio of PSS to SSS   |                      | dB         | 0                         |  |  |
| EPRE ratio of PBCH_DMRS to SSS   |                      | dB         |                           |  |  |
| EPRE ratio of PBCH to PBCH_DMRS  |                      | dB         |                           |  |  |
| EPRE ratio of PDCCH_DMRS to SSS  |                      | dB         |                           |  |  |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                      | dB         |                           |  |  |
| EPRE ratio of PDSCH_DMRS to SSS  |                      | dB         |                           |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                      | dB         |                           |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                      | dB         |                           |  |  |
| SSB with<br>index 0  | $\hat{E}_s / I_{ot}$ |            | dB                        | 3  | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz                 | -98  |  |
|  |                      | Config 3,4 |                           | -101   |  |
|  | $\hat{E}_s / N_{oc}$ |            | dB                        |  |  |
| SS-RSRP <sup>Note 3</sup>  |                      | dBm/ SCS   |                           | -95  |  |
| SSB with<br>index 1  | $\hat{E}_s / I_{ot}$ |            | dB                        | -17  | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz                 | -98  |  |
|  |                      | Config 3,4 |                           | -101   |  |
|  | $\hat{E}_s / N_{oc}$ |            | dB                        |  |  |
| SS-RSRP <sup>Note 3</sup>  |                      | dBm/ SCS   |                           | -115   |  |
| $I_o$ <sup>Note 2</sup>  | Config 1,2           | dBm        | -65.3/9.36MHz             | For symbols without SSB index 1              |  |
|  | Config 3,4           |            | -62.2/38.16MHz            |  |  |
| ss-PBCH-BlockPower   |                      | dBm/ SCS   | -5                        | As defined in clause 6.3.2 in TS 38.331 [2]. |  |
| Configured UE transmitted power ( $P_{CMAX, f,c}$ )  |                      | dBm        | 23                        | As defined in clause 6.2.4 in TS 38.101-1.   |  |
| PRACH Configuration  |                      |            | FR1 PRACH configuration 1 | As defined in A.3.8.2.                       |  |
| Propagation Condition  |                      | -          | AWGN                      |  |  |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: SS-RSRP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purpose. They are not settable parameters.</p> <p>Note 3: Void</p> <p>Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> |                      |            |                           |  |  |

#### A.4.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.4.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4, the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

A.4.3.2.2.1.2.5 Void

Clause A.4.3.2.2.1.2.6 Void

Clause A.4.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

A.4.3.2.2.2 4-step RA type non-contention based random access test in FR1 for PSCell in EN-DC

A.4.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.2.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2). Test 2 is only applicable to UE which supports *csi-RSRP-AndRSRQ-MeasWithSSB* or *csi-RSRP-AndRSRQ-MeasWithoutSSB*.

**Table A.4.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for PSCell in EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 4      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.4.3.2.2.1-2: General test parameters for non-contention based random access test in FR1 for PSCell in EN-DC**

| Parameter  |                      | Unit       | Test-1                    | Test-2                    | Comments                                     |  |
|--|----------------------|------------|---------------------------|---------------------------|--|--|
| SSB Configuration                                      | Config 1,2           |            | SSB pattern 3 in FR1      | SSB pattern 3 in FR1      | As defined in A.3.10                         |  |
|  | Config 3,4           |            | SSB pattern 4 in FR1      | SSB pattern 4 in FR1      |  |  |
| CSI-RS Configuration                                   | Config 1,2           |            | N/A                       | CSI-RS.1.1 FDD            | As defined in A.3.1.4                        |  |
|  | Config 3,4           |            |                           | CSI-RS.2.1 TDD            |  |  |
| Duplex Mode for Cell 2                                 | Config 1,2           |            | FDD                       | FDD                       |  |  |
|  | Config 3,4           |            | TDD                       | TDD                       |  |  |
| TDD Configuration                                      | Config 3,4           |            | TDDConf.2.1               | TDDConf.2.1               |  |  |
| OCNG Pattern <sup>Note 1</sup>                         |                      |            | OCNG pattern 1            | OCNG pattern 1            | As defined in A.3.2.1.                       |  |
| PDSCH parameters<br>Note 4                             | Config 1,2           |            | SR.1.1 FDD                | SR.1.1 FDD                | As defined in A.3.1.1.                       |  |
|  | Config 3,4           |            | SR.2.1 TDD                | SR.2.1 TDD                |  |  |
| RMSI CORESET Reference Channel                         | Config 1,2           |            | CR.1.1 TDD                | CR.1.1 TDD                |  |  |
|  | Config 3,4           |            | CR.2.1 TDD                | CR.2.1 TDD                |  |  |
| Dedicated CORESET Reference Channel                    | Config 1,2           |            | CCR.1.1 TDD               | CCR.1.1 TDD               |  |  |
|  | Config 3,4           |            | CCR.2.1 TDD               | CCR.2.1 TDD               |  |  |
| NR RF Channel Number                                   |                      |            | 1                         | 1                         |  |  |
| EPRE ratio of PSS to SSS                               |                      | dB         | 0                         | 0                         |  |  |
| EPRE ratio of PBCH_DMRS to SSS                         |                      | dB         |                           |                           |  |  |
| EPRE ratio of PBCH to PBCH_DMRS                        |                      | dB         |                           |                           |  |  |
| EPRE ratio of PDCCH_DMRS to SSS                        |                      | dB         |                           |                           |  |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                      |                      | dB         |                           |                           |  |  |
| EPRE ratio of PDSCH_DMRS to SSS                        |                      | dB         |                           |                           |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                      |                      | dB         |                           |                           |  |  |
| SSB with index 0                                       | $\hat{E}_s / I_{ot}$ |            | dB                        | 3                         | 3  | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz                 | -98                       | -98  |  |
|  |                      | Config 3,4 |                           | -101                      | -101   |  |
|  | $\hat{E}_s / N_{oc}$ |            | dB                        | 3                         | 3  |  |
| SS-RSRP <sup>Note 3</sup>                              |                      | dBm/ SCS   | -95                       | -95                       |  |  |
| SSB with index 1                                       | $\hat{E}_s / I_{ot}$ |            | dB                        | -17                       | -17  | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz                 | -98                       | -98  |  |
|  |                      | Config 3,4 |                           | -101                      | -101   |  |
|  | $\hat{E}_s / N_{oc}$ |            | dB                        | -17                       | -17  |  |
| SS-RSRP <sup>Note 3</sup>                              |                      | dBm/ SCS   | -115                      | -115                      |  |  |
| I <sub>0</sub> <sup>Note 2</sup>                       | Config 1,2           | dBm        | -65.3/9.36MHz             | -65.3/9.36MHz             | For symbols without SSB index 1              |  |
|  | Config 3,4           |            | -62.2/38.16MHz            | -62.2/38.16MHz            |  |  |
| ss-PBCH-BlockPower                                     |                      | dBm/ SCS   | -5                        | -5                        | As defined in clause 6.3.2 in TS 38.331 [2]. |  |
| Configured UE transmitted power ( $P_{C_{MAX, f,c}}$ ) |                      | dBm        | 23                        | 23                        | As defined in clause 6.2.4 in TS 38.101-1.   |  |
| PRACH Configuration                                    |                      |            | FR1 PRACH configuration 2 | FR1 PRACH configuration 3 | As defined in A.3.8.2.                       |  |
| Propagation Condition                                  |                      | -          | AWGN                      | AWGN                      |  |  |



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

#### A.4.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.4.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.1 for SSB-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.1 for CSI-RS-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.3 2-step RA type contention based random access test in FR1 for PSCell in EN-DC

##### A.4.3.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.3.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.3.1-2.

**Table A.4.3.2.2.3.1-1: Supported test configurations for 2-step RA type contention based random access test in FR1 for PSCell in EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 4      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.4.3.2.2.3.1-2: General test parameters for 2-step RA type contention based random access test in FR1 for PSCell in EN-DC**

| Parameter  |                      | Unit       | Test-1                   | Comments   |   |
|--|----------------------|------------|--------------------------|--|---|
| SSB Configuration  | Config 1,2           |            | SSB pattern 3 in FR1     | As defined in A.3.10   |   |
|  | Config 3,4           |            | SSB pattern 4 in FR1     |  |   |
| Duplex Mode for Cell 2   | Config 1,2           |            | FDD                      |  |   |
|  | Config 3,4           |            | TDD                      |  |   |
| TDD Configuration  | Config 3,4           |            | TDDConf.2.1              |  |   |
| OCNG Pattern <sup>Note 1</sup>   |                      |            | OCNG pattern 1           | As defined in A.3.2.1.   |   |
| PDSCH parameters <sup>Note 3</sup>   | Config 1,2           |            | SR.1.1 FDD               | As defined in A.3.1.1.   |   |
|  | Config 3,4           |            | SR.2.1 TDD               |  |   |
| RMSI CORESET Reference Channel   | Config 1,2           |            | CR.1.1 FDD               |  |   |
|  | Config 3,4           |            | CR.2.1 TDD               |  |   |
| Dedicated CORESET Reference Channel  | Config 1,2           |            | CCR.1.1 FDD              |  |   |
|  | Config 3,4           |            | CCR.2.1 TDD              |  |   |
| NR RF Channel Number   |                      |            | 1                        |  |   |
| EPRE ratio of PSS to SSS   |                      | dB         | 0                        |  |   |
| EPRE ratio of PBCH_DMRS to SSS   |                      | dB         |                          |  |   |
| EPRE ratio of PBCH to PBCH_DMRS  |                      | dB         |                          |  |   |
| EPRE ratio of PDCCH_DMRS to SSS  |                      | dB         |                          |  |   |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                      | dB         |                          |  |   |
| EPRE ratio of PDSCH_DMRS to SSS  |                      | dB         |                          |  |   |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                      | dB         |                          |  |   |
| SSB with index 0   | $\hat{E}_s / I_{ot}$ |            | dB                       | 3  | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz                | -98  |   |
|  |                      | Config 3,4 |                          | -101   |   |
|  | $\hat{E}_s / N_{oc}$ |            | dB                       | 3  |   |
| SS-RSRP <sup>Note 2</sup>  |                      | dBm/ SCS   | -95                      |  |   |
| SSB with index 1   | $\hat{E}_s / I_{ot}$ |            | dB                       | -17  | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz                | -98  |   |
|  |                      | Config 3,4 |                          | -101   |   |
|  | $\hat{E}_s / N_{oc}$ |            | dB                       | -17  |   |
| SS-RSRP <sup>Note 2</sup>  |                      | dBm/ SCS   | -115                     |  |   |
| Io   | Config 1,2           | dBm        | -65.3/9.36MHz            | For symbols without SSB index 1  |   |
|  | Config 3,4           |            | -62.2/38.16MHz           |  |   |
| ss-PBCH-BlockPower   |                      | dBm/ SCS   | -5                       | As defined in clause 6.3.2 in TS 38.331 [2].                               |   |
| Configured UE transmitted power ( $P_{CMAX, f,c}$ )  |                      | dBm        | 23                       | As defined in clause 6.2.4 in TS 38.101-1.                                 |   |
| MsgA Configuration   |                      |            | FR1 MsgA configuration 1 | As defined in A.3.20.2.1.  |   |
| <i>msgA-RSRP-ThresholdSSB</i>  |                      | dBm        | RSRP_51                  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |   |
| Propagation Condition  |                      | -          | AWGN                     |  |   |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: SS-RSRP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purpose. They are not settable parameters.</p> <p>Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> |                      |            |                          |  |   |

#### A.4.3.2.2.3.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.4.3.2.2.3.2.1 MsgA Transmission

To test the UE behaviour specified in Clause 6.2.2.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first MsgA preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.3.2.2 MsgB Reception

To test the UE behaviour specified in Clause 6.2.2.3.1.2 the System Simulator shall transmit a MsgB with fallbackRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first MsgA preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.1.3 the System Simulator shall transmit a MsgB with fallbackRAR containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first MsgA preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.4 2-step RA type non-contention based random access test in FR1 for PSCell in EN-DC

##### A.4.3.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.4.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.4.1-2.

**Table A.4.3.2.2.4.1-1: Supported test configurations for non-contention based random access test for 2-step RA type in FR1 for PSCell in EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 4      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.4.3.2.2.4.1-2: General test parameters for non-contention based random access test for 2-step RA type in FR1 for PSCell in EN-DC**

| Parameter  |                      | Unit       | Test-1                   | Comments  |
|--|----------------------|------------|--------------------------|---|
| SSB Configuration                                  | Config 1,2           |            | SSB pattern 3 in FR1     | As defined in A.3.10  |
|  | Config 3,4           |            | SSB pattern 4 in FR1     |   |
| Duplex Mode for Cell 2                             | Config 1,2           |            | FDD                      |   |
|  | Config 3,4           |            | TDD                      |   |
| TDD Configuration                                  | Config 3,4           |            | TDDConf.2.1              |   |
| OCNG Pattern <sup>Note 1</sup>                     |                      |            | OCNG pattern 1           | As defined in A.3.2.1.  |
| PDSCH parameters <sup>Note 3</sup>                 | Config 1,2           |            | SR.1.1 FDD               | As defined in A.3.1.1.  |
|  | Config 3,4           |            | SR.2.1 TDD               |   |
| RMSI CORESET Reference Channel                     | Config 1,2           |            | CR.1.1 TDD               |   |
|  | Config 3,4           |            | CR.2.1 TDD               |   |
| Dedicated CORESET Reference Channel                | Config 1,2           |            | CCR.1.1 TDD              |   |
|  | Config 3,4           |            | CCR.2.1 TDD              |   |
| NR RF Channel Number                               |                      |            | 1                        |   |
| EPRE ratio of PSS to SSS                           |                      | dB         | 0                        |   |
| EPRE ratio of PBCH_DMRS to SSS                     |                      | dB         |                          |   |
| EPRE ratio of PBCH to PBCH_DMRS                    |                      | dB         |                          |   |
| EPRE ratio of PDCCH_DMRS to SSS                    |                      | dB         |                          |   |
| EPRE ratio of PDCCH to PDCCH_DMRS                  |                      | dB         |                          |   |
| EPRE ratio of PDSCH_DMRS to SSS                    |                      | dB         |                          |   |
| EPRE ratio of PDSCH to PDSCH_DMRS                  |                      | dB         |                          |   |
| SSB with index 0                                   | $\hat{E}_s / I_{ot}$ | dB         | 3                        | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | -98                      |   |
|  |                      | Config 3,4 | -101                     |   |
|  | $\hat{E}_s / N_{oc}$ | dB         | 3                        |   |
| SS-RSRP  |                      | dBm/ SCS   | -95                      |   |
| SSB with index 1                                   | $\hat{E}_s / I_{ot}$ | dB         | -17                      | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1,2 | -98                      |   |
|  |                      | Config 3,4 | -101                     |   |
|  | $\hat{E}_s / N_{oc}$ | dB         | -17                      |   |
| SS-RSRP  |                      | dBm/ SCS   | -115                     |   |
| $I_0$ <sup>Note 2</sup>                            | Config 1,2           | dBm        | -65.3/9.36MHz            | For symbols without SSB index 1   |
|  | Config 3,4           |            | -62.2/38.16MHz           |   |
| ss-PBCH-BlockPower                                 |                      | dBm/ SCS   | -5                       | As defined in clause 6.3.2 in TS 38.331 [2].  |
| Configured UE transmitted power ( $P_{CMAX,f,c}$ ) |                      | dBm        | 23                       | As defined in clause 6.2.4 in TS 38.101-1.  |
| MsgA Configuration                                 |                      |            | FR1 MsgA configuration 2 | As defined in A.3.20.2.   |
| <i>msgA-RSRP-ThresholdSSB</i>                      |                      | dBm        | RSRP_51                  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].            |
| Propagation Condition                              |                      | -          | AWGN                     |   |

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

#### A.4.3.2.2.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.4.3.2.2.4.2.1 MsgA Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.3.2.1 for MsgA transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.2.2 the System Simulator shall transmit a MsgB containing a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble after 5 MsgA transmissions have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB if the MsgB contains a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power if Random Access Responses Reception has not been considered as successful.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.4.3.2.2.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.2.3 the System Simulator shall transmit a MsgB corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*.



In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.3 Void

### A.4.4 Timing

#### A.4.4.1 UE transmit timing

##### A.4.4.1.1 NR UE Transmit Timing Test for FR1

###### A.4.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2. Supported test configurations are shown in Table 4.4.1.1.1-1.

**Table A.4.4.1.1.1-1: Supported test configurations for FR1 PSCell**

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

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.3.7.2.1. Table A.4.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.4.4.1.1.1-3.

**Table A.4.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter                                | Unit    | Config      | Test1                       | Test2                  | Band Group |
|--|---------|-------------|-----------------------------|------------------------|------------|
| SSB ARFCN                                |         | 1,2,3,4,5,6 | Freq1                       | Freq1                  |            |
| Duplex Mode                              |         | 1,4         | FDD                         |                        |            |
|  |         | 2,3,5,6     | TDD                         |                        |            |
| TDD configuration                        |         | 1,4         | Not Applicable              |                        |            |
|  |         | 2,5         | TDDConf.1.1                 |                        |            |
|  |         | 3,6         | TDDConf.2.1                 |                        |            |
| BW <sub>channel</sub>                    | MHz     | 1,4         | 10: N <sub>RB,c</sub> = 52  |                        |            |
|  |         | 2,5         | 10: N <sub>RB,c</sub> = 52  |                        |            |
|  |         | 3,6         | 40: N <sub>RB,c</sub> = 106 |                        |            |
| Initial BWP Configuration                |         | 1,2,3,4,5,6 | DLBWP.0.1<br>ULBWP.0.1      |                        |            |
| Dedicated BWP Configuration              |         | 1,2,3,4,5,6 | DLBWP.1.1<br>ULBWP.1.1      |                        |            |
| DRx Cycle                                | ms      | 1,2,3,4,5,6 | N/A                         | DRX.8 <sup>Note5</sup> |            |
| PDSCH Reference measurement channel      |         | 1,4         | SR.1.1 FDD                  |                        |            |
|  |         | 2,5         | SR.1.1 TDD                  |                        |            |
|  |         | 3,6         | SR.2.1 TDD                  |                        |            |
| RMSI CORESET Reference Channel           |         | 1,4         | CR.1.1 FDD                  |                        |            |
|  |         | 2,5         | CR.1.1 TDD                  |                        |            |
|  |         | 3,6         | CR.2.1 TDD                  |                        |            |
| Dedicated CORESET Reference Channel      |         | 1,4         | CCR.1.1 FDD                 |                        |            |
|  |         | 2,5         | CCR.1.1 TDD                 |                        |            |
|  |         | 3,6         | CCR.2.1 TDD                 |                        |            |
| OCNG Patterns                            |         | 1,2,3,4,5,6 | OP.1                        |                        |            |
| SSB configuration                        |         | 1,4         | SSB.1 FR1                   |                        |            |
|  |         | 2,5         | SSB.1 FR1                   |                        |            |
|  |         | 3,6         | SSB.2 FR1                   |                        |            |
| SMTc configuration                       |         | 1,2,3,4,5,6 | SMTc.2                      |                        |            |
| TRS configuration                        |         | 1,4         | TRS.1.1 FDD                 |                        |            |
|  |         | 2,5         | TRS.1.1 TDD                 |                        |            |
|  |         | 3,6         | TRS.1.2 TDD                 |                        |            |
| PDSCH/PDCCH subcarrier spacing           | kHz     | 1,2,4,5     | 15                          |                        |            |
|  |         | 3,6         | 30                          |                        |            |
| EPRE ratio of PSS to SSS                 | dB      | 1,2,3,4,5,6 | 0                           | 0                      |            |
| EPRE ratio of PBCH DMRS to SSS           |         |             |                             |                        |            |
| EPRE ratio of PBCH to PBCH DMRS          |         |             |                             |                        |            |
| EPRE ratio of PDCCH DMRS to SSS          |         |             |                             |                        |            |
| EPRE ratio of PDCCH to PDCCH DMRS        |         |             |                             |                        |            |
| EPRE ratio of PDSCH DMRS to SSS          |         |             |                             |                        |            |
| EPRE ratio of PDSCH to PDSCH             |         |             |                             |                        |            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |         |             |                             |                        |            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |         |             |                             |                        |            |
| $N_{oc}^{Note2}$                         |         |             |                             |                        |            |
| $N_{oc}^{Note2}$                         | dBm/SCS | 1,2,4,5     | -98                         | -98                    |            |
|  |         | 3,6         | -95                         | -95                    |            |
| $\hat{E}_s / I_{ot}$                     |         | 1,2,3,4,5,6 | 3                           | 3                      |            |
| $\hat{E}_s / N_{oc}$                     |         | 1,2,3,4,5,6 | 3                           | 3                      |            |
| SS-RSRP <sup>Note3</sup>                 | dBm/SCS | 1,2,4,5     | -95                         | -95                    |            |
|  |         | 3,6         | -92                         | -92                    |            |

|                                 |  |             |                             |                             |  |
|---------------------------------|--|-------------|-----------------------------|-----------------------------|--|
| I <sub>0</sub> <sup>Note3</sup> | dBm/9.36MHz  | 1,2,4,5     | -65.2                       | -65.2                       |  |
|                                 | dBm/38.1MHz  | 3,6         | -59.2                       | -59.2                       |  |
| Propagation condition           |  | 1,2,3,4,5,6 | AWGN                        |                             |  |
| SRS Config                      |  | 1,2,4,5     | SRSCConf.1 <sup>Note6</sup> | SRSCConf.3 <sup>Note6</sup> |  |
|                                 |  | 3, 6        | SRSCConf.1 <sup>Note6</sup> | SRSCConf.2 <sup>Note6</sup> |  |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |             |                             |                             |  |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |             |                             |                             |  |
| Note 3:                         | SS-RSRP and I <sub>0</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |             |                             |                             |  |
| Note 4:                         | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |             |                             |                             |  |
| Note 5:                         | DRx related parameters are given in Table A.3.3.8-1  |             |                             |                             |  |
| Note 6:                         | SRS configs are given in Table A.4.4.1.1.1-3   |             |                             |                             |  |

Table A.4.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

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

#### A.4.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.1-1 and setup NR PCell according to parameters given in Table A.4.4.1.1.1-1.

- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.4.4.1.1.2-1

**Table A.4.4.1.1.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value     |                      |
|--------------------------|----------------------|----------------------|
|                          | Test1                | Test2                |
| 15                       | +64*64T <sub>c</sub> | +32*64T <sub>c</sub> |
| 30                       | +32*64T <sub>c</sub> | +16*64T <sub>c</sub> |

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

## A.4.4.2 UE timer accuracy

### A.4.4.3 Timing advance

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

##### A.4.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

##### A.4.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.4.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.4.4.3.1.2-2, A.4.4.3.1.2-3 and A.4.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in clause A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.4.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.4.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in clause 7.3.2.1, the UE adjusts its uplink timing at slot  $n+k$  for a timing advance command received in slot  $n$ . This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

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

**Table A.4.4.3.1.2-1: Timing advance supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.4.4.3.1.2-2: General test parameters for timing advance**

| Parameter  | Unit | Value                  | Comment  |
|--|------|------------------------|--|
| RF channel number                                |      | Cell 1: 1<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>2 for NR PSCell   |
| Initial DL BWP                                   |      | DLBWP.0.1              | As specified in Table A.3.9.2.1-1  |
| Dedicated DL BWP                                 |      | DLBWP.1.1              | As specified in Table A.3.9.2.2-1  |
| Initial UL BWP                                   |      | ULBWP.0.1              | As specified in Table A.3.9.3.1-1  |
| Dedicated UL BWP                                 |      | ULBWP.1.1              | As specified in Table A.3.9.3.2-1  |
| Timing Advance Command ( $T_A$ ) value during T1 |      | 31                     | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2                |
| Timing Advance Command ( $T_A$ ) value during T2 |      | 39                     | For 15 kHz SCS $N_{TA\_new} = N_{TA\_old} + 8192 * T_c$<br>For 30 kHz SCS $N_{TA\_new} = N_{TA\_old} + 4096 * T_c$<br>(based on equation in clause 4.2 of TS 38.213 [3]) |
| T1   | s    | 5                      |  |
| T2   | s    | 5                      |  |

**Table A.4.4.3.1.2-3: Cell specific test parameters for timing advance**

| Parameter         |                | Unit | Test1          |    |
|-------------------|----------------|------|----------------|----|
|                   |                |      | T1             | T2 |
| Duplex mode       | Config 1,4     |      | FDD            |    |
|                   | Config 2,3,5,6 |      | TDD            |    |
| TDD configuration | Config 1,4     |      | Not Applicable |    |

|   |                |              |                             |
|---|----------------|--------------|-----------------------------|
|   | Config 2,5     |              | TDDConf.1.1                 |
|   | Config 3,6     |              | TDDConf.2.1                 |
| BW <sub>channel</sub>   | Config 1,4     | MHz          | 10: N <sub>RB,c</sub> = 52  |
|   | Config 2,5     |              | 10: N <sub>RB,c</sub> = 52  |
|   | Config 3,6     |              | 40: N <sub>RB,c</sub> = 106 |
| BWP BW  | Config 1,4     | MHz          | 10: N <sub>RB,c</sub> = 52  |
|   | Config 2,5     |              | 10: N <sub>RB,c</sub> = 52  |
|   | Config 3,6     |              | 40: N <sub>RB,c</sub> = 106 |
| DRx Cycle   |                | ms           | Not Applicable              |
| PDSCH Reference measurement channel   | Config 1,4     |              | SR.1.1 FDD                  |
|   | Config 2,5     |              | SR.1.1 TDD                  |
|   | Config 3,6     |              | SR2.1 TDD                   |
| RMSI CORESET Reference Channel  | Config 1,4     |              | CR.1.1 FDD                  |
|   | Config 2,5     |              | CR.1.1 TDD                  |
|   | Config 3,6     |              | CR2.1 TDD                   |
| Dedicated CORESET Reference Channel   | Config 1,4     |              | CCR.1.1 FDD                 |
|   | Config 2,5     |              | CCR.1.1 TDD                 |
|   | Config 3,6     |              | CCR.2.1 TDD                 |
| TRS configuration   | Config 1,4     |              | TRS.1.1 FDD                 |
|   | Config 2,5     |              | TRS.1.1 TDD                 |
|   | Config 3,6     |              | TRS.1.2 TDD                 |
| OCNG Patterns   |                |              | OCNG pattern 1              |
| SSB Configuration   | Config 1,2,4,5 |              | SSB.1 FR1                   |
|   | Config 3,6     |              | SSB.2 FR1                   |
| SMTC configuration  | Config 1,2,4,5 |              | SMTC.1 FR1                  |
|   | Config 3,6     |              | SMTC.2 FR1                  |
| PDSCH/PDCCH subcarrier spacing  | Config 1,2,4,5 | kHz          | 15 kHz                      |
|   | Config 3,6     |              | 30 kHz                      |
| PUCCH/PUSCH subcarrier spacing  | Config 1,2,4,5 | kHz          | 15 kHz                      |
|   | Config 3,6     |              | 30 kHz                      |
| EPRE ratio of PSS to SSS  |                |              |                             |
| EPRE ratio of PBCH DMRS to SSS  |                |              |                             |
| EPRE ratio of PBCH to PBCH DMRS   |                |              |                             |
| EPRE ratio of PDCCH DMRS to SSS   |                |              |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |                |              |                             |
| EPRE ratio of PDSCH DMRS to SSS   |                |              |                             |
| EPRE ratio of PDSCH to PDSCH  |                |              |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                |              |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                |              |                             |
| $N_{oc}$ <sup>Note2</sup>   |                | dBm/15kHz    | -98                         |
| $N_{oc}$ <sup>Note2</sup>   | Config 1,2,4,5 | dBm/SCS      | -98                         |
|   | Config 3,6     |              | -95                         |
| $\hat{E}_s / I_{ot}$  |                | dB           | 3                           |
| $\hat{E}_s / N_{oc}$  |                | dB           | 3                           |
| $I_o$ <sup>Note3</sup>  | Config 1,2,4,5 | dBm/9.36MHz  | -67.57                      |
|   | Config 3,6     | dBm/38.16MHz | -62.58                      |
| Propagation condition   |                | -            | AWGN                        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                |              |                             |

**Table A.4.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance**

| Field  |                | Value  | Comment  |
|--|----------------|--|--|
| c-SRS  | Config 1,2,4,5 | 12   | Frequency hopping is disabled  |
|  | Config 3,6     | 24   |  |
| b-SRS  |                | 0  |  |
| b-hop  |                | 0  |  |
| freqDomainPosition   |                | 0  | Frequency domain position of SRS   |
| freqDomainShift  |                | 0  |  |
| groupOrSequenceHopping   |                | neither  | No group or sequence hopping   |
| SRS-PeriodicityAndOffset   |                | sl5=2 for SCS<br>15kHz<br>sl5=4 for SCS<br>30kHz | Once every 5 slots   |
| pathlossReferenceRS  |                | ssb-Index=0                                      | SSB #0 is used for SRS path loss estimation  |
| usage  |                | Codebook   | Codebook based UL transmission   |
| startPosition  |                | 0  | resourceMapping setting. SRS on last symbol of slot, and 1 symbols for SRS without repetition. |
| nrofSymbols  |                | n1   |  |
| repetitionFactor   |                | n1   |  |
| combOffset-n2  |                | 0  | transmissionComb setting   |
| cyclicShift-n2   |                | 0  |  |
| nrofSRS-Ports  |                | port1  | Number of antenna ports used for SRS transmission  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                |  |  |

### A.4.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e.  $k+1$  slots after the reception of the timing advance command, where  $k=5$ .

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

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

## A.4.5 Signaling characteristics

### A.4.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means no uplink signal.



### A.4.5.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

#### A.4.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.4.5.1.1.1-1. The test parameters are given in Tables A.4.5.1.1.1-2, A.4.5.1.1.1-3, and A.4.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.1.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

**Table A.4.5.1.1.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode**

| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active E-UTRA PCell                          |  |      | Cell 1                      |
| E-UTRA RF Channel Number                     |  |      | 1                           |
| Active PSCell                                |  |      | Cell 2                      |
| RF Channel Number                            |  |      | 2                           |
| Duplex mode                                  | Config 1, 4  |      | FDD                         |
|  | Config 2, 3, 5, 6  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1, 4  | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2, 5  |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3, 6  |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1, 4  |      | Not Applicable              |
|  | Config 2, 5  |      | TDDConf.1.1                 |
|  | Config 3, 6  |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1, 4  |      | CR.1.1 FDD                  |
|  | Config 2, 5  |      | CR.1.1 TDD                  |
|  | Config 3, 6  |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1, 4  |      | CCR.1.3 FDD                 |
|  | Config 2, 5  |      | CCR.1.3 TDD                 |
|  | Config 3, 6  |      | CCR.2.2 TDD                 |
| SSB Configuration                            | Config 1, 4  |      | SSB.1 FR1                   |
|  | Config 2, 5  |      | SSB.1 FR1                   |
|  | Config 3, 6  |      | SSB.2 FR1                   |
| SMTC Configuration                           | Config 1, 2, 4, 5  |      | SMTC.1                      |
|  | Config 3, 6  |      | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5  |      | 15 kHz                      |
|  | Config 3, 6  |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2, 4, 5  |      | Table A.3.8.2.1-1           |
|  | Config 3, 6  |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| Out of sync transmission parameters          | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 8                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|  | DMRS precoder granularity  |      | REG bundle size             |
|  | REG bundle size  |      | 6                           |
| DRX  |  |      | OFF                         |
| Gap pattern ID                               |  |      | gp0                         |
| Layer 3 filtering                            |  |      | Enabled                     |
| T310 timer                                   |  | ms   | 0                           |
| T311 timer                                   |  | ms   | 1000                        |
| N310   |  |      | 1                           |
| N311   |  |      | 1                           |
| CSI-RS for CSI reporting                     | Config 1, 4  |      | CSI-RS.1.1 FDD              |
|  | Config 2, 5  |      | CSI-RS.1.1 TDD              |
|  | Config 3, 6  |      | CSI-RS.2.1 TDD              |
| CSI-RS for tracking                          | Config 1, 4  |      | TRS.1.1 FDD                 |
|  | Config 2, 5  |      | TRS.1.1 TDD                 |

|  |             |   |             |
|--|-------------|---|-------------|
|  | Config 3, 6 |   | TRS.1.2 TDD |
| T1   |             | s | 0.2         |
| T2   |             | s | 0.48        |
| T3   |             | s | 0.48        |
| D1   |             | s | 0.44        |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: E-UTRAN is in non-DRX mode under test. |             |   |             |

**Table A.4.5.1.1.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter   |             | Unit       | Test 1            |    |     |
|---|-------------|------------|-------------------|----|-----|
|   |             |            | T1                | T2 | T3  |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB         | 4                 |    |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB         | 0                 |    |     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB         | 0                 |    |     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB         |                   |    |     |
| EPRE ratio of PSS to SSS  |             | dB         |                   |    |     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB         |                   |    |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB         |                   |    |     |
| EPRE ratio of OCNG DMRS to SSS  |             | dB         |                   |    |     |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB         |                   |    |     |
| SNR on RLM-RS   | Config 1, 4 | dB         | 1                 | -7 | -15 |
|   | Config 2, 5 |            | 1                 | -7 | -15 |
|   | Config 3, 6 |            | 1                 | -7 | -15 |
| $N_{oc}$  | Config 1, 4 | dBm/15 kHz | -98               |    |     |
|   | Config 2, 5 |            | -98               |    |     |
|   | Config 3, 6 |            | -98               |    |     |
| $N_{oc}$  | Config 1, 4 | dBm/S CS   | -98               |    |     |
|   | Config 2, 5 |            | -98               |    |     |
|   | Config 3, 6 |            | -95               |    |     |
| Propagation condition   |             |            | TDL-C 300ns 100Hz |    |     |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. |             |            |                   |    |     |

**Table A.4.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode**

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

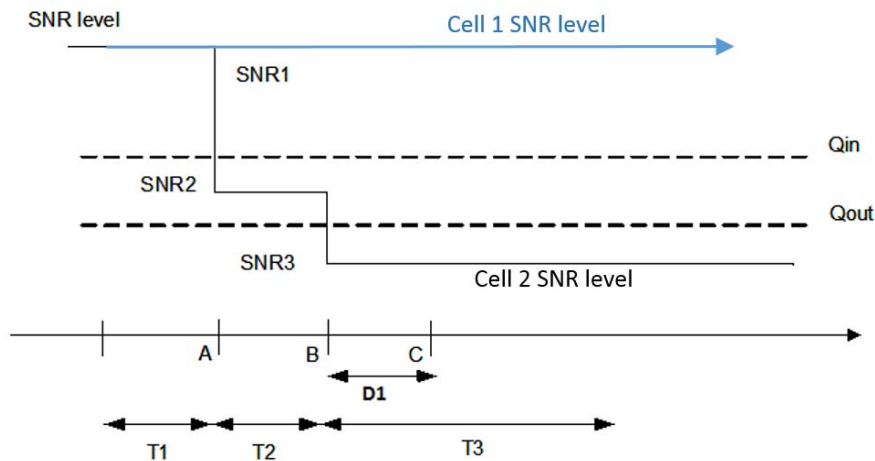


Figure A.4.5.1.1.1-1: SNR variation for out-of-sync testing

A.4.5.1.1.2 Test Requirements

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

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

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

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

A.4.5.1.2 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

A.4.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.4.5.1.2.1-1. The test parameters are given in Tables A.4.5.1.2.1-2, and A.4.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.2.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.4.5.1.2.1-1: Supported test configurations for FR1 PSCell

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

**Table A.4.5.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode**

| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active E-UTRA PCell                          |  |      | Cell 1                      |
| E-UTRA RF Channel Number                     |  |      | 1                           |
| Active PSCell                                |  |      | Cell 2                      |
| RF Channel Number                            |  |      | 2                           |
| Duplex mode                                  | Config 1, 4  |      | FDD                         |
|  | Config 2, 3, 5, 6  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1, 4  | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2, 5  |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3, 6  |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1, 4  |      | Not Applicable              |
|  | Config 2, 5  |      | TDDConf.1.1                 |
|  | Config 3, 6  |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1, 4  |      | CR.1.1 FDD                  |
|  | Config 2, 5  |      | CR.1.1 TDD                  |
|  | Config 3, 6  |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1, 4  |      | CCR.1.1 FDD                 |
|  | Config 2, 5  |      | CCR.1.1 TDD                 |
|  | Config 3, 6  |      | CCR.2.1 TDD                 |
| SSB Configuration                            | Config 1, 4  |      | SSB.1 FR1                   |
|  | Config 2, 5  |      | SSB.1 FR1                   |
|  | Config 3, 6  |      | SSB.2 FR1                   |
| SMTTC Configuration                          | Config 1, 2, 4, 5  |      | SMTTC.1                     |
|  | Config 3, 6  |      | SMTTC.1                     |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5  |      | 15 kHz                      |
|  | Config 3, 6  |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2, 4, 5  |      | Table A.3.8.2.1-1           |
|  | Config 3, 6  |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| In sync transmission parameters              | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 4                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                           |

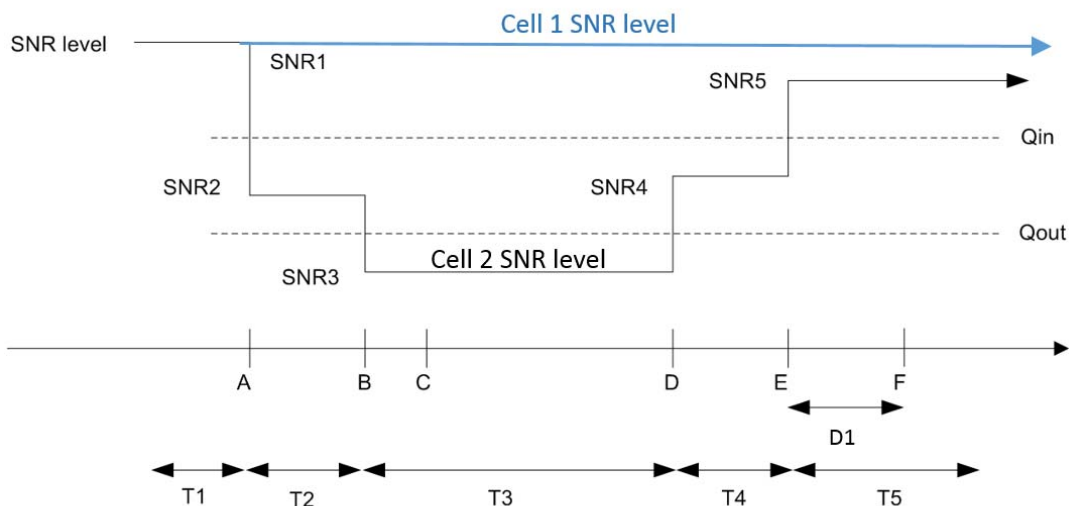
|   |  |     |                 |
|---|--|-----|-----------------|
|   | DMRS precoder granularity  |     | REG bundle size |
|   | REG bundle size  |     | 6               |
| Out of sync transmission parameters   | DCI format   |     | 1-0             |
|   | Number of Control OFDM symbols                                   |     | 2               |
|   | Aggregation level  | CCE | 8               |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB  | 4               |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB  | 4               |
|   | DMRS precoder granularity  |     | REG bundle size |
|   | REG bundle size  |     | 6               |
| DRX   |  |     | <i>OFF</i>      |
| Gap pattern ID  |  |     | N.A.            |
| Layer 3 filtering   |  |     | <i>Enabled</i>  |
| T310 timer  |  | ms  | 1000            |
| T311 timer  |  | ms  | 1000            |
| N310  |  |     | 1               |
| N311  |  |     | 1               |
| CSI-RS for CSI reporting  | Config 1, 4  |     | CSI-RS.1.1 FDD  |
|   | Config 2, 5  |     | CSI-RS.1.1 TDD  |
|   | Config 3, 6  |     | CSI-RS.2.1 TDD  |
| CSI-RS for tracking   | Config 1, 4  |     | TRS.1.1 FDD     |
|   | Config 2, 5  |     | TRS.1.1 TDD     |
|   | Config 3, 6  |     | TRS.1.2 TDD     |
| T1  |  | s   | 0.2             |
| T2  |  | s   | 0.2             |
| T3  |  | s   | 0.24            |
| T4  |  | s   | 0.2             |
| T5  |  | s   | 0.88            |
| D1  |  | s   | 0.84            |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |     |                 |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |     |                 |
| Note 3: E-UTRAN is in non-DRX mode under test.  |  |     |                 |



**Table A.4.5.1.2.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter   |             | Unit       | Test 1            |    |     |      |    |
|---|-------------|------------|-------------------|----|-----|------|----|
|   |             |            | T1                | T2 | T3  | T4   | T5 |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB         | 0                 |    |     |      |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB         | 0                 |    |     |      |    |
| EPRE ratio of PBCH DMRS to SSS  |             | dB         | 0                 |    |     |      |    |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB         |                   |    |     |      |    |
| EPRE ratio of PSS to SSS  |             | dB         |                   |    |     |      |    |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB         |                   |    |     |      |    |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB         |                   |    |     |      |    |
| EPRE ratio of OCNG DMRS to SSS  |             | dB         |                   |    |     |      |    |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB         |                   |    |     |      |    |
| SNR on RLM-RS   | Config 1, 4 | dB         |                   |    |     |      |    |
|   | Config 2, 5 |            | 1                 | -7 | -15 | -4.5 | 1  |
|   | Config 3, 6 |            | 1                 | -7 | -15 | -4.5 | 1  |
| $N_{oc}$  | Config 1, 4 | dBm/15 kHz | -98               |    |     |      |    |
|   | Config 2, 5 |            | -98               |    |     |      |    |
|   | Config 3, 6 |            | -98               |    |     |      |    |
| $N_{oc}$  | Config 1, 4 | dBm/SCS    | -98               |    |     |      |    |
|   | Config 2, 5 |            | -98               |    |     |      |    |
|   | Config 3, 6 |            | -95               |    |     |      |    |
| Propagation condition   |             |            | TDL-C 300ns 100Hz |    |     |      |    |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.2.1-1.</p> <p>Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.</p> |             |            |                   |    |     |      |    |

**Table A.4.5.1.2.1-4: Void**



**Figure A.4.5.1.2.1-1: SNR variation for in-sync testing**

#### A.4.5.1.2.2 Test Requirements

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

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

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

#### A.4.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

##### A.4.5.1.3.1 Test Purpose and Environment

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

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.4.5.1.3.1-1. The test parameters are given in Tables A.4.5.1.3.1-2 and A.4.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.3.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.4.5.1.3.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in DRX mode**

| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active E-UTRA PCell                          |  |      | Cell 1                      |
| E-UTRA RF Channel Number                     |  |      | 1                           |
| Active PSCell                                |  |      | Cell 2                      |
| RF Channel Number                            |  |      | 2                           |
| Duplex mode                                  | Config 1, 4  |      | FDD                         |
|  | Config 2, 3, 5, 6  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1, 4  | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2, 5  |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3, 6  |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1, 4  |      | Not Applicable              |
|  | Config 2, 5  |      | TDDConf.1.1                 |
|  | Config 3, 6  |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1, 4  |      | CR.1.1 FDD                  |
|  | Config 2, 5  |      | CR.1.1 TDD                  |
|  | Config 3, 6  |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1, 4  |      | CCR.1.3 FDD                 |
|  | Config 2, 5  |      | CCR.1.3 TDD                 |
|  | Config 3, 6  |      | CCR.2.2 TDD                 |
| SSB Configuration                            | Config 1, 4  |      | SSB.1 FR1                   |
|  | Config 2, 5  |      | SSB.1 FR1                   |
|  | Config 3, 6  |      | SSB.2 FR1                   |
| SMTTC Configuration                          | Config 1, 2, 4, 5  |      | SMTTC.1                     |
|  | Config 3, 6  |      | SMTTC.1                     |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5  |      | 15 kHz                      |
|  | Config 3, 6  |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2, 4, 5  |      | Table A.3.8.2.1-1           |
|  | Config 3, 6  |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| Out of sync transmission parameters          | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 8                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|  | DMRS precoder granularity  |      | REG bundle size             |
|  | REG bundle size  |      | 6                           |
| DRX Configuration                            |  |      | DRX.3                       |
| Gap pattern ID                               |  |      | N.A.                        |
| Layer 3 filtering                            |  |      | Enabled                     |

|   |             |                |
|---|-------------|----------------|
| T310 timer  | ms          | 0              |
| T311 timer  | ms          | 1000           |
| N310  |             | 1              |
| N311  |             | 1              |
| CSI-RS for CSI reporting  | Config 1, 4 | CSI-RS.1.1 FDD |
|   | Config 2, 5 | CSI-RS.1.1 TDD |
|   | Config 3, 6 | CSI-RS.2.1 TDD |
| CSI-RS for tracking   | Config 1, 4 | TRS.1.1 FDD    |
|   | Config 2, 5 | TRS.1.1 TDD    |
|   | Config 3, 6 | TRS.1.2 TDD    |
| T1  | s           | 0.2            |
| T2  | s           | 0.68           |
| T3  | s           | 0.68           |
| D1  | s           | 0.64           |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |             |                |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |             |                |
| Note 3: E-UTRAN is in non-DRX mode under test.  |             |                |

**Table A.4.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter   |             | Unit              | Test 1 |     |     |
|---|-------------|-------------------|--------|-----|-----|
|   |             |                   | T1     | T2  | T3  |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB                | 4      |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             |                   | 0      |     |     |
| EPRE ratio of PBCH DMRS to SSS  |             |                   | 0      |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |             |                   |        |     |     |
| EPRE ratio of PSS to SSS  |             |                   |        |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |             |                   |        |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             |                   |        |     |     |
| EPRE ratio of OCNG DMRS to SSS  |             |                   |        |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |             |                   |        |     |     |
| SNR on RLM-RS   | Config 1, 4 |                   | 1      | -7  | -15 |
|   | Config 2, 5 | 1                 | -7     | -15 |     |
|   | Config 3, 6 | 1                 | -7     | -15 |     |
| $N_{oc}$  | Config 1, 4 | dBm/15k Hz        | -98    |     |     |
|   | Config 2, 5 |                   | -98    |     |     |
|   | Config 3, 6 |                   | -98    |     |     |
| $N_{oc}$  | Config 1, 4 | dBm/SCS           | -98    |     |     |
|   | Config 2, 5 |                   | -98    |     |     |
|   | Config 3, 6 |                   | -95    |     |     |
| Propagation condition   |             | TDL-C 300ns 100Hz |        |     |     |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.      |             |                   |        |     |     |
| Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.   |             |                   |        |     |     |
| Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  |             |                   |        |     |     |
| Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.4.5.1.3.1-1.   |             |                   |        |     |     |
| Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. |             |                   |        |     |     |

Table A.4.5.1.3.1-4: Void

Table A.4.5.1.3.1-5: Void

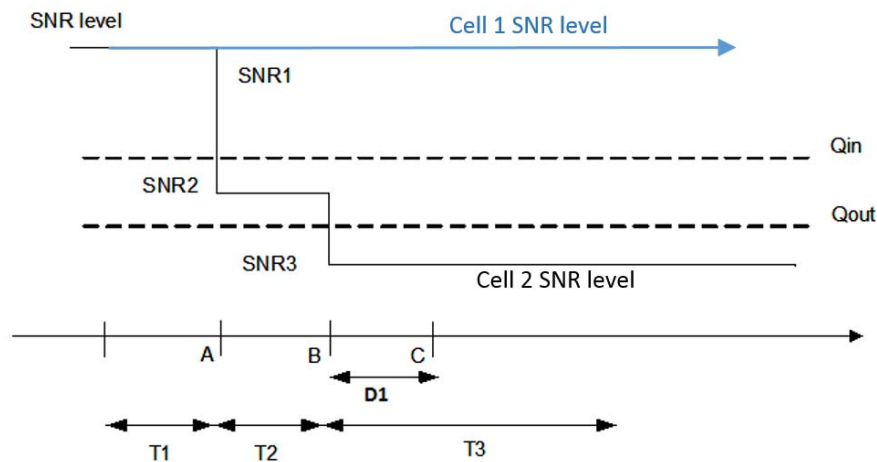


Figure A.4.5.1.3.1-1: SNR variation for out-of-sync testing

#### A.4.5.1.3.2 Test Requirements

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

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

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

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

#### A.4.5.1.4 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

##### A.4.5.1.4.1 Test Purpose and Environment

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

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.4.5.1.4.1-1. The test parameters are given in Tables A.4.5.1.4.1-2, and A.4.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.4.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.4.5.1.4.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.1.4.1-2: General test parameters for FR1 in-sync testing in DRX mode**



| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active E-UTRA PCell                          |  |      | Cell 1                      |
| E-UTRA RF Channel Number                     |  |      | 1                           |
| Active PSCell                                |  |      | Cell 2                      |
| RF Channel Number                            |  |      | 2                           |
| Duplex mode                                  | Config 1, 4  |      | FDD                         |
|  | Config 2, 3, 5, 6  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1, 4  | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2, 5  |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3, 6  |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1, 4  |      | Not Applicable              |
|  | Config 2, 5  |      | TDDConf.1.1                 |
|  | Config 3, 6  |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1, 4  |      | CR.1.1 FDD                  |
|  | Config 2, 5  |      | CR.1.1 TDD                  |
|  | Config 3, 6  |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1, 4  |      | CCR.1.1 FDD                 |
|  | Config 2, 5  |      | CCR.1.1 TDD                 |
|  | Config 3, 6  |      | CCR.2.1 TDD                 |
| SSB Configuration                            | Config 1, 4  |      | SSB.1 FR1                   |
|  | Config 2, 5  |      | SSB.1 FR1                   |
|  | Config 3, 6  |      | SSB.2 FR1                   |
| SMTC Configuration                           | Config 1, 2, 4, 5  |      | SMTC.1                      |
|  | Config 3, 6  |      | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5  |      | 15 kHz                      |
|  | Config 3, 6  |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2, 4, 5  |      | Table A.3.8.2.1-1           |
|  | Config 3, 6  |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| In sync transmission parameters              | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 4                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                           |
|  | DMRS precoder granularity  |      | REG bundle size             |
|  | REG bundle size  |      | 6                           |
| Out of sync transmission parameters          | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 8                           |

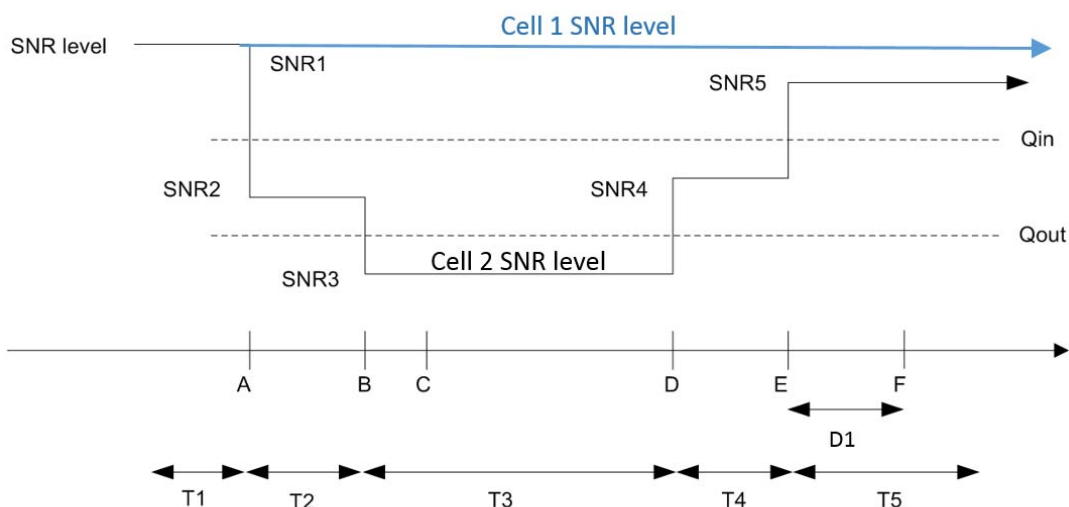
|   |  |    |                 |
|---|--|----|-----------------|
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB | 4               |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4               |
|   | DMRS precoder granularity  |    | REG bundle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

**Table A.4.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in DRX mode**

| Parameter   |             | Unit       | Test 1            |    |     |      |    |
|---|-------------|------------|-------------------|----|-----|------|----|
|   |             |            | T1                | T2 | T3  | T4   | T5 |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB         | 0                 |    |     |      |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB         | 0                 |    |     |      |    |
| EPRE ratio of PBCH DMRS to SSS  |             | dB         | 0                 |    |     |      |    |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB         |                   |    |     |      |    |
| EPRE ratio of PSS to SSS  |             | dB         |                   |    |     |      |    |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB         |                   |    |     |      |    |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB         |                   |    |     |      |    |
| EPRE ratio of OCNG DMRS to SSS  |             | dB         |                   |    |     |      |    |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB         |                   |    |     |      |    |
| SNR on RLM-RS   | Config 1, 4 | dB         |                   |    |     |      |    |
|   | Config 2, 5 |            | 1                 | -7 | -15 | -4.5 | 1  |
|   | Config 3, 6 |            | 1                 | -7 | -15 | -4.5 | 1  |
| $N_{oc}$  | Config 1, 4 | dBm/15 kHz | -98               |    |     |      |    |
|   | Config 2, 5 |            | -98               |    |     |      |    |
|   | Config 3, 6 |            | -98               |    |     |      |    |
| $N_{oc}$  | Config 1, 4 | dBm/SCS    | -98               |    |     |      |    |
|   | Config 2, 5 |            | -98               |    |     |      |    |
|   | Config 3, 6 |            | -95               |    |     |      |    |
| Propagation condition   |             |            | TDL-C 300ns 100Hz |    |     |      |    |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.4.1-1.</p> <p>Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.</p> |             |            |                   |    |     |      |    |

**Table A.4.5.1.4.1-4: Void**

**Table A.4.5.1.4.1-5: Void**



**Figure A.4.5.1.4.1-1: SNR variation for in-sync testing**

#### A.4.5.1.4.2 Test Requirements

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

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

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

#### A.4.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

##### A.4.5.1.5.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.5.1-1, A.4.5.1.5.1-2, A.4.5.1.5.1-3, and A.4.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 is configured as the BFD-RS.

**Table A.4.5.1.5.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.1.5.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in non-DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
|  |   |      | Test 1                     |
| Active E-UTRA PCell                          |   |      | Cell 1                     |
| E-UTRA RF Channel Number                     |   |      | 1                          |
| Active PSCell                                |   |      | Cell 2                     |
| RF Channel Number                            |   |      | 2                          |
| Duplex mode                                  | Config 1, 4   |      | FDD                        |
|  | Config 2, 3, 5, 6   |      | TDD                        |
| TDD Configuration                            | Config 1, 4   |      | Not Applicable             |
|  | Config 2, 5   |      | TDDConf.1.1                |
|  | Config 3, 6   |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1, 4   |      | CR.1.1 FDD                 |
|  | Config 2, 5   |      | CR.1.1 TDD                 |
|  | Config 3, 6   |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1, 4   |      | CCR.1.3 FDD                |
|  | Config 2, 5   |      | CCR.1.3 TDD                |
|  | Config 3, 6   |      | CCR.2.2 TDD                |
| SSB Configuration                            | Config 1, 4   |      | SSB.1 FR1                  |
|  | Config 2, 5   |      | SSB.1 FR1                  |
|  | Config 3, 6   |      | SSB.2 FR1                  |
| SMTTC Configuration                          | Config 1, 2, 4, 5   |      | SMTTC.1                    |
|  | Config 3, 6   |      | SMTTC.1                    |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5   |      | 15 KHz                     |
|  | Config 3, 6   |      | 30 KHz                     |
| TRS configuration                            | Config 1, 4   |      | TRS.1.1 FDD                |
|  | Config 2, 5   |      | TRS.1.1 TDD                |
|  | Config 3, 6   |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1, 4   |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2, 5   |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3, 6   |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| DRX  |   |      | OFF                        |
| Gap pattern ID                               |   |      | gp0                        |
| Layer 3 filtering                            |   |      | Enabled                    |
| T310 timer                                   |   | ms   | 0                          |
| T311 timer                                   |   | ms   | 1000                       |
| N310   |   |      | 1                          |
| N311   |   |      | 1                          |
| CSI-RS for reporting                         | Config 1, 4   |      | CSI-RS1.1 FDD              |
|  | Config 2, 5   |      | CSI-RS.1.1 TDD             |

|   | Config 3, 6 |   | CSI-RS.2.1 TDD |
|---|-------------|---|----------------|
| T1  |             | s | 0.2            |
| T2  |             | s | 0.48           |
| T3  |             | s | 0.48           |
| D1  |             | s | 0.44           |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |             |   |                |
| Note 2: E-UTRAN is in non-DRX mode under test.                |             |   |                |

**Table A.4.5.1.5.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Parameter  |             | Unit      | Test 1            |    |     |
|--|-------------|-----------|-------------------|----|-----|
|  |             |           | T1                | T2 | T3  |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB        | 4                 |    |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |             | dB        | 0                 |    |     |
| EPRE ratio of PBCH to PBCH DMRS  |             | dB        |                   |    |     |
| EPRE ratio of PSS to SSS   |             | dB        |                   |    |     |
| EPRE ratio of PBCH DMRS to SSS   |             | dB        |                   |    |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |             | dB        |                   |    |     |
| EPRE ratio of PDSCH DMRS to SSS  |             | dB        |                   |    |     |
| EPRE ratio of OCNG DMRS to SSS   |             | dB        |                   |    |     |
| EPRE ratio of OCNG to OCNG DMRS  |             | dB        |                   |    |     |
| SNR on RLM-RS  | Config 1, 4 | dB        |                   |    |     |
|  | Config 2, 5 |           | 1                 | -7 | -15 |
|  | Config 3, 6 |           | 1                 | -7 | -15 |
| $N_{oc}$   | Config 1, 4 | dBm/15KHz | -98               |    |     |
|  | Config 2, 5 |           | -98               |    |     |
|  | Config 3, 6 |           | -98               |    |     |
| Propagation condition  |             |           | TDL-C 300ns 100Hz |    |     |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                               |             |           |                   |    |     |
| Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  |             |           |                   |    |     |
| Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.   |             |           |                   |    |     |
| Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  |             |           |                   |    |     |
| Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.   |             |           |                   |    |     |
| Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  |             |           |                   |    |     |
| Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.   |             |           |                   |    |     |
| Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.5.1-1.  |             |           |                   |    |     |
| Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.. |             |           |                   |    |     |

**Table A.4.5.1.5.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Field  | Test 1 |
|--|--------|
|  | Value  |
| gapOffset  | 0      |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. |        |

Table A.4.5.1.5.1-4: Void

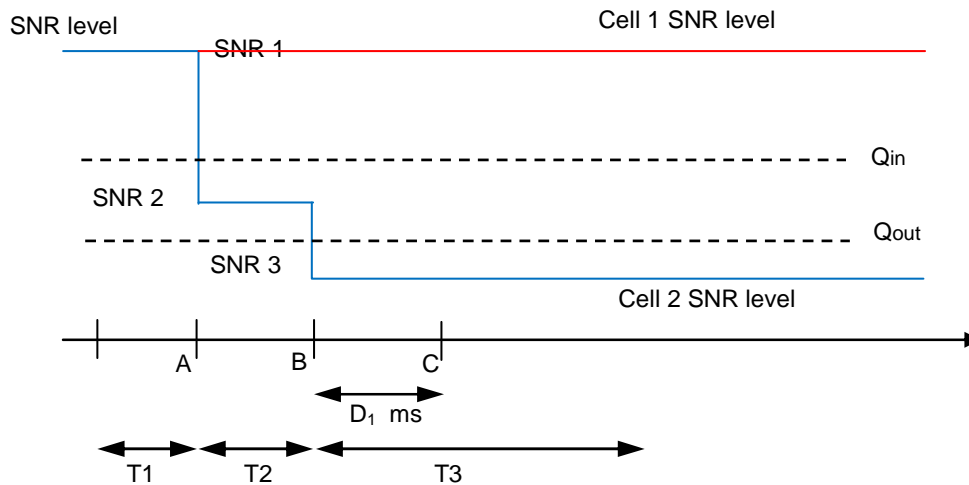


Figure A.4.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.4.5.1.5.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

#### A.4.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

##### A.4.5.1.6.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.6.1-1, A.4.5.1.6.1-2, and A.4.5.1.6.1-3 below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. In the test, SSB0 is configured as the BFD-RS.



**Table A.4.5.1.6.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.1.6.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
|  |   |      | Test 1                     |
| Active E-UTRA PCell                          |   |      | Cell 1                     |
| E-UTRA RF Channel Number                     |   |      | 1                          |
| Active PSCell                                |   |      | Cell 2                     |
| RF Channel Number                            |   |      | 2                          |
| Duplex mode                                  | Config 1, 4   |      | FDD                        |
|  | Config 2, 3, 5, 6   |      | TDD                        |
| TDD Configuration                            | Config 1, 4   |      | Not Applicable             |
|  | Config 2, 5   |      | TDDConf.1.1                |
|  | Config 3, 6   |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1, 4   |      | CR.1.1 FDD                 |
|  | Config 2, 5   |      | CR.1.1 TDD                 |
|  | Config 3, 6   |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1, 4   |      | CCR.1.1 FDD                |
|  | Config 2, 5   |      | CCR.1.1 TDD                |
|  | Config 3, 6   |      | CCR.2.1 TDD                |
| SSB Configuration                            | Config 1, 4   |      | SSB.1 FR1                  |
|  | Config 2, 5   |      | SSB.1 FR1                  |
|  | Config 3, 6   |      | SSB.2 FR1                  |
| SMTTC Configuration                          | Config 1, 2, 4, 5   |      | SMTTC.1                    |
|  | Config 3, 6   |      | SMTTC.1                    |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5   |      | 15 KHz                     |
|  | Config 3, 6   |      | 30 KHz                     |
| TRS configuration                            | Config 1, 4   |      | TRS.1.1 FDD                |
|  | Config 2, 5   |      | TRS.1.1 TDD                |
|  | Config 3, 6   |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1, 4   |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2, 5   |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3, 6   |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| In sync transmission parameters              | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 4                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| DRX  |   |      | OFF                        |
| Gap pattern ID                               |   |      | N.A.                       |

|   |             |    |                |
|---|-------------|----|----------------|
| Layer 3 filtering   |             |    | Enabled        |
| T310 timer  |             | ms | 1000           |
| T311 timer  |             | ms | 1000           |
| N310  |             |    | 1              |
| N311  |             |    | 1              |
| CSI-RS for reporting  | Config 1, 4 |    | CSI-RS.1.1 FDD |
|   | Config 2, 5 |    | CSI-RS.1.1 TDD |
|   | Config 3, 6 |    | CSI-RS.2.1 TDD |
| T1  |             | s  | 0.2            |
| T2  |             | s  | 0.2            |
| T3  |             | s  | 0.44           |
| T4  |             | s  | 0.2            |
| T5  |             | s  | 0.88           |
| T6  |             | s  | 0.84           |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |             |    |                |
| Note 2: E-UTRAN is in non-DRX mode under test.                |             |    |                |

**Table A.4.5.1.6.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter   |             | Unit      | Test 1            |    |     |      |    |
|---|-------------|-----------|-------------------|----|-----|------|----|
|   |             |           | T1                | T2 | T3  | T4   | T5 |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB        | 0                 |    |     |      |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB        | 0                 |    |     |      |    |
| EPRE ratio of PBCH DMRS to SSS  |             | dB        |                   |    |     |      |    |
| EPRE ratio of PSS to SSS  |             | dB        |                   |    |     |      |    |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB        |                   |    |     |      |    |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB        |                   |    |     |      |    |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB        |                   |    |     |      |    |
| EPRE ratio of OCNG DMRS to SSS  |             | dB        |                   |    |     |      |    |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB        |                   |    |     |      |    |
| SNR on RLM-RS   | Config 1, 4 | dB        |                   |    |     |      |    |
|   | Config 2, 5 |           | 1                 | -7 | -15 | -4.5 | 1  |
|   | Config 3, 6 |           | 1                 | -7 | -15 | -4.5 | 1  |
| $N_{oc}$  | Config 1, 4 | dBm/15KHz | -98               |    |     |      |    |
|   | Config 2, 5 |           | -98               |    |     |      |    |
|   | Config 3, 6 |           | -98               |    |     |      |    |
| Propagation condition   |             |           | TDL-C 300ns 100Hz |    |     |      |    |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.6.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1..</p> |             |           |                   |    |     |      |    |

Table A.4.5.1.6.1-3A: Void

Table A.4.5.1.6.1-4: Void

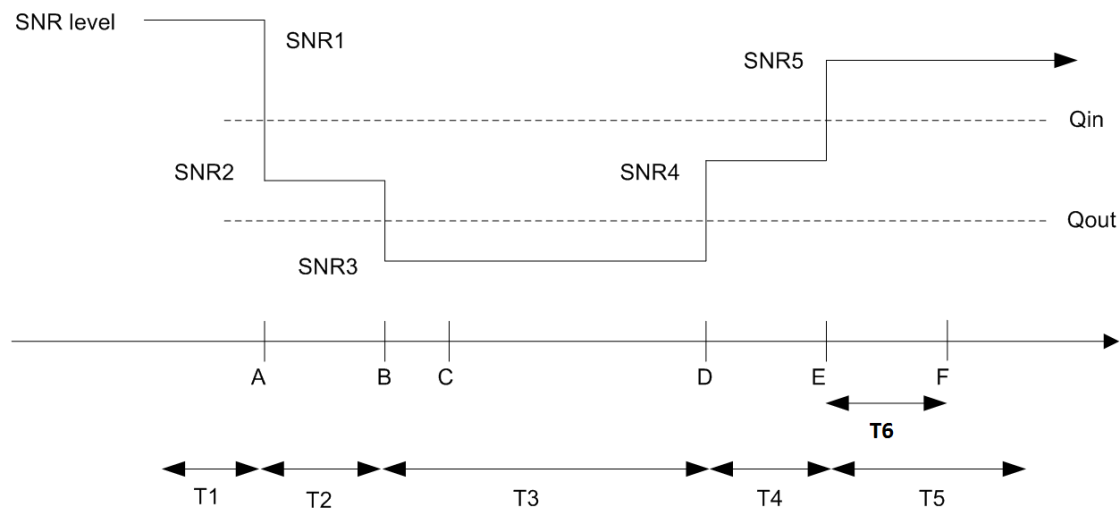


Figure A.4.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

#### A.4.5.1.6.2 Test Requirements

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

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

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

#### A.4.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

##### A.4.5.1.7.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.7.1-1, A.4.5.1.7.1-2, and A.4.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 is configured as the BFD-RS.

**Table A.4.5.1.7.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.1.7.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
|  |   |      | Test 1                     |
| Active E-UTRA PCell                          |   |      | Cell 1                     |
| E-UTRA RF Channel Number                     |   |      | 1                          |
| Active PSCell                                |   |      | Cell 2                     |
| RF Channel Number                            |   |      | 2                          |
| Duplex mode                                  | Config 1, 4   |      | FDD                        |
|  | Config 2, 3, 5, 6   |      | TDD                        |
| TDD Configuration                            | Config 1, 4   |      | Not Applicable             |
|  | Config 2, 5   |      | TDDConf.1.1                |
|  | Config 3, 6   |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1, 4   |      | CR.1.1 FDD                 |
|  | Config 2, 5   |      | CR.1.1 TDD                 |
|  | Config 3, 6   |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1, 4   |      | CCR.1.3 FDD                |
|  | Config 2, 5   |      | CCR.1.3 TDD                |
|  | Config 3, 6   |      | CCR.2.2 TDD                |
| SSB Configuration                            | Config 1, 4   |      | SSB.1 FR1                  |
|  | Config 2, 5   |      | SSB.1 FR1                  |
|  | Config 3, 6   |      | SSB.2 FR1                  |
| SMTC Configuration                           | Config 1, 2, 4, 5   |      | SMTC.1                     |
|  | Config 3, 6   |      | SMTC.1                     |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5   |      | 15 KHz                     |
|  | Config 3, 6   |      | 30 KHz                     |
| TRS configuration                            | Config 1, 4   |      | TRS.1.1 FDD                |
|  | Config 2, 5   |      | TRS.1.1 TDD                |
|  | Config 3, 6   |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1, 4   |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2, 5   |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3, 6   |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| DRX  |   |      | DRX.3                      |
| Gap pattern ID                               |   |      | N.A.                       |
| Layer 3 filtering                            |   |      | Enabled                    |
| T310 timer                                   |   | ms   | 0                          |
| T311 timer                                   |   | ms   | 1000                       |
| N310   |   |      | 1                          |
| N311   |   |      | 1                          |
| CSI-RS for reporting                         | Config 1, 4   |      | CSI-RS.1.1 FDD             |
|  | Config 2, 5   |      | CSI-RS.1.1 TDD             |



|   | Config 3, 6 |   | CSI-RS.2.1 TDD |
|---|-------------|---|----------------|
| T1  |             | s | 0.2            |
| T2  |             | s | 1.28           |
| T3  |             | s | 1.28           |
| D1  |             | s | 1.24           |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |             |   |                |
| Note 2: E-UTRAN is in non-DRX mode under test.                |             |   |                |

**Table A.4.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode**

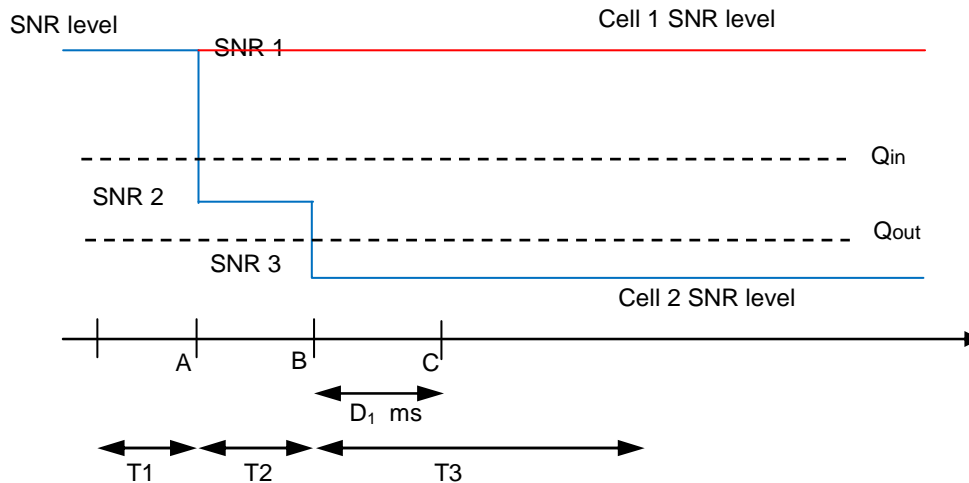
| Parameter  |             | Unit      | Test 1            |    |     |
|--|-------------|-----------|-------------------|----|-----|
|  |             |           | T1                | T2 | T3  |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB        | 4                 |    |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |             |           | 0                 |    |     |
| EPRE ratio of PBCH DMRS to SSS   |             |           |                   |    |     |
| EPRE ratio of PBCH to PBCH DMRS  |             |           |                   |    |     |
| EPRE ratio of PBCH to PBCH DMRS  |             |           |                   |    |     |
| EPRE ratio of PDSCH DMRS to SSS  |             |           |                   |    |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |             |           |                   |    |     |
| EPRE ratio of OCNG DMRS to SSS   |             |           |                   |    |     |
| EPRE ratio of OCNG to OCNG DMRS  |             |           |                   |    |     |
| SNR on RLM-RS  | Config 1, 4 | dB        |                   |    |     |
|  | Config 2, 5 |           | 1                 | -7 | -15 |
|  | Config 3, 6 |           | 1                 | -7 | -15 |
| $N_{oc}$   | Config 1, 4 | dBm/15KHz | -98               |    |     |
|  | Config 2, 5 |           | -98               |    |     |
|  | Config 3, 6 |           | -98               |    |     |
| Propagation condition  |             |           | TDL-C 300ns 100Hz |    |     |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                               |             |           |                   |    |     |
| Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  |             |           |                   |    |     |
| Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.   |             |           |                   |    |     |
| Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  |             |           |                   |    |     |
| Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.   |             |           |                   |    |     |
| Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  |             |           |                   |    |     |
| Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.   |             |           |                   |    |     |
| Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.7.1-1.  |             |           |                   |    |     |
| Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.. |             |           |                   |    |     |

**Table A.4.5.1.7.1-3A: Void**

**Table A.4.5.1.7.1-4: Void**

**Table A.4.5.1.7.1-5: Void**

**Table A.4.5.1.7.1-6: Void**



**Figure A.4.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing**

#### A.4.5.1.7.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

#### A.4.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

##### A.4.5.1.8.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.8.1-1, A.4.5.1.8.1-2, A.4.5.1.8.1-3 and A.4.5.1.8.1-3A below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 is configured as the BFD-RS.

**Table A.4.5.1.8.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.1.8.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
|  |   |      | Test 1                     |
| Active E-UTRA PCell                          |   |      | Cell 1                     |
| E-UTRA RF Channel Number                     |   |      | 1                          |
| Active PSCell                                |   |      | Cell 2                     |
| RF Channel Number                            |   |      | 2                          |
| Duplex mode                                  | Config 1, 4   |      | FDD                        |
|  | Config 2, 3, 5, 6   |      | TDD                        |
| TDD Configuration                            | Config 1, 4   |      | Not Applicable             |
|  | Config 2, 5   |      | TDDConf.1.1                |
|  | Config 3, 6   |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1, 4   |      | CR.1.1 FDD                 |
|  | Config 2, 5   |      | CR.1.1 TDD                 |
|  | Config 3, 6   |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1, 4   |      | CCR.1.1 FDD                |
|  | Config 2, 5   |      | CCR.1.1 TDD                |
|  | Config 3, 6   |      | CCR.2.1 TDD                |
| SSB Configuration                            | Config 1, 4   |      | SSB.1 FR1                  |
|  | Config 2, 5   |      | SSB.1 FR1                  |
|  | Config 3, 6   |      | SSB.2 FR1                  |
| SMTC Configuration                           | Config 1, 2, 4, 5   |      | SMTC.1                     |
|  | Config 3, 6   |      | SMTC.1                     |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2, 4, 5   |      | 15 KHz                     |
|  | Config 3, 6   |      | 30 KHz                     |
| TRS configuration                            | Config 1, 4   |      | TRS.1.1 FDD                |
|  | Config 2, 5   |      | TRS.1.1 TDD                |
|  | Config 3, 6   |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1, 4   |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2, 5   |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3, 6   |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| In sync transmission parameters              | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 4                          |

|   |   |    |                 |
|---|---|----|-----------------|
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB | 0               |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0               |
|   | DMRS precoder granularity   |    | REG bundle size |
|   | REG bundle size   |    | 6               |
| DRX   |   |    | DRX.3           |
| Gap pattern ID  |   |    | gp0             |
| Layer 3 filtering   |   |    | Enabled         |
| T310 timer  |   | ms | 2000            |
| T311 timer  |   | ms | 1000            |
| N310  |   |    | 1               |
| N311  |   |    | 1               |
| CSI-RS for reporting  | Config 1, 4   |    | CSI-RS.1.1 FDD  |
|   | Config 2, 5   |    | CSI-RS.1.1 TDD  |
|   | Config 3, 6   |    | CSI-RS.2.1 TDD  |
| T1  |   | s  | 0.2             |
| T2  |   | s  | 0.2             |
| T3  |   | s  | 1.24            |
| T4  |   | s  | 0.2             |
| T5  |   | s  | 1.88            |
| T6  |   | s  | 1.84            |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |    |                 |
| Note 2: E-UTRAN is in non-DRX mode under test.                |   |    |                 |

**Table A.4.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in DRX mode**

| Parameter  |             | Unit      | Test 1            |     |      |    |    |
|--|-------------|-----------|-------------------|-----|------|----|----|
|  |             |           | T1                | T2  | T3   | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB        | 0                 |     |      |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS  |             |           | 0                 |     |      |    |    |
| EPRE ratio of PBCH DMRS to SSS   |             |           |                   |     |      |    |    |
| EPRE ratio of PBCH to PBCH DMRS  |             |           |                   |     |      |    |    |
| EPRE ratio of PSS to SSS   |             |           |                   |     |      |    |    |
| EPRE ratio of PDSCH DMRS to SSS  |             |           |                   |     |      |    |    |
| EPRE ratio of PDSCH to PDSCH DMRS  |             |           |                   |     |      |    |    |
| EPRE ratio of OCNG DMRS to SSS   |             |           |                   |     |      |    |    |
| EPRE ratio of OCNG to OCNG DMRS  |             |           |                   |     |      |    |    |
| SNR on RLM-RS  | Config 1, 4 |           |                   |     |      |    |    |
|  | Config 2, 5 | 1         | -7                | -15 | -4.5 | 1  |    |
|  | Config 3, 6 | 1         | -7                | -15 | -4.5 | 1  |    |
| $N_{oc}$   | Config 1, 4 | dBm/15KHz | -98               |     |      |    |    |
|  | Config 2, 5 |           | -98               |     |      |    |    |
|  | Config 3, 6 |           | -98               |     |      |    |    |
| Propagation condition  |             |           | TDL-C 300ns 100Hz |     |      |    |    |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.8.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.</p> |             |           |                   |     |      |    |    |

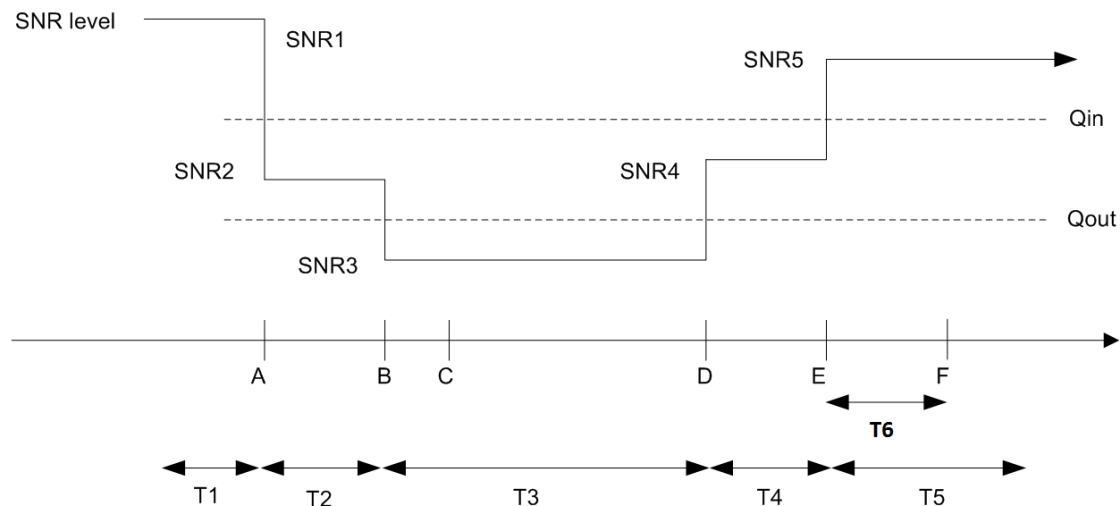
**Table A.4.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode**

| Field  | Test 1 |
|--|--------|
|  | Value  |
| gapOffset  | 0      |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. |        |

**Table A.4.5.1.8.1-4: Void**

**Table A.4.5.1.8.1-5: Void**

**Table A.4.5.1.8.1-6: Void**



**Figure A.4.5.1.8.1-1: SNR variation for CSI-RS in-sync testing**

#### A.4.5.1.8.2 Test Requirements

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

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

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

### A.4.5.2 Interruption

#### A.4.5.2.1 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

##### A.4.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS38.133 clause 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.1.1-2 and A.4.5.2.1.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.1.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. CORESET indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.



**Table A.4.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.4.5.2.1.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter                  | Unit | Value  | Comment  |
|----------------------------|------|--------|--|
| RF Channel Number          |      | 1, 2   | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell               |      | Cell1  | PCell on E-UTRAN RF channel number 1.                    |
| Configured PSCell          |      | Cell2  | PSCell on NR RF channel number 2.                        |
| CP length                  |      | Normal | Applicable to Cell1 and Cell2                            |
| DRX                        |      | DRX.4  | DRX related parameters are defined in Table A.3.3.4-1    |
| Measurement gap pattern Id |      | OFF    |  |
| T1                         | s    | 10     |  |

**Table A.4.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter                                    |                | Unit         | Cell2  |
|--|----------------|--------------|--|
| Frequency Range                              |                |              | FR1  |
| Duplex mode                                  | Config 1,4     |              | FDD  |
|  | Config 2,3,5,6 |              | TDD  |
| TDD configuration                            | Config 1,4     |              | Not Applicable                                     |
|  | Config 2,5     |              | TDDConf.1.1  |
|  | Config 3,6     |              | TDDConf.2.1  |
| BW <sub>channel</sub>                        | Config 1,4     |              | 10: N <sub>RB,c</sub> = 52                         |
|  | Config 2,5     |              | 10: N <sub>RB,c</sub> = 52                         |
|  | Config 3,6     |              | 40: N <sub>RB,c</sub> = 106                        |
| Initial DL BWP Configuration                 | Config 1,4     |              | DLBWP.0.1  |
|  | Config 2,5     |              | DLBWP.0.1  |
|  | Config 3,6     |              | DLBWP.0.1  |
| Dedicated DL BWP Configuration               | Config 1,4     |              | DLBWP.1.1  |
|  | Config 2,5     |              | DLBWP.1.1  |
|  | Config 3,6     |              | DLBWP.1.1  |
| Initial UL BWP Configuration                 | Config 1,4     |              | ULBWP.0.1  |
|  | Config 2,5     |              | ULBWP.0.1  |
|  | Config 3,6     |              | ULBWP.0.1  |
| Dedicated UL BWP Configuration               | Config 1,4     |              | ULBWP.1.1  |
|  | Config 2,5     |              | ULBWP.1.1  |
|  | Config 3,6     |              | ULBWP.1.1  |
| PDSCH Reference measurement channel          | Config 1,4     |              | SR.1.1 FDD   |
|  | Config 2,5     |              | SR.1.1 TDD   |
|  | Config 3,6     |              | SR.2.1 TDD   |
| RMSI CORESET parameters                      | Config 1,4     |              | CR.1.1 FDD   |
|  | Config 2,5     |              | CR.1.1 TDD   |
|  | Config 3,6     |              | CR.2.1 TDD   |
| PDCCH CORESET parameters                     | Config 1,4     |              | CCR.1.1 FDD  |
|  | Config 2,5     |              | CCR.1.1 TDD  |
|  | Config 3,6     |              | CCR.2.1 TDD  |
| OCNG Patterns                                |                |              | OP.1   |
| SMTTC Configuration                          |                |              | SMTTC.1  |
| TRS configuration                            | Config 1,4     |              | TRS.1.1 FDD  |
|  | Config 2,5     |              | TRS.1.1 TDD  |
|  | Config 3,6     |              | TRS.1.2 TDD  |
| SSB Configuration                            | Config 1,2,4,5 |              | SSB.1 FR1  |
|  | Config 3,6     |              | SSB.2 FR1  |
| Correlation Matrix and Antenna Configuration |                |              | 1x2 Low  |
| EPRE ratio of PSS to SSS                     |                | dB           | 0  |
| EPRE ratio of PBCH DMRS to SSS               |                |              |  |
| EPRE ratio of PBCH to PBCH DMRS              |                |              |  |
| EPRE ratio of PDCCH DMRS to SSS              |                |              |  |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |              |  |
| EPRE ratio of PDSCH DMRS to SSS              |                |              |  |
| EPRE ratio of PDSCH to PDSCH                 |                |              |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1)      |                |              |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |              |  |
| N <sub>oc</sub> <sup>Note 2</sup>            |                |              |  |
| SS-RSRP <sup>Note 3</sup>                    |                | dBm/15 kHz   | -87  |
| E <sub>s</sub> /I <sub>ot</sub>              |                | dB           | 17   |
| E <sub>s</sub> /N <sub>oc</sub>              |                | dB           | 17   |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,4,5 | dBm/9.36MHz  | -58.96   |
|  | Config 3,6     | dBm/38.16MHz | -52.86   |
| Time offset to Cell1 <sup>Note 4</sup>       |                | μs           | 3 for intra-band EN-DC,<br>33 for inter-band EN-DC |
| Propagation Condition                        |                |              | AWGN   |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.    |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells |

**Table A.4.5.2.1.1-4: Void**

#### A.4.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.1.2-1.

**Table A.4.5.2.1.2-1: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X |
|-------|---------------------|-----------------------|
|       |                     | Sync                  |
| 0     | 1                   | 1                     |
| 1     | 0.5                 | 1                     |

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

#### A.4.5.2.2 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

##### A.4.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1.2. Supported test configurations are shown in table A.4.5.2.2.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.2.1-2 and A.4.5.2.2.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.2.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

**Table A.4.5.2.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.4.5.2.2.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| <b>Parameter</b>           | <b>Unit</b> | <b>Value</b> | <b>Comment</b>   |
|----------------------------|-------------|--------------|--|
| RF Channel Number          |             | 1, 2         | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell               |             | Cell1        | PCell on E-UTRAN RF channel number 1.                    |
| Configured PSCell          |             | Cell2        | PSCell on NR RF channel number 2.                        |
| CP length                  |             | Normal       | Applicable to Cell1 and Cell2                            |
| DRX                        |             | DRX.4        | DRX related parameters are defined in Table A.3.3.4-1    |
| Measurement gap pattern Id |             | OFF          |  |
| T1                         | s           | 10           |  |

**Table A.4.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter                                    |                | Unit             | Cell2                       |
|--|----------------|------------------|-----------------------------|
| Frequency Range                              |                |                  | FR1                         |
| Duplex mode                                  | Config 1,4     |                  | FDD                         |
|  | Config 2,3,5,6 |                  | TDD                         |
| TDD configuration                            | Config 1,4     |                  | Not Applicable              |
|  | Config 2,5     |                  | TDDConf.1.1                 |
|  | Config 3,6     |                  | TDDConf.2.1                 |
| BW <sub>channel</sub>                        | Config 1,4     |                  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2,5     |                  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3,6     |                  | 40: N <sub>RB,c</sub> = 106 |
| Initial DL BWP Configuration                 | Config 1,4     |                  | DLBWP.0.1                   |
|  | Config 2,5     |                  | DLBWP.0.1                   |
|  | Config 3,6     |                  | DLBWP.0.1                   |
| Dedicated DL BWP Configuration               | Config 1,4     |                  | DLBWP.1.1                   |
|  | Config 2,5     |                  | DLBWP.1.1                   |
|  | Config 3,6     |                  | DLBWP.1.1                   |
| Initial UL BWP Configuration                 | Config 1,4     |                  | ULBWP.0.1                   |
|  | Config 2,5     |                  | ULBWP.0.1                   |
|  | Config 3,6     |                  | ULBWP.0.1                   |
| Dedicated UL BWP Configuration               | Config 1,4     |                  | ULBWP.1.1                   |
|  | Config 2,5     |                  | ULBWP.1.1                   |
|  | Config 3,6     |                  | ULBWP.1.1                   |
| PDSCH Reference measurement channel          | Config 1,4     |                  | SR.1.1 FDD                  |
|  | Config 2,5     |                  | SR.1.1 TDD                  |
|  | Config 3,6     |                  | SR.2.1 TDD                  |
| RMSI CORESET parameters                      | Config 1,4     |                  | CR.1.1 FDD                  |
|  | Config 2,5     |                  | CR.1.1 TDD                  |
|  | Config 3,6     |                  | CR.2.1 TDD                  |
| PDCCH CORESET parameters                     | Config 1,4     |                  | CCR.1.1 FDD                 |
|  | Config 2,5     |                  | CCR.1.1 TDD                 |
|  | Config 3,6     |                  | CCR.2.1 TDD                 |
| OCNG Patterns                                |                |                  | OP.1                        |
| SMTC Configuration                           |                |                  | SMTC.1                      |
| TRS configuration                            | Config 1,4     |                  | TRS.1.1 FDD                 |
|  | Config 2,5     |                  | TRS.1.1 TDD                 |
|  | Config 3,6     |                  | TRS.1.2 TDD                 |
| SSB Configuration                            | Config 1,2,4,5 |                  | SSB.1 FR1                   |
|  | Config 3,6     |                  | SSB.2 FR1                   |
| Correlation Matrix and Antenna Configuration |                |                  | 1x2 Low                     |
| EPRE ratio of PSS to SSS                     |                | dB               | 0                           |
| EPRE ratio of PBCH DMRS to SSS               |                |                  |                             |
| EPRE ratio of PBCH to PBCH DMRS              |                |                  |                             |
| EPRE ratio of PDCCH DMRS to SSS              |                |                  |                             |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |                  |                             |
| EPRE ratio of PDSCH DMRS to SSS              |                |                  |                             |
| EPRE ratio of PDSCH to PDSCH                 |                |                  |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |                  |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |                  |                             |
| N <sub>oc</sub> <sup>Note 2</sup>            |                | dBm/15 kHz       | -104                        |
| SS-RSRP <sup>Note 3</sup>                    |                | dBm/15 kHz       | -87                         |
| $\bar{E}_s/I_{ot}$                           |                | dB               | 17                          |
| $\bar{E}_s/N_{oc}$                           |                | dB               | 17                          |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,4,5 | dBm/9.36MHz      | -58.96                      |
|  | Config 3,6     | dBm/38.16MH<br>z | -52.86                      |
| Time offset to Cell1 <sup>Note 4</sup>       | Config 1,2,4,5 | $\mu$ s          | 500                         |
|  | Config 3,6     |                  | 250                         |
| Propagation Condition                        |                |                  | AWGN                        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.    |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells |

**Table A.4.5.2.2.1-4: Void**

**A.4.5.2.2.2 Test Requirements**

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.2.2-1.

**Table A.4.5.2.2.2-1: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X |
|-------|---------------------|-----------------------|
|       |                     | Async                 |
| 0     | 1                   | 2                     |
| 1     | 0.5                 | 2                     |

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

**A.4.5.2.3 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

**A.4.5.2.3.1 Test Purpose and Environment**

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1.2. Supported test configurations are shown in table A.4.5.2.3.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.3.1-2 and A.4.5.2.3.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.4.5.2.3.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode   |
| 2       | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode   |
| 3       | LTE FDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode   |
| 4       | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode   |
| 5       | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode   |
| 6       | LTE TDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode   |
| Note 1: | The UE is only required to be tested in one of the supported test configurations   |
| Note 2: | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{channel}$ ) defined in each test configuration, |



**Table A.4.5.2.3.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| <b>Parameter</b>                         | <b>Unit</b> | <b>Value</b> | <b>Comment</b>   |
|--|-------------|--------------|--|
| RF Channel Number                        |             | 1, 2, 3      | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell                             |             | Cell1        | PCell on E-UTRAN RF channel number 1.                          |
| Active PSCell                            |             | Cell2        | PSCell on NR RF channel number 2.                              |
| Configured deactivated SCell             |             | Cell3        | Deactivated SCell on NR RF channel number 3.                   |
| CP length                                |             | Normal       | Applicable to Cell1, Cell2 and Cell3                           |
| DRX                                      |             | OFF          |  |
| Measurement gap pattern Id               |             | OFF          |  |
| SCell measurement cycle (measCycleSCell) | ms          | 640          |  |
| T1                                       | s           | 10           |  |

**Table A.4.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter                                    |                | Unit         | Cell2  | Cell3  |
|--|----------------|--------------|--|--|
| <b>Frequency Range</b>                       |                |              | FR1  | FR1  |
| Duplex mode                                  | Config 1,4     |              | FDD  | FDD  |
|  | Config 2,3,5,6 |              | TDD  | TDD  |
| TDD configuration                            | Config 1,4     |              | Not Applicable                                     | Not Applicable   |
|  | Config 2,5     |              | TDDConf.1.1  | TDDConf.1.1  |
|  | Config 3,6     |              | TDDConf.2.1  | TDDConf.2.1  |
| BW <sub>channel</sub>                        | Config 1,4     |              | Note 8   | Note 8   |
|  | Config 2,5     |              | Note 8   | Note 8   |
|  | Config 3,6     |              | Note 8   | Note 8   |
| BW <sub>occupied</sub>                       | Config 1,4     | RB           | 52 <sup>Note 6</sup>                               | 52 <sup>Note 6</sup>   |
|  | Config 2,5     |              | 52 <sup>Note 6</sup>                               | 52 <sup>Note 6</sup>   |
|  | Config 3,6     |              | 106 <sup>Note 7</sup>                              | 106 <sup>Note 7</sup>  |
| Initial DL BWP Configuration                 | Config 1,4     |              | DLBWP.0.1  | DLBWP.0.1  |
|  | Config 2,5     |              | DLBWP.0.1  | DLBWP.0.1  |
|  | Config 3,6     |              | DLBWP.0.1  | DLBWP.0.1  |
| Dedicated DL BWP Configuration               | Config 1,4     |              | DLBWP.1.1  | DLBWP.1.1  |
|  | Config 2,5     |              | DLBWP.1.1  | DLBWP.1.1  |
|  | Config 3,6     |              | DLBWP.1.1  | DLBWP.1.1  |
| Initial UL BWP Configuration                 | Config 1,4     |              | ULBWP.0.1  | ULBWP.0.1  |
|  | Config 2,5     |              | ULBWP.0.1  | ULBWP.0.1  |
|  | Config 3,6     |              | ULBWP.0.1  | ULBWP.0.1  |
| Dedicated UL BWP Configuration               | Config 1,4     |              | ULBWP.1.1  | ULBWP.1.1  |
|  | Config 2,5     |              | ULBWP.1.1  | ULBWP.1.1  |
|  | Config 3,6     |              | ULBWP.1.1  | ULBWP.1.1  |
| PDSCH Reference measurement channel          | Config 1,4     |              | SR.1.1 FDD   | -  |
|  | Config 2,5     |              | SR.1.1 TDD   | -  |
|  | Config 3,6     |              | SR.2.1 TDD   | -  |
| RMSI CORESET parameters                      | Config 1,4     |              | CR.1.1 FDD   | CR.1.1 FDD   |
|  | Config 2,5     |              | CR.1.1 TDD   | CR.1.1 TDD   |
|  | Config 3,6     |              | CR.2.1 TDD   | CR.2.1 TDD   |
| PDCCH CORESET parameters                     | Config 1,4     |              | CCR.1.1 FDD  | CCR.1.1 FDD  |
|  | Config 2,5     |              | CCR.1.1 TDD  | CCR.1.1 TDD  |
|  | Config 3,6     |              | CCR.2.1 TDD  | CCR.2.1 TDD  |
| TRS configuration                            | Config 1,4     |              | TRS.1.1 FDD  | TRS.1.1 FDD  |
|  | Config 2,5     |              | TRS.1.1 TDD  | TRS.1.1 TDD  |
|  | Config 3,6     |              | TRS.1.2 TDD  | TRS.1.2 TDD  |
| OCNG Patterns                                | Config 1,2,4,5 |              | OP.1 <sup>Note 6</sup>                             | OP.1 <sup>Note 6</sup>   |
|  | Config 3,6     |              | OP.1 <sup>Note 7</sup>                             | OP.1 <sup>Note 7</sup>   |
| SMTC Configuration                           |                |              | SMTC.1   | SMTC.1   |
| TCI state                                    |                |              | TCI.State.0  | TCI.State.0  |
| SSB Configuration                            | Config 1,2,4,5 |              | SSB.1 FR1  | SSB.1 FR1  |
|  | Config 3,6     |              | SSB.2 FR1  | SSB.2 FR1  |
| Correlation Matrix and Antenna Configuration |                |              | 1x2 Low  | 1x2 Low  |
| EPRE ratio of PSS to SSS                     |                | dB           | 0  | 0  |
| EPRE ratio of PBCH DMRS to SSS               |                |              |  |  |
| EPRE ratio of PBCH to PBCH DMRS              |                |              |  |  |
| EPRE ratio of PDCCH DMRS to SSS              |                |              |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |              |  |  |
| EPRE ratio of PDSCH DMRS to SSS              |                |              |  |  |
| EPRE ratio of PDSCH to PDSCH                 |                |              |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |              |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |              |  |  |
| N <sub>oc</sub> <sup>Note 2</sup>            |                | dBm/15 kHz   | -104   | -104   |
| SS-RSRP <sup>Note 3</sup>                    |                | dBm/15 kHz   | -87  | -87  |
| $\bar{E}_s/I_{ot}$                           |                | dB           | 17   | 17   |
| $\bar{E}_s/N_{oc}$                           |                | dB           | 17   | 17   |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,4,5 | dBm/9.36MHz  | -58.96   | -58.96   |
|  | Config 3,6     | dBm/38.16MHz | -52.86   | -52.86   |
| Time offset to Cell1 <sup>Note 4</sup>       |                | μs           | 3 for intra-band EN-DC,<br>33 for inter-band EN-DC | 3 + Time offset to Cell2 for intra-band EN-DC,<br>33 + Time offset to Cell2 for inter-band EN-DC |

|  |   |      |      |
|--|---|------|------|
| Time offset to Cell2 <sup>Note 5</sup> | $\mu\text{s}$   | -    | 3    |
| Propagation Condition                  |   | AWGN | AWGN |
| Note 1:                                | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |      |      |
| Note 2:                                | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$ . |      |      |
| Note 3:                                | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |      |
| Note 4:                                | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells                      |      |      |
| Note 5:                                | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  |      |      |
| Note 6:                                | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.   |      |      |
| Note 7:                                | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.  |      |      |
| Note 8:                                | $N_{RB,C}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .  |      |      |

#### A.4.5.2.3.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.3.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.3.2-2.

**Table A.4.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 1                   |
| 1     | 0.5                 | 1                   |

**Table A.4.5.2.3.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 2 + SMTC duration   |
| 1     | 0.5                 | 2 + SMTC duration   |

For synchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 1 subframe.

For synchronous intra-band EN-DC, the UE is only allowed to cause an interruption on E-UTRA PCell no earlier than 1 subframe before an SMTC and no later than 1 subframe after the SMTC. The interruption on E-UTRA PCell shall not exceed SMTC duration + 2 subframes.

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

#### A.4.5.2.4 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

##### A.4.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1. Supported test configurations are shown in table A.4.5.2.4.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.4.1-2 and A.4.5.2.4.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.4.5.2.4.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations  
Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs  $\geq$  the bandwidth ( $BW_{channel}$ ) defined in each test configuration,

**Table A.4.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter   | Unit | Value   | Comment  |
|---|------|---------|--|
| RF Channel Number                                 |      | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell                                      |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Configured PSCell                                 |      | Cell2   | PSCell on NR RF channel number 2.                              |
| Configured deactivated SCell                      |      | Cell3   | Deactivated SCell on NR RF channel number 3.                   |
| CP length   |      | Normal  | Applicable to Cell1, Cell2 and Cell3                           |
| DRX   |      | OFF     |  |
| Measurement gap pattern Id                        |      | OFF     |  |
| SCell measurement cycle ( <i>measCycleSCell</i> ) | ms   | 640     |  |
| T1  | s    | 10      |  |

**Table A.4.5.2.4.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter                                    |                | Unit         | Cell2                  | Cell3                      |
|--|----------------|--------------|------------------------|----------------------------|
| <b>Frequency Range</b>                       |                |              | <b>FR1</b>             | <b>FR1</b>                 |
| Duplex mode                                  | Config 1,4     |              | FDD                    | FDD                        |
|  | Config 2,3,5,6 |              | TDD                    | TDD                        |
| TDD configuration                            | Config 1,4     |              | Not Applicable         | Not Applicable             |
|  | Config 2,5     |              | TDDConf.1.1            | TDDConf.1.1                |
|  | Config 3,6     |              | TDDConf.2.1            | TDDConf.2.1                |
| BW <sub>channel</sub>                        | Config 1,4     |              | Note 8                 | Note 8                     |
|  | Config 2,5     |              | Note 8                 | Note 8                     |
|  | Config 3,6     |              | Note 8                 | Note 8                     |
| BW <sub>occupied</sub>                       | Config 1,4     | RB           | 52 <sup>Note 6</sup>   | 52 <sup>Note 6</sup>       |
|  | Config 2,5     |              | 52 <sup>Note 6</sup>   | 52 <sup>Note 6</sup>       |
|  | Config 3,6     |              | 106 <sup>Note 7</sup>  | 106 <sup>Note 7</sup>      |
| Initial BWP Configuration                    | Config 1,4     |              | DLBWP.0.1              | DLBWP.0.1                  |
|  | Config 2,5     |              | DLBWP.0.1              | DLBWP.0.1                  |
|  | Config 3,6     |              | DLBWP.0.1              | DLBWP.0.1                  |
| Dedicated DL BWP Configuration               | Config 1,4     |              | DLBWP.1.1              | DLBWP.1.1                  |
|  | Config 2,5     |              | DLBWP.1.1              | DLBWP.1.1                  |
|  | Config 3,6     |              | DLBWP.1.1              | DLBWP.1.1                  |
| Initial UL BWP Configuration                 | Config 1,4     |              | ULBWP.0.1              | ULBWP.0.1                  |
|  | Config 2,5     |              | ULBWP.0.1              | ULBWP.0.1                  |
|  | Config 3,6     |              | ULBWP.0.1              | ULBWP.0.1                  |
| Dedicated UL BWP Configuration               | Config 1,4     |              | ULBWP.1.1              | ULBWP.1.1                  |
|  | Config 2,5     |              | ULBWP.1.1              | ULBWP.1.1                  |
|  | Config 3,6     |              | ULBWP.1.1              | ULBWP.1.1                  |
| PDSCH Reference measurement channel          | Config 1,4     |              | SR.1.1 FDD             | -                          |
|  | Config 2,5     |              | SR.1.1 TDD             | -                          |
|  | Config 3,6     |              | SR.2.1 TDD             | -                          |
| RMSI CORESET parameters                      | Config 1,4     |              | CR.1.1 FDD             | CR.1.1 FDD                 |
|  | Config 2,5     |              | CR.1.1 TDD             | CR.1.1 TDD                 |
|  | Config 3,6     |              | CR.2.1 TDD             | CR.2.1 TDD                 |
| PDCCH CORESET parameters                     | Config 1,4     |              | CCR.1.1 FDD            | CCR.1.1 FDD                |
|  | Config 2,5     |              | CCR.1.1 TDD            | CCR.1.1 TDD                |
|  | Config 3,6     |              | CCR.2.1 TDD            | CCR.2.1 TDD                |
| TRS configuration                            | Config 1,4     |              | TRS.1.1 FDD            | TRS.1.1 FDD                |
|  | Config 2,5     |              | TRS.1.1 TDD            | TRS.1.1 TDD                |
|  | Config 3,6     |              | TRS.1.2 TDD            | TRS.1.2 TDD                |
| OCNG Patterns                                | Config 1,2,4,5 |              | OP.1 <sup>Note 6</sup> | OP.1 <sup>Note 6</sup>     |
|  | Config 3,6     |              | OP.1 <sup>Note 7</sup> | OP.1 <sup>Note 7</sup>     |
| SSB Configuration                            | Config 1,2,4,5 |              | SSB.1 FR1              | SSB.1 FR1                  |
|  | Config 3,6     |              | SSB.2 FR1              | SSB.2 FR1                  |
| SMTc Configuration                           |                |              | SMTc.1                 | SMTc.1                     |
| TCI state                                    |                |              | TCI.State.0            | TCI.State.0                |
| Correlation Matrix and Antenna Configuration |                |              | 1x2 Low                | 1x2 Low                    |
| EPRE ratio of PSS to SSS                     |                | dB           | 0                      | 0                          |
| EPRE ratio of PBCH DMRS to SSS               |                |              |                        |                            |
| EPRE ratio of PBCH to PBCH DMRS              |                |              |                        |                            |
| EPRE ratio of PDCCH DMRS to SSS              |                |              |                        |                            |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |              |                        |                            |
| EPRE ratio of PDSCH DMRS to SSS              |                |              |                        |                            |
| EPRE ratio of PDSCH to PDSCH                 |                |              |                        |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |              |                        |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |              |                        |                            |
| N <sub>oc</sub> <sup>Note 2</sup>            |                |              |                        |                            |
| SS-RSRP <sup>Note 3</sup>                    |                | dBm/15 kHz   | -87                    | -87                        |
| $\bar{E}_s/I_{ot}$                           |                | dB           | 17                     | 17                         |
| $\bar{E}_s/N_{oc}$                           |                | dB           | 17                     | 17                         |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,4,5 | dBm/9.36MHz  | -58.96                 | -58.96                     |
|  | Config 3,6     | dBm/38.16MHz | -52.86                 | -52.86                     |
| Time offset to Cell1 <sup>Note 4</sup>       | Config 1,2,4,5 | $\mu$ s      | 500                    | 500 + Time offset to Cell2 |
|  | Config 3,6     |              | 250                    | 250 + Time offset to Cell2 |
| Time offset to Cell2 <sup>Note 5</sup>       |                | $\mu$ s      | -                      | 3                          |

| Propagation Condition |   | AWGN | AWGN |
|-----------------------|---|------|------|
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |      |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$ . |      |      |
| Note 3:               | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |      |
| Note 4:               | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells                      |      |      |
| Note 5:               | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  |      |      |
| Note 6:               | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.   |      |      |
| Note 7:               | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.  |      |      |
| Note 8:               | $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .  |      |      |

**A.4.5.2.4.2 Test Requirements**

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-2.

**Table A.4.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 1                   |
| 1     | 0.5                 | 1                   |

**Table A.4.5.2.4.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 2 + SMTC duration   |
| 1     | 0.5                 | 2 + SMTC duration   |

For asynchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 2 subframe.

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



#### A.4.5.2.5 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

##### A.4.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS38.133 clause 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.5.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.5.1-2 and A.4.5.2.5.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.4.5.2.5.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.4.5.2.5.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter                                | Unit | Value   | Comment  |
|--|------|---------|--|
| RF Channel Number                        |      | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell                             |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Active PSCell                            |      | Cell2   | PSCell on NR RF channel number 2.                              |
| Configured deactivated SCell             |      | Cell3   | Deactivated SCell on E-UTRAN RF channel number 3.              |
| CP length                                |      | Normal  | Applicable to Cell1, Cell2 and Cell3                           |
| DRX                                      |      | OFF     |  |
| Measurement gap pattern Id               |      | OFF     |  |
| SCell measurement cycle (measCycleSCell) | ms   | 640     |  |
| T1                                       | s    | 10      |  |

**Table A.4.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter                                    |                | Unit         | Cell2  |
|--|----------------|--------------|--|
| Frequency Range                              |                |              | FR1  |
| Duplex mode                                  | Config 1,4     |              | FDD  |
|  | Config 2,3,5,6 |              | TDD  |
| TDD configuration                            | Config 1,4     |              | Not Applicable                                     |
|  | Config 2,5     |              | TDDConf.1.1  |
|  | Config 3,6     |              | TDDConf.2.1  |
| BW <sub>channel</sub>                        | Config 1,4     | MHz          | 10: N <sub>RB,c</sub> = 52                         |
|  | Config 2,5     |              | 10: N <sub>RB,c</sub> = 52                         |
|  | Config 3,6     |              | 40: N <sub>RB,c</sub> = 106                        |
| Initial DL BWP Configuration                 | Config 1,4     |              | DLBWP.0.1  |
|  | Config 2,5     |              | DLBWP.0.1  |
|  | Config 3,6     |              | DLBWP.0.1  |
| Dedicated DL BWP Configuration               | Config 1,4     |              | DLBWP.1.1  |
|  | Config 2,5     |              | DLBWP.1.1  |
|  | Config 3,6     |              | DLBWP.1.1  |
| Initial UL BWP Configuration                 | Config 1,4     |              | ULBWP.0.1  |
|  | Config 2,5     |              | ULBWP.0.1  |
|  | Config 3,6     |              | ULBWP.0.1  |
| Dedicated UL BWP Configuration               | Config 1,4     |              | ULBWP.1.1  |
|  | Config 2,5     |              | ULBWP.1.1  |
|  | Config 3,6     |              | ULBWP.1.1  |
| PDSCH Reference measurement channel          | Config 1,4     |              | SR.1.1 FDD   |
|  | Config 2,5     |              | SR.1.1 TDD   |
|  | Config 3,6     |              | SR.2.1 TDD   |
| RMSI CORESET parameters                      | Config 1,4     |              | CR.1.1 FDD   |
|  | Config 2,5     |              | CR.1.1 TDD   |
|  | Config 3,6     |              | CR.2.1 TDD   |
| PDCCH CORESET parameters                     | Config 1,4     |              | CCR.1.1 FDD  |
|  | Config 2,5     |              | CCR.1.1 TDD  |
|  | Config 3,6     |              | CCR.2.1 TDD  |
| TRS configuration                            | Config 1,4     |              | TRS.1.1 FDD  |
|  | Config 2,5     |              | TRS.1.1 TDD  |
|  | Config 3,6     |              | TRS.1.2 TDD  |
| OCNG Patterns                                |                |              | OP.1   |
| SMTC Configuration                           |                |              | SMTc.1   |
| TCI state                                    |                |              | TCI.State.0  |
| SSB Configuration                            | Config 1,2,4,5 |              | SSB.1 FR1  |
|  | Config 3,6     |              | SSB.2 FR1  |
| Correlation Matrix and Antenna Configuration |                |              | 1x2 Low  |
| EPRE ratio of PSS to SSS                     |                | dB           | 0  |
| EPRE ratio of PBCH DMRS to SSS               |                |              |  |
| EPRE ratio of PBCH to PBCH DMRS              |                |              |  |
| EPRE ratio of PDCCH DMRS to SSS              |                |              |  |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |              |  |
| EPRE ratio of PDSCH DMRS to SSS              |                |              |  |
| EPRE ratio of PDSCH to PDSCH                 |                |              |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |              |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |              |  |
| N <sub>oc</sub> <sup>Note 2</sup>            |                |              |  |
| SS-RSRP <sup>Note 3</sup>                    |                | dBm/15 kHz   | -87  |
| $\bar{E}_s/I_{ot}$                           |                | dB           | 17   |
| $\bar{E}_s/N_{oc}$                           |                | dB           | 17   |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,4,5 | dBm/9.36MHz  | -58.96   |
|  | Config 3,6     | dBm/38.16MHz | -52.86   |
| Time offset to Cell1 <sup>Note 4</sup>       |                | μs           | 3 for intra-band EN-DC,<br>33 for inter-band EN-DC |
| Propagation Condition                        |                |              | AWGN   |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.    |
| Note 3: | SS-RSRP and $l_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells |

#### A.4.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.5.2-1 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table A.4.5.2.3.2-1 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

**Table A.4.5.2.5.2-1: Interruption length X and Y at measurements on deactivated E-UTRA SCC**

| $\mu$ | NR Slot length (ms) | Interruption length X slot | Interruption length Y slot |
|-------|---------------------|----------------------------|----------------------------|
|       |                     | Sync                       |                            |
| 0     | 1                   | 1                          | 1+SMTC duration            |
| 1     | 0.5                 | 1                          | 1+SMTC duration            |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

#### A.4.5.2.6 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

##### A.4.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1. Supported test configurations are shown in table A.4.5.2.6.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.6.1-1 and A.4.5.2.6.1-2 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.4.5.2.6.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.4.5.2.6.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter                                | Unit | Value   | Comment  |
|--|------|---------|--|
| RF Channel Number                        |      | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell                             |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Configured PSCell                        |      | Cell2   | PSCell on NR RF channel number 2.                              |
| Configured deactivated SCell             |      | Cell3   | Deactivated SCell on E-UTRAN RF channel number 3.              |
| CP length                                |      | Normal  | Applicable to Cell1, Cell2 and Cell3                           |
| DRX                                      |      | OFF     |  |
| Measurement gap pattern Id               |      | OFF     |  |
| SCell measurement cycle (measCycleSCell) | ms   | 640     |  |
| T1                                       | s    | 10      |  |

**Table A.4.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter                                    |                | Unit         | Cell2                       |
|--|----------------|--------------|-----------------------------|
| Frequency Range                              |                |              | FR1                         |
| Duplex mode                                  | Config 1,4     |              | FDD                         |
|  | Config 2,3,5,6 |              | TDD                         |
| TDD configuration                            | Config 1,4     |              | Not Applicable              |
|  | Config 2,5     |              | TDDConf.1.1                 |
|  | Config 3,6     |              | TDDConf.2.1                 |
| BW <sub>channel</sub>                        | Config 1,4     |              | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2,5     |              | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3,6     |              | 40: N <sub>RB,c</sub> = 106 |
| Initial DL BWP Configuration                 | Config 1,4     |              | DLBWP.0.1                   |
|  | Config 2,5     |              | DLBWP.0.1                   |
|  | Config 3,6     |              | DLBWP.0.1                   |
| Dedicated DL BWP Configuration               | Config 1,4     |              | DLBWP.1.1                   |
|  | Config 2,5     |              | DLBWP.1.1                   |
|  | Config 3,6     |              | DLBWP.1.1                   |
| Initial UL BWP Configuration                 | Config 1,4     |              | ULBWP.0.1                   |
|  | Config 2,5     |              | ULBWP.0.1                   |
|  | Config 3,6     |              | ULBWP.0.1                   |
| Dedicated UL BWP Configuration               | Config 1,4     |              | ULBWP.1.1                   |
|  | Config 2,5     |              | ULBWP.1.1                   |
|  | Config 3,6     |              | ULBWP.1.1                   |
| PDSCH Reference measurement channel          | Config 1,4     |              | SR.1.1 FDD                  |
|  | Config 2,5     |              | SR.1.1 TDD                  |
|  | Config 3,6     |              | SR.2.1 TDD                  |
| RMSI CORESET parameters                      | Config 1,4     |              | CR.1.1 FDD                  |
|  | Config 2,5     |              | CR.1.1 TDD                  |
|  | Config 3,6     |              | CR.2.1 TDD                  |
| PDCCH CORESET parameters                     | Config 1,4     |              | CCR.1.1 FDD                 |
|  | Config 2,5     |              | CCR.1.1 TDD                 |
|  | Config 3,6     |              | CCR.2.1 TDD                 |
| TRS configuration                            | Config 1,4     |              | TRS.1.1 FDD                 |
|  | Config 2,5     |              | TRS.1.1 TDD                 |
|  | Config 3,6     |              | TRS.1.2 TDD                 |
| OCNG Patterns                                |                |              | OP.1                        |
| SMTC Configuration                           |                |              | SMTc.1                      |
| TCI state                                    |                |              | TCI.State.0                 |
| SSB Configuration                            | Config 1,2,4,5 |              | SSB.1 FR1                   |
|  | Config 3,6     |              | SSB.2 FR1                   |
| Correlation Matrix and Antenna Configuration |                |              | 1x2 Low                     |
| EPRE ratio of PSS to SSS                     |                | dB           | 0                           |
| EPRE ratio of PBCH DMRS to SSS               |                |              |                             |
| EPRE ratio of PBCH to PBCH DMRS              |                |              |                             |
| EPRE ratio of PDCCH DMRS to SSS              |                |              |                             |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |              |                             |
| EPRE ratio of PDSCH DMRS to SSS              |                |              |                             |
| EPRE ratio of PDSCH to PDSCH                 |                |              |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |              |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |              |                             |
| N <sub>oc</sub> <sup>Note 2</sup>            |                |              |                             |
| SS-RSRP <sup>Note 3</sup>                    |                | dBm/15 kHz   | -87                         |
| $\hat{E}_s/I_{ot}$                           |                | dB           | 17                          |
| $\hat{E}_s/N_{oc}$                           |                | dB           | 17                          |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,4,5 | dBm/9.36MHz  | -58.96                      |
|  | Config 3,6     | dBm/38.16MHz | -52.86                      |
| Time offset to Cell1 <sup>Note 4</sup>       | Config 1,2,4,5 | $\mu$ s      | 500                         |
|  | Config 3,6     |              | 250                         |
| Propagation Condition                        |                |              | AWGN                        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.    |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells |

#### A.4.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1 and Table A.4.5.2.4.2-2.

**Table A.4.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 2                   |
| 1     | 0.5                 | 2                   |

**Table A.4.5.2.6.2-2: Interruption duration if the NR PSCell is in the same band as the E-UTRAN deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 2 + SMTC duration   |
| 1     | 0.5                 | 2 + SMTC duration   |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

#### A.4.5.2.7 Void

#### A.4.5.2.8 E-UTRAN - NR FR1 interruptions at NR SRS carrier based switching in asynchronous EN-DC

##### A.4.5.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS, the UE can perform carrier based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission. The test will verify the interruption requirements on E-UTRAN PCell and NR PSCell in clause 8.2.1.2.12. Supported test configurations are shown in table A.4.5.2.8.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.8.1-2 and A.4.5.2.8.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell in FR1 with PUCCH/PUSCH transmission, Cell3 is an activated NR SCell in FR1 which operates in downlink without PUCCH/PUSCH transmission. The UE is configured with the SRS carrier based switching between PSCell and SCell.

The test consists of two successive time periods, with duration of T1 and T2, respectively. Throughout the test the UE shall be continuously scheduled on PCell and PSCell. Immediately at the beginning of T2, a PDCCH with TPC-SRS-RNTI is sent to the UE to initiate NR SRS switching.



**Table A.4.5.2.8.1-1: Interruptions at SRS carrier switching supported test configurations in FR1**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell FDD duplex mode, SCell TDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell TDD duplex mode, SCell TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                               |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell FDD duplex mode, SCell TDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell TDD duplex mode, SCell TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                               |
| Note:  | The UE is only required to be tested in one of the supported test configurations            |

**Table A.4.5.2.8.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter          | Unit | Value   | Comment  |
|--------------------|------|---------|--|
| RF Channel Number  |      | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell       |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Configured PSCell  |      | Cell2   | Configured PSCell on NR RF channel number 2.                   |
| Configured SCell   |      | Cell3   | Configured activated secondary cell on NR RF channel number 3. |
| CP length          |      | Normal  | Applicable to Cell1, Cell2 and Cell3.                          |
| DRX                |      | OFF     | Continuous monitoring of primary cell                          |
| Filter coefficient |      | 0       | L3 filtering is not used                                       |
| T1                 | s    | 5       |  |
| T2                 | ms   | 40      | UE shall perform SRS switching during T2                       |

**Table A.4.5.2.8.1-3: NR Cell specific test parameters for E-UTRAN – NR FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter                           | Unit           | Cell2                       | Cell3                       |
|-------------------------------------|----------------|-----------------------------|-----------------------------|
| Frequency Range                     |                | FR1                         | FR1                         |
| Duplex mode                         | Config 1,4     | FDD                         | TDD                         |
|                                     | Config 2,3,5,6 | TDD                         | TDD                         |
| TDD configuration                   | Config 1,4     | Not Applicable              | TDDConfig.1.1               |
|                                     | Config 2,5     | TDDConf.1.1                 | TDDConfig.1.1               |
|                                     | Config 3,6     | TDDConf.2.1                 | TDDConfig.2.1               |
| BW <sub>channel</sub>               | Config 1,2,4,5 | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |
|                                     | Config 3,6     | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |
| DL Initial BWP configuration        | Config 1-6     | DLBWP.0.1                   | DLBWP.0.1                   |
| DL dedicated BWP configuration      | Config 1-6     | DLBWP.1.1                   | DLBWP.1.1                   |
| UL Initial BWP configuration        | Config 1-6     | ULBWP.0.1                   | -                           |
| UL dedicated BWP configuration      | Config 1-6     | ULBWP.1.1                   | -                           |
| PDSCH Reference measurement channel | Config 1,4     | SR.1.1 FDD                  | SR.1.1 TDD                  |
|                                     | Config 2,5     | SR.1.1 TDD                  | SR.1.1 TDD                  |
|                                     | Config 3,6     | SR.2.1 TDD                  | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel      | Config 1,4     | CR.1.1 FDD                  | CR.1.1 TDD                  |
|                                     | Config 2,5     | CR.1.1 TDD                  | CR.1.1 TDD                  |
|                                     | Config 3,6     | CR.2.1 TDD                  | CR.2.1 TDD                  |
| RMC CORESET Reference Channel       | Config 1,4     | CCR.1.1 FDD                 | CCR.1.1 TDD                 |
|                                     | Config 2,5     | CCR.1.1 TDD                 | CCR.1.1 TDD                 |

|   |                |              |             |             |
|---|----------------|--------------|-------------|-------------|
|   | Config 3,6     |              | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns   |                |              | OP.1        | OP.1        |
| TRS configuration   | Config 1,4     |              | TRS.1.1 FDD | TRS.1.1 TDD |
|   | Config 2,5     |              | TRS.1.1 TDD | TRS.1.1 TDD |
|   | Config 3,6     |              | TRS.1.2 TDD | TRS.1.2 TDD |
| SMTC configuration  |                |              | SMTC.1      | SMTC.1      |
| SSB configuration   | Config 1,2,4,5 |              | SSB.1 FR1   | SSB.1 FR1   |
|   | Config 3,6     |              | SSB.2 FR1   | SSB.2 FR1   |
| PDSCH/PDCCH subcarrier spacing  | Config 1,2,4,5 | kHz          | 15 kHz      | 15 kHz      |
|   | Config 3,6     |              | 30 kHz      | 30 kHz      |
| SRS Configuration   | Config 1,2,4,5 | kHz          | -           | SRS.1 TDD   |
|   | Config 3,6     |              | -           | SRS.2 TDD   |
| PUCCH/PUSCH subcarrier spacing  | Config 1,2,4,5 | kHz          | 15 kHz      | -           |
|   | Config 3,6     |              | 30 kHz      | -           |
| EPRE ratio of PSS to SSS  |                |              |             |             |
| EPRE ratio of PBCH DMRS to SSS  |                |              |             |             |
| EPRE ratio of PBCH to PBCH DMRS   |                |              |             |             |
| EPRE ratio of PDCCH DMRS to SSS   |                |              |             |             |
| EPRE ratio of PDCCH to PDCCH DMRS   |                |              |             | 0           |
| EPRE ratio of PDSCH DMRS to SSS   |                |              | 0           |             |
| EPRE ratio of PDSCH to PDSCH  |                |              |             |             |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |                |              |             |             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                |              |             |             |
| $N_{oc}$ <sup>Note2</sup>   |                | dBm/15kHz    | -104        | -104        |
| $N_{oc}$ <sup>Note2</sup>   | Config 1,2,4,5 | dBm/SCS      | -104        | -104        |
|   | Config 3,6     |              | -101        | -101        |
| SS-RSRP <sup>Note3</sup>  | Config 1,2,4,5 | dBm/SCS      | -87         | -87         |
|   | Config 3,6     |              | -84         | -84         |
| $\hat{E}_s / I_{ot}$  |                | dB           | 17          | 17          |
| $\hat{E}_s / N_{oc}$  |                | dB           | 17          | 17          |
| $I_o$ <sup>Note3</sup>  | Config 1,2,4,5 | dBm/9.36MHz  | -58.96      | -58.96      |
|   | Config 3,6     | dBm/38.16MHz | -52.86      | -52.86      |
| Time offset to Cell1 <sup>Note 5</sup>  |                | $\mu$ s      | -           | 3           |
| Propagation condition   |                | -            | AWGN        | AWGN        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.</p> |                |              |             |             |

Table A.4.5.2.8.1-4: Void

### A.4.5.2.8.2 Test Requirements

During the time duration T2, the interruption on NR PSCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table A.4.5.2.8.2-1 dependent on the applied SRS carrier switching time.

**Table A4.5.2.8.2-1: Interruption length on NR active serving cells at NR SRS carrier switching (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) <sup>Note 1</sup> | Interruption length X1 (slots)               |    |
|-------|------------------------------------|---|--|----|
|       |                                    |   | Sub carrier spacing for aggressor cell (kHz) |    |
|       |                                    |   | 15   | 30 |
| 0     | 1                                  | ≤ 200   | 2  | 2  |
|       |                                    | 300, 500  | 2  | 2  |
|       |                                    | 900   | 3  | 3  |
| 1     | 0.5                                | ≤ 200   | 3  | 2  |
|       |                                    | 300, 500  | 3  | 3  |
|       |                                    | 900   | 4  | 4  |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

During the time duration T2, the interruption on E-UTRAN PCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table A.4.5.2.8.2-2 dependent on the applied SRS carrier switching time.

**Table 4.5.2.8.2-2: Interruption length on E-UTRAN active serving cells at NR SRS carrier switching**

| NR SRS carrier switching time (us) <sup>note1</sup> | Interruption length X1 (subframes) |
|---|------------------------------------|
| ≤500  | 2                                  |
| 900   | 3                                  |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

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

## A.4.5.2.9 E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching

### A.4.5.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS on a PUSCH-less carrier of SCell, the UE can perform carrier based switching to one PUSCH-less SCCs from a CC with PUSCH. The test will verify the interruption requirements on active serving cell in SCG in clause 8.2.1.2.13. Supported test configurations are shown in table A.4.5.2. x2.1-1.

In the test there are three cells: cell1, cell2 and cell3. Cell1 is E-UTRAN PCell on the primary component carrier. Cell3 is E-UTRAN SCell on the TDD secondary component carrier which operates in downlink without PUCCH/PUSCH. Cell2 is NR FR1 PSCell. The UE is configured with the SRS switching between E-UTRAN PCell and E-UTRAN SCell. The general test parameters, NR cell specific test parameters and E-UTRA SRS configurations are given in Table A.4.5.2.9.1-2, A.4.5.2.9.1-3 and Table A.4.5.2.9.1-4 below. And the E-UTRAN cell specific test parameters (for cell1 and cell3) can refer to Table A.3.7.2.1-1. The test consists of two successive time periods, with duration of T1 and T2, respectively. During T1 LTE PCell and NR PSCell are continuously scheduled in DL. Immediately at the beginning of T2, a PDCCCH with SRS-TPC-RNTI is sent to the UE to initiate SRS switching.

**Table A.4.5.2.9.1-1: E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching supported test configurations**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | LTE FDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | LTE FDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | LTE FDD(cell1), LTE TDD (cell3), NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4             | LTE TDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5             | LTE TDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6             | LTE TDD(cell1), LTE TDD (cell3), NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.4.5.2.9.1-2: General test parameters for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

| <b>Parameter</b>           | <b>Unit</b> | <b>Value</b> | <b>Comment</b>   |
|----------------------------|-------------|--------------|--|
| RF Channel Number          |             | 1, 2, 3      | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell               |             | Cell1        | PCell on E-UTRAN RF channel number 1.                          |
| Active PSCell              |             | Cell2        | PSCell on NR RF channel number 2.                              |
| Activated SCell            |             | Cell3        | SCell on E-UTRAN RF channel number 3.                          |
| CP length                  |             | Normal       | Applicable to Cell1, Cell2 and Cell3                           |
| DRX                        |             | OFF          |  |
| Measurement gap pattern Id |             | OFF          |  |
| T1                         | s           | 0.2          |  |
| T2                         | s           | 0.2          | UE shall perform SRS switching during T2                       |

**Table A.4.5.2.9.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

| Parameter                                    |                | Unit         | Cell2                       |
|--|----------------|--------------|-----------------------------|
| <b>Frequency Range</b>                       |                |              | FR1                         |
| Duplex mode                                  | Config 1,4     |              | FDD                         |
|  | Config 2,3,5,6 |              | TDD                         |
| TDD configuration                            | Config 1,4     |              | Not Applicable              |
|  | Config 2,5     |              | TDDConf.1.1                 |
|  | Config 3,6     |              | TDDConf.2.1                 |
| BW <sub>channel</sub>                        | Config 1,4     | MHz          | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2,5     |              | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3,6     |              | 40: N <sub>RB,c</sub> = 106 |
| Initial DL BWP Configuration                 | Config 1,4     |              | DLBWP.0.1                   |
|  | Config 2,5     |              | DLBWP.0.1                   |
|  | Config 3,6     |              | DLBWP.0.1                   |
| Dedicated DL BWP Configuration               | Config 1,4     |              | DLBWP.1.1                   |
|  | Config 2,5     |              | DLBWP.1.1                   |
|  | Config 3,6     |              | DLBWP.1.1                   |
| Initial UL BWP Configuration                 | Config 1,4     |              | ULBWP.0.1                   |
|  | Config 2,5     |              | ULBWP.0.1                   |
|  | Config 3,6     |              | ULBWP.0.1                   |
| Dedicated UL BWP Configuration               | Config 1,4     |              | ULBWP.1.1                   |
|  | Config 2,5     |              | ULBWP.1.1                   |
|  | Config 3,6     |              | ULBWP.1.1                   |
| PDSCH Reference measurement channel          | Config 1,4     |              | SR.1.1 FDD                  |
|  | Config 2,5     |              | SR.1.1 TDD                  |
|  | Config 3,6     |              | SR.2.1 TDD                  |
| RMSI CORESET parameters                      | Config 1,4     |              | CR.1.1 FDD                  |
|  | Config 2,5     |              | CR.1.1 TDD                  |
|  | Config 3,6     |              | CR.2.1 TDD                  |
| PDCCH CORESET parameters                     | Config 1,4     |              | CCR.1.1 FDD                 |
|  | Config 2,5     |              | CCR.1.1 TDD                 |
|  | Config 3,6     |              | CCR.2.1 TDD                 |
| TRS configuration                            | Config 1,4     |              | TRS.1.1 FDD                 |
|  | Config 2,5     |              | TRS.1.1 TDD                 |
|  | Config 3,6     |              | TRS.1.2 TDD                 |
| OCNG Patterns                                |                |              | OP.1                        |
| SMTC Configuration                           |                |              | SMTc.1                      |
| TCI state                                    |                |              | TCI.State.0                 |
| SSB Configuration                            | Config 1,2,4,5 |              | SSB.1 FR1                   |
|  | Config 3,6     |              | SSB.2 FR1                   |
| Correlation Matrix and Antenna Configuration |                |              | 1x2 Low                     |
| EPRE ratio of PSS to SSS                     |                | dB           | 0                           |
| EPRE ratio of PBCH DMRS to SSS               |                |              |                             |
| EPRE ratio of PBCH to PBCH DMRS              |                |              |                             |
| EPRE ratio of PDCCH DMRS to SSS              |                |              |                             |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |              |                             |
| EPRE ratio of PDSCH DMRS to SSS              |                |              |                             |
| EPRE ratio of PDSCH to PDSCH                 |                |              |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |              |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |              |                             |
| N <sub>oc</sub> <sup>Note 2</sup>            |                |              |                             |
| SS-RSRP <sup>Note 3</sup>                    |                | dBm/15 kHz   | -87                         |
| $\bar{E}_s/I_{ot}$                           |                | dB           | 17                          |
| $\bar{E}_s/N_{oc}$                           |                | dB           | 17                          |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,4,5 | dBm/9.36MHz  | -58.96                      |
|  | Config 3,6     | dBm/38.16MHz | -52.86                      |
| Time offset to Cell1 <sup>Note 4</sup>       |                | μs           | 33                          |
| Propagation Condition                        |                |              | AWGN                        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.    |
| Note 3: | SS-RSRP and $l_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells |

**Table A.4.5.2.9.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

| Field  | Value | Comment   |
|--|-------|---|
| srsBandwidthConfiguration                                    | bw5   |   |
| srsSubframeConfiguration                                     | Sc8   | Once every 5 subframes                            |
| ackNackSrsSimultaneousTransmission                           | FALSE |   |
| srsMaxUpPTS  | N/A   | Not applicable for E-UTRAN FDD                    |
| srsBandwidth   | 0     | No hopping  |
| srsHoppingBandwidth  | hbw0  |   |
| frequencyDomainPosition                                      | 0     |   |
| Duration   | TRUE  | Indefinite duration                               |
| Srs-ConfigurationIndex                                       | 47    | SRS periodicity of 40ms.                          |
| transmissionComb   | 0     |   |
| cyclicShift  | cs0   | No cyclic shift                                   |
| SRS-AntennaPort  | an1   | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331. |       |   |

**A.4.5.2.9.2 Test Requirements**

The UE shall be continuously scheduled in NR PSCell throughout the test and during the time duration  $T_2$ , Each interruption on NR PSCell shall not exceed  $X$  defined in Table A.4.5.2.9.2-1.

**Table A.4.5.2.9.2-1: Interruption length  $X$  (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching**

| $\mu$ | NR Slot length (ms) | Interruption length $X3$ (slots) |
|-------|---------------------|----------------------------------|
| 0     | 1                   | 2                                |
| 1     | 0.5                 | 3                                |

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

**A.4.5.3 SCell Activation and Deactivation Delay**

**A.4.5.3.1 SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle**

**A.4.5.3.1.1 Test Purpose and Environment**

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.4.5.3.1.1-1 below. The test parameters are given in Tables A.4.5.3.1.1-2 and cell-specific parameters in A.4.5.3.1.1-3 below. The test consists of three successive time periods, with duration of  $T_1$ ,  $T_2$  and  $T_3$ , respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA

and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. The UE now starts monitoring the SCell. The test equipment sends a MAC message for activation of the SCell.

the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$ , as defined in clause 8.3. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $(m+k)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to slot  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{NR slot length}} + N_{\text{interruption}}$ , as defined in clause 8.3, where  $N_{\text{interruption}}$  is the interruption length given in clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe  $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$  to subframe  $m_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{EUTRA slot length}} + N_{\text{interruption}}$ , where  $m_1$  and  $m_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $m$ , and  $N_{\text{interruption}}$  is the interruption length given in TS 36.133 [14] clause 7.32.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted  $n$ , is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe  $n_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA subframe length}}$  to subframe  $n_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{EUTRA subframe length}}$ , where  $n_1$  and  $n_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $n$ .

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for SCell is discontinued.

**Table A.4.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  |
| 2             | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  |
| 3             | LTE FDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  |
| 4             | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  |
| 5             | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  |
| 6             | LTE TDD, NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  |
| Note 1:       | The UE is only required to be tested in one of the supported test configurations  |
| Note 2:       | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration, |



**Table A.4.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter  | Unit | Value   | Comment  |
|--|------|---|--|
| RF Channel Number  |      | 1,2,3   | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test  |
| Active PCell   |      | Cell 1  | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.1   |
| Active PSCell  |      | Cell 2  | Primary secondary cell on NR RF channel number 2.  |
| Configured deactivated SCell                                 |      | Cell 3  | Configured deactivated secondary cell on NR RF channel number 3  |
| CP length  |      | Normal  |  |
| DRX  |      | OFF   | Continuous monitoring of primary cell  |
| Cell-individual offset for cells on E-UTRA RF channel number | dB   | 0   | Individual offset for cells on primary component carrier.  |
| Cell-individual offset for cells on NR channel number        | dB   | 0   | Individual offset for cells on secondary component carrier.  |
| SCell measurement cycle (measCycleSCell)                     | ms   | 160   |  |
| Cell3 timing offset to cell2                                 | μs   | 0   |  |
| Time alignment error between cell3 and cell2                 | μs   | ≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.  |
| T1   | s    | 7   | During this time the PSCell shall be known and the SCell configured and detected.  |
| T2   | s    | 1   | During this time the UE shall activate the SCell.  |
| T3   | s    | 1   | During this time the UE shall deactivate the SCell.  |
| T <sub>HARQ</sub>  | ms   | k <sub>1</sub> NR slot length   | k <sub>1</sub> is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by <i>dl-DataToUL-ACK</i> if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3] |
| T <sub>CSI_Reporting</sub>                                   | ms   | 15  | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]    |
| k  | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe}, \mu} + 1$            | As specified in clause 4.3 of TS 38.213 [3]  |

**Table A. 4.5.3.1.1-3: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter                                |                         | Unit | Cell 2                 |    |    | Cell 3       |    |    |
|--|-------------------------|------|------------------------|----|----|--------------|----|----|
|  |                         |      | T1                     | T2 | T3 | T1           | T2 | T3 |
| <b>SSB ARFCN</b>                         |                         |      | <b>freq1</b>           |    |    | <b>freq2</b> |    |    |
| Duplex mode                              | Config 1,4              |      | FDD                    |    |    |              |    |    |
|  | Config 2,3,5,6          |      | TDD                    |    |    |              |    |    |
| TDD configuration                        | Config 1,4              |      | Not Applicable         |    |    |              |    |    |
|  | Config 2,5              |      | TDDConf.1.1            |    |    |              |    |    |
|  | Config 3,6              |      | TDDConf.2.1            |    |    |              |    |    |
| BW <sub>channel</sub>                    | Config 1,4              | MHz  | Note 7                 |    |    |              |    |    |
|  | Config 2,5              |      | Note 7                 |    |    |              |    |    |
|  | Config 3,6              |      | Note 7                 |    |    |              |    |    |
| BW <sub>occupied</sub>                   | Config 1,4              | RB   | 52 <sup>Note 5</sup>   |    |    |              |    |    |
|  | Config 2,5              |      | 52 <sup>Note 5</sup>   |    |    |              |    |    |
|  | Config 3,6              |      | 106 <sup>Note 6</sup>  |    |    |              |    |    |
| DL initial BWP configuration             | Config 1, 2, 3, 4, 5, 6 |      | DLBWP.0.1              |    |    |              |    |    |
| DL dedicated BWP configuration           | Config 1, 2, 3, 4, 5, 6 |      | DLBWP.1.1              |    |    |              |    |    |
| UL initial BWP configuration             | Config 1, 2, 3, 4, 5, 6 |      | ULBWP.0.1              |    |    |              |    |    |
| UL dedicated BWP configuration           | Config 1, 2, 3, 4, 5, 6 |      | ULBWP.1.1              |    |    |              |    |    |
| DRX Cycle                                |                         | ms   | Not Applicable         |    |    |              |    |    |
| PDSCH Reference measurement channel      | Config 1,4              |      | SR.1.1 FDD             |    |    | SR.1.1 FDD   |    |    |
|  | Config 2,5              |      | SR.1.1 TDD             |    |    | SR.1.1 TDD   |    |    |
|  | Config 3,6              |      | SR.2.1 TDD             |    |    | SR.2.1 TDD   |    |    |
| RMSI CORESET Reference Channel           | Config 1,4              |      | CR.1.1 FDD             |    |    | CR.1.1 FDD   |    |    |
|  | Config 2,5              |      | CR.1.1 TDD             |    |    | CR.1.1 TDD   |    |    |
|  | Config 3,6              |      | CR.2.1 TDD             |    |    | CR.2.1 TDD   |    |    |
| RMC CORESET Reference Channel            | Config 1,4              |      | CCR.1.1 FDD            |    |    | CCR.1.1 FDD  |    |    |
|  | Config 2,5              |      | CCR.1.1 TDD            |    |    | CCR.1.1 TDD  |    |    |
|  | Config 3,6              |      | CCR.2.1 TDD            |    |    | CCR.2.1 TDD  |    |    |
| TRS configuration                        | Config 1,4              |      | TRS.1.1 FDD            |    |    | TRS.1.1 FDD  |    |    |
|  | Config 2,5              |      | TRS.1.1 TDD            |    |    | TRS.1.1 TDD  |    |    |
|  | Config 3,6              |      | TRS.1.2 TDD            |    |    | TRS.1.2 TDD  |    |    |
| OCNG Patterns                            | Config 1,2,4,5          |      | OP.1 <sup>Note 5</sup> |    |    |              |    |    |
|  | Config 3,6              |      | OP.1 <sup>Note 6</sup> |    |    |              |    |    |
| SMTC configuration                       |                         |      | SMTC.1                 |    |    |              |    |    |
| SSB configuration                        | Config 1,2,4,5          |      | SSB.1 FR1              |    |    |              |    |    |
|  | Config 3,6              |      | SSB.2 FR1              |    |    |              |    |    |
| CSI-RS configuration for CSI reporting   | Config 1,4              |      | CSI-RS.1.1 FDD         |    |    |              |    |    |
|  | Config 2,5              |      | CSI-RS.1.1 TDD         |    |    |              |    |    |
|  | Config 3,6              |      | CSI-RS.2.1 TDD         |    |    |              |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5          | kHz  | 15                     |    |    |              |    |    |
|  | Config 3,6              |      | 30                     |    |    |              |    |    |
| reportConfigType                         | Config 1-6              |      | periodic               |    |    | N/A          |    |    |
| reportQuantity                           | Config 1-6              |      | cri-RI-PMI-CQI         |    |    | N/A          |    |    |
| CSI reporting periodicity                | Config 1,2,4,5          | slot | 5                      |    |    | N/A          |    |    |
|  | Config 3,6              |      | 10                     |    |    | N/A          |    |    |
| CSI reporting offset                     | Config 1,2,4,5          | slot | 2                      |    |    | N/A          |    |    |
|  | Config 3,6              |      | 4                      |    |    | N/A          |    |    |
| EPRE ratio of PSS to SSS                 |                         | dB   | 0                      |    |    |              |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                         |      |                        |    |    |              |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                         |      |                        |    |    |              |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                         |      |                        |    |    |              |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                         |      |                        |    |    |              |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                         |      |                        |    |    |              |    |    |
| EPRE ratio of PDSCH to PDSCH             |                         |      |                        |    |    |              |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                         |      |                        |    |    |              |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                         |      |                        |    |    |              |    |    |

|                           |  |                  |        |
|---------------------------|--|------------------|--------|
| $N_{oc}$ <sup>Note2</sup> |  | dBm/15kHz        | -104   |
| $N_{oc}$ <sup>Note2</sup> | Config 1,2,4,5   | dBm/SCS          | -104   |
|                           | Config 3,6   |                  | -101   |
| $\hat{E}_s / I_{ot}$      |  | dB               | 17     |
| $\hat{E}_s / N_{oc}$      |  | dB               | 17     |
| SS-RSRP <sup>Note3</sup>  | Config 1,2,4,5   | dBm/SCS          | -87    |
|                           | Config 3,6   |                  | -84    |
| SCH_RP <sup>Note 3</sup>  |  | dBm/15 kHz       | -87    |
| $I_o$ <sup>Note3</sup>    | Config 1,2,4,5   | dBm/<br>9.36MHz  | -58.96 |
|                           | Config 3,6   | dBm/<br>38.16MHz | -52.87 |
| Propagation condition     |  | -                | AWGN   |
| Note 1:                   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$ . |                  |        |
| Note 3:                   | SS-RSRP, $I_o$ and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                  |        |
| Note 4:                   | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]   |                  |        |
| Note 5:                   | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.  |                  |        |
| Note 6:                   | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.   |                  |        |
| Note 7:                   | $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .   |                  |        |

#### A.4.5.3.1.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $m + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR\ slot\ length}$ ,  $T_{activation\_time} = T_{FirstSSB} + 5ms$ , as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot  $n + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$ , as defined in clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot  $m + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $m + 1 + \frac{T_{HARQ} + 3ms + T_X}{NR\ slot\ length} + N_{interruption}$ , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe  $m_1 + 1 + \frac{T_{HARQ}}{EUTRA\ slot\ length}$  to subframe  $m_2 + 1 + \frac{T_{HARQ} + 3ms + T_X}{EUTRA\ slot\ length} + N_{interruption}$ , as defined in clause 8.3.

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot  $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $n + 1 + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$ , as defined in clause 8.3 and the starting point of interruption of E-UTRA PCell during SCell deactivation shall not happen outside the subframe  $n_1 + 1 + \frac{T_{HARQ}}{EUTRA\ subframe\ length}$  to subframe  $n_2 + 1 + \frac{T_{HARQ} + 3ms}{EUTRA\ subframe\ length}$ .

The interruption of PSCell shall not be more than the values specified for EN-DC in Clause 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$  as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### A.4.5.3.2 SCell Activation and deactivation of known SCell in FR1 for 640 ms SCell measurement cycle

#### A.4.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1. The supported test configurations are the same as defined in clause A.4.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.4.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2.

**Table A.4.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 640 ms SCell measurement cycle**

| Parameter                                | Unit | Value | Comment |
|--|------|-------|---------|
| SCell measurement cycle (measCycleSCell) | ms   | 640   |         |

#### A.4.5.3.2.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, except  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{FirstSSB\_MAX}} + T_{\text{rs}} + 5\text{ms}$ .

### A.4.5.3.3 SCell Activation and deactivation of unknown SCell in FR1

#### A.4.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

The supported test configurations are defined in clause A.4.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.4.5.3.3.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment 100ms after the RRC message, in a slot # denoted  $m$ . The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. The UE shall be able to report valid CSI for the activated SCell at latest in slot  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$  as defined in clause 8.3 provided the SCell can be successfully detected on the first

attempt. The UE shall start reporting CSI after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $(m+k)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed.

Any PSCell interruption due to activation of SCell shall occur in the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to slot  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$ , as defined in clause 8.3, where  $N_{\text{interruption}}$  is the interruption length given in clause 8.2.

Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe  $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$  to subframe  $m_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$ , where  $m_1$  and  $m_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $m$ , and  $N_{\text{interruption}}$  is the interruption length given in TS 36.133 [14] clause 7.32.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted  $n$ , is received at the UE antenna connector. The UE shall carry out deactivation of the SCell at latest in

slot  $n + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$  as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe  $n_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA subframe length}}$  to subframe  $n_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{EUTRA subframe length}}$ , where  $n_1$  and  $n_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $n$ .

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

**Table A.4.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment  |
|-----------|------|-------|--|
| T1        | ms   | 100   | During this time the PSCell shall be known and the SCell configured, but not detected. |

#### A.4.5.3.3.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, except  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{FirstSSB\_MAX}} + T_{\text{SMTC\_MAX}} + 2 \cdot T_{\text{rs}} + 5\text{ms}$  as defined in clause 8.3.

#### A.4.5.3.4 SCell Activation and deactivation of multiple unknown SCells in FR1 with single activation/deactivation command

##### A.4.5.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the multiple SCell activation and deactivation times are within the requirements stated in clause 8.3.7 and 8.3.8, when the two configured deactivated SCells in FR1 are unknown by the UE at the time of activation.

The supported test configurations are the same as defined in clause A.4.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Table A.4.5.3.4.1-1 will replace the values of corresponding parameters in Table A.4.5.3.1.1-2. The cell specific test parameter values in Table A.4.5.3.4.1-2 will replace the values of corresponding parameters in Table A.4.5.3.1.1-3.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are four carriers, E-UTRA has one cell, NR has three cells. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) and Cell 4 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCells (Cell 3 and Cell 4) become configured on NR. During T1 the SCells (Cell 3 and Cell 4) are powered off and UE is not aware of SCells.

A MAC message for activation of SCells (Cell 3 and Cell 4) is sent by the test equipment 100ms after the RRC message, in a slot # denoted  $m$ . The point in time at which the MAC message for activation of SCells is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of cell 3 and cell 4 are increased to same level as for cell 2. The UE shall be able to report valid CSI for the activated SCells (Cell3 and Cell 4) at latest in slot  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time\_multiple\_scells}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$  respectively as defined in clause 8.3.7 provided the SCells can be successfully detected on the first attempt. The UE shall start reporting CSI for cell 3 and cell 4 after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $(m+k)$  and shall report CQI index 0 (out-of-range) until the SCell activation for cell 3 and cell 4 has been completed, respectively.

Any PSCell interruption due to activation of SCells shall occur in the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to slot  $m + 1 +$

$\frac{T_{\text{HARQ}}+3\text{ms}+T_X}{\text{NR slot length}} + N_{\text{interruption}}$ , as defined in clause 8.3, where  $N_{\text{interruption}}$  is the interruption length given in section

8.2. Any E-UTRA PCell interruption due to activation of SCells shall occur in the subframe  $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$

to subframe  $m_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{EUTRA slot length}} + N_{\text{interruption}}$ , where  $m_1$  and  $m_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $m$ , and  $N_{\text{interruption}}$  is the interruption length given in TS 36.133 [14] clause 7.32.

Time period T3 starts when a MAC message for deactivation of the SCells (Cell 3 and Cell 4), sent from the test equipment to the UE in a slot # denoted  $n$ , is received at the UE antenna connector. The UE shall carry out deactivation of the SCells at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$  as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe  $n_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA subframe length}}$  to subframe  $n_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{EUTRA subframe length}}$ , where  $n_1$  and  $n_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $n$ .

The test equipment verifies the activation time for Cell 3 by counting the slots from the time when the SCell activation command is sent until CSI report of activated Cell 3 with other than CQI index 0 is received.

The test equipment verifies the activation time for Cell 4 by counting the slots from the time when the SCell activation command is sent until CSI report of activated Cell 4 with other than CQI index 0 is received.

The test equipment verifies the deactivation time for Cell 3 by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for Cell 3 is discontinued.

The test equipment verifies the deactivation time for Cell 4 by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for Cell 4 is discontinued.

**Table A.4.5.3.4.1-1: General test parameters for unknown FR1 SCell activation case with 2 deactivated SCells, 160ms SCell measurement cycle**

| Parameter                                    | Unit          | Value  | Comment   |
|--|---------------|--|---|
| Configured deactivated SCell 1               |               | Cell 3   | Configured deactivated secondary cell on NR RF channel number 3 which is an intra-band contiguous CC to PSCC of Cell 2;<br><i>ssb-PositionInBurst</i> of Cell 3 is same as the one for Cell 2 |
| Configured deactivated SCell 2               |               | Cell 4   | Configured deactivated secondary cell on NR RF channel number 4 which is an inter-band CC to PSCC of Cell 2   |
| Cell3 timing offset to cell2                 | $\mu\text{s}$ | 0  |   |
| Cell4 timing offset to cell2                 | $\mu\text{s}$ | 0  |   |
| Time alignment error between cell3 and cell2 | $\mu\text{s}$ | $\leq$ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.   |
| Time alignment error between cell4 and cell2 | $\mu\text{s}$ | $\leq$ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.   |
|  |               |  |   |
|  |               |  |   |
| T1   | ms            | 100  | During this time the PSCell shall be known and the SCell configured, but not detected.  |

**Table A.4.5.3.4.1-2: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter                                |                         | Unit       | Cell 3                      |    | Cell 4      |    |
|--|-------------------------|------------|-----------------------------|----|-------------|----|
|  |                         |            | T2                          | T3 | T2          | T3 |
| SSB ARFCN                                |                         |            | Freq2                       |    | Freq3       |    |
| Duplex mode                              | Config 1,4              |            | FDD                         |    |             |    |
|  | Config 2,3,5,6          |            | TDD                         |    |             |    |
| TDD configuration                        | Config 1,4              |            | Not Applicable              |    |             |    |
|  | Config 2,5              |            | TDDConf.1.1                 |    |             |    |
|  | Config 3,6              |            | TDDConf.2.1                 |    |             |    |
| BW <sub>channel</sub>                    | Config 1,4              | MHz        | 10: N <sub>RB,c</sub> = 52  |    |             |    |
|  | Config 2,5              |            | 10: N <sub>RB,c</sub> = 52  |    |             |    |
|  | Config 3,6              |            | 40: N <sub>RB,c</sub> = 106 |    |             |    |
| DL initial BWP configuration             | Config 1, 2, 3, 4, 5, 6 |            | DLBWP.0.1                   |    |             |    |
| DL dedicated BWP configuration           | Config 1, 2, 3, 4, 5, 6 |            | DLBWP.1.1                   |    |             |    |
| UL initial BWP configuration             | Config 1, 2, 3, 4, 5, 6 |            | ULBWP.0.1                   |    |             |    |
| UL dedicated BWP configuration           | Config 1, 2, 3, 4, 5, 6 |            | ULBWP.1.1                   |    |             |    |
| DRX Cycle                                |                         | ms         | Not Applicable              |    |             |    |
| PDSCH Reference measurement channel      | Config 1,4              |            | SR.1.1 FDD                  |    | SR.1.1 FDD  |    |
|  | Config 2,5              |            | SR.1.1 TDD                  |    | SR.1.1 TDD  |    |
|  | Config 3,6              |            | SR.2.1 TDD                  |    | SR.2.1 TDD  |    |
| RMSI CORESET Reference Channel           | Config 1,4              |            | CR.1.1 FDD                  |    | CR.1.1 FDD  |    |
|  | Config 2,5              |            | CR.1.1 TDD                  |    | CR.1.1 TDD  |    |
|  | Config 3,6              |            | CR.2.1 TDD                  |    | CR.2.1 TDD  |    |
| RMC CORESET Reference Channel            | Config 1,4              |            | CCR.1.1 FDD                 |    | CCR.1.1 FDD |    |
|  | Config 2,5              |            | CCR.1.1 TDD                 |    | CCR.1.1 TDD |    |
|  | Config 3,6              |            | CCR.2.1 TDD                 |    | CCR.2.1 TDD |    |
| TRS configuration                        | Config 1,4              |            | TRS.1.1 FDD                 |    | TRS.1.1 FDD |    |
|  | Config 2,5              |            | TRS.1.1 TDD                 |    | TRS.1.1 TDD |    |
|  | Config 3,6              |            | TRS.1.2 TDD                 |    | TRS.1.2 TDD |    |
| OCNG Patterns                            |                         |            | OP.1                        |    |             |    |
| SMTTC configuration                      |                         |            | SMTTC.1                     |    |             |    |
| SSB configuration                        | Config 1,2,4,5          |            | SSB.1 FR1                   |    |             |    |
|  | Config 3,6              |            | SSB.2 FR1                   |    |             |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5          | kHz        | 15 kHz                      |    |             |    |
|  | Config 3,6              |            | 30kHz                       |    |             |    |
| EPRE ratio of PSS to SSS                 |                         | dB         | 0                           |    |             |    |
| EPRE ratio of PBCH DMRS to SSS           |                         |            |                             |    |             |    |
| EPRE ratio of PBCH to PBCH DMRS          |                         |            |                             |    |             |    |
| EPRE ratio of PDCCH DMRS to SSS          |                         |            |                             |    |             |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                         |            |                             |    |             |    |
| EPRE ratio of PDSCH DMRS to SSS          |                         |            |                             |    |             |    |
| EPRE ratio of PDSCH to PDSCH             |                         |            |                             |    |             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                         |            |                             |    |             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                         |            |                             |    |             |    |
| $N_{oc}$ <sup>Note2</sup>                |                         | dBm/15kHz  | -104                        |    |             |    |
| $N_{oc}$ <sup>Note2</sup>                | Config 1,2,4,5          | dBm/SCS    | -104                        |    |             |    |
|  | Config 3,6              |            | -101                        |    |             |    |
| $\hat{E}_s/I_{ot}$                       |                         | dB         | 17                          |    |             |    |
| $\hat{E}_s/N_{oc}$                       |                         | dB         | 17                          |    |             |    |
| SS-RSRP <sup>Note3</sup>                 | Config 1,2,4,5          | dBm/SCS    | -87                         |    |             |    |
|  | Config 3,6              |            | -84                         |    |             |    |
| SCH_RP <sup>Note 3</sup>                 |                         | dBm/15 kHz | -87                         |    |             |    |
| Propagation condition                    |                         | -          | AWGN                        |    |             |    |



#### A.4.5.3.4.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case for both Cell 3 and Cell 4, except the followings:

- For Cell 3 activation delay,  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{activation\_time\_multiple\_scells}} = T_{\text{FirstSSB\_MAX\_multiple\_scells}} + T_{\text{SMTC\_MAX\_multiple\_scells}} + T_{\text{rs}} + 5\text{ms}$  as defined in clause 8.3.7.
- For Cell 4 activation delay,  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{activation\_time\_multiple\_scells}} = T_{\text{FirstSSB\_MAX\_multiple\_scells}} + T_{\text{SMTC\_MAX\_multiple\_scells}} + 2 * T_{\text{rs}} + 5\text{ms}$  as defined in clause 8.3.7.

#### A.4.5.3.5 Direct SCell activation at SCell addition of known SCell in FR1

##### A.4.5.3.5.1 Test Purpose and Environment

The purpose of this test is to verify that the direct SCell activation time is within the requirements stated in clause 8.3.4, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.4.5.3.5.1-1 below. The test parameters are given in Tables A.4.5.3.5.1-2 and cell-specific parameters in A.4.5.3.5.1-3 below. The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the measurement on Cell 3 is configured. The UE now starts measuring the Cell 3. During T1, Cell 3 should be detected and measured by the UE such that it meets the condition for known cell defined in clause 8.3.4 for direct SCell activation. At the end of T1, the test equipment sends an RRC message for direct SCell activation of the Cell 3.

The point in time at which the RRC message for direct SCell activation is received at the UE antenna connector, in a slot # denoted  $m$ , defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot  $m + \frac{N_{\text{direct}}}{\text{NR slot length}}$ , as defined in clause 8.3.4. The UE shall start reporting CSI in PSCell in slot  $(m+k+T_{\text{RRC\_process}})$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot  $m + 1$  to slot  $m + 1 + \frac{T_{\text{RRC\_Process}} + T_1 + T_X}{\text{NR slot length}} + N_{\text{interruption}}$ , as defined in clause 8.3.4, where  $N_{\text{interruption}}$  is the interruption length given in clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe  $m_1 + 1$  to subframe  $m_2 + 1 + \frac{T_{\text{RRC\_Process}} + T_1 + T_X}{\text{NR slot length}} + N_{\text{interruption}}$ , where  $m_1$  and  $m_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $m$ , and  $N_{\text{interruption}}$  is the interruption length given in TS 36.133 [14] clause 7.32.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell.

The test equipment verifies the activation time by counting the slots from the time when the direct SCell activation command is sent until a CSI report with other than CQI index 0 is received.

**Table A.4.5.3.5.1-1: known FR1 direct SCell activation supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6             | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

Table A.4.5.3.5.1-2: General test parameters for known FR1 direct SCell activation

| Parameter  | Unit    | Value  | Comment   |
|--|---------|--|---|
| RF Channel Number  |         | 1,2,3  | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test   |
| Active PCell   |         | Cell 1   | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.1  |
| Active PSCell  |         | Cell 2   | Primary secondary cell on NR RF channel number 2.   |
| SCell  |         | Cell 3   | Secondary cell on NR RF channel number 3  |
| CP length  |         | Normal   |   |
| DRX  |         | OFF  | Continuous monitoring of primary cell   |
| CQI/PMI periodicity and offset configuration index           |         | 0  | CQI reporting for SCell every four slots.   |
| Cell-individual offset for cells on E-UTRA RF channel number | dB      | 0  | Individual offset for cells on primary component carrier.   |
| Cell-individual offset for cells on NR channel number        | dB      | 0  | Individual offset for cells on secondary component carrier.   |
| SCell measurement cycle (measCycleSCell)                     | ms      | 160  |   |
| Cell3 timing offset to cell2                                 | $\mu$ s | 0  |   |
| Time alignment error between cell3 and cell2                 | $\mu$ s | $\leq$ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.   |
| T1   | s       | 7  | During this time the Cell 3 shall be known.   |
| T2   | s       | 1  | During this time the UE shall activate the SCell.   |
| T <sub>HARQ</sub>  | ms      | $k_1 \times \text{NR slot length}$   | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by <i>dl-DataToUL-ACK</i> if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3] |
| T <sub>CSI_Reporting</sub>                                   | ms      | 2  | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]  |
| k  | ms      | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe}, \mu} + 1$                 | As specified in clause 4.3 of TS 38.213 [3]   |

**Table A. 4.5.3.5.1-3: Cell specific test parameters for known FR1 direct SCell activation**

| Parameter                                |                         | Unit       | Cell 2                      |    |    | Cell 3       |    |    |
|--|-------------------------|------------|-----------------------------|----|----|--------------|----|----|
|  |                         |            | T1                          | T2 | T3 | T1           | T2 | T3 |
| <b>SSB ARFCN</b>                         |                         |            | <b>freq1</b>                |    |    | <b>freq2</b> |    |    |
| Duplex mode                              | Config 1,4              |            | FDD                         |    |    |              |    |    |
|  | Config 2,3,5,6          |            | TDD                         |    |    |              |    |    |
| TDD configuration                        | Config 1,4              |            | Not Applicable              |    |    |              |    |    |
|  | Config 2,5              |            | TDDConf.1.1                 |    |    |              |    |    |
|  | Config 3,6              |            | TDDConf.2.1                 |    |    |              |    |    |
| BW <sub>channel</sub>                    | Config 1,4              | MHz        | 10: N <sub>RB,c</sub> = 52  |    |    |              |    |    |
|  | Config 2,5              |            | 10: N <sub>RB,c</sub> = 52  |    |    |              |    |    |
|  | Config 3,6              |            | 40: N <sub>RB,c</sub> = 106 |    |    |              |    |    |
| DL initial BWP configuration             | Config 1, 2, 3, 4, 5, 6 |            | DLBWP.0.1                   |    |    |              |    |    |
| DL dedicated BWP configuration           | Config 1, 2, 3, 4, 5, 6 |            | DLBWP.1.1                   |    |    |              |    |    |
| UL initial BWP configuration             | Config 1, 2, 3, 4, 5, 6 |            | ULBWP.0.1                   |    |    |              |    |    |
| UL dedicated BWP configuration           | Config 1, 2, 3, 4, 5, 6 |            | ULBWP.1.1                   |    |    |              |    |    |
| DRx Cycle                                |                         | ms         | Not Applicable              |    |    |              |    |    |
| PDSCH Reference measurement channel      | Config 1,4              |            | SR.1.1 FDD                  |    |    | SR.1.1 FDD   |    |    |
|  | Config 2,5              |            | SR.1.1 TDD                  |    |    | SR.1.1 TDD   |    |    |
|  | Config 3,6              |            | SR.2.1 TDD                  |    |    | SR.2.1 TDD   |    |    |
| RMSI CORESET Reference Channel           | Config 1,4              |            | CR.1.1 FDD                  |    |    | CR.1.1 FDD   |    |    |
|  | Config 2,5              |            | CR.1.1 TDD                  |    |    | CR.1.1 TDD   |    |    |
|  | Config 3,6              |            | CR.2.1 TDD                  |    |    | CR.2.1 TDD   |    |    |
| RMC CORESET Reference Channel            | Config 1,4              |            | CCR.1.1 FDD                 |    |    | CCR.1.1 FDD  |    |    |
|  | Config 2,5              |            | CCR.1.1 TDD                 |    |    | CCR.1.1 TDD  |    |    |
|  | Config 3,6              |            | CCR.2.1 TDD                 |    |    | CCR.2.1 TDD  |    |    |
| TRS configuration                        | Config 1,4              |            | TRS.1.1 FDD                 |    |    | TRS.1.1 FDD  |    |    |
|  | Config 2,5              |            | TRS.1.1 TDD                 |    |    | TRS.1.1 TDD  |    |    |
|  | Config 3,6              |            | TRS.1.2 TDD                 |    |    | TRS.1.2 TDD  |    |    |
| OCNG Patterns                            |                         | OP.1       |                             |    |    |              |    |    |
| SMTC configuration                       |                         |            | SMTC.1                      |    |    |              |    |    |
| SSB configuration                        | Config 1,2,4,5          |            | SSB.1 FR1                   |    |    |              |    |    |
|  | Config 3,6              |            | SSB.2 FR1                   |    |    |              |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5          | kHz        | 15 kHz                      |    |    |              |    |    |
|  | Config 3,6              |            | 30kHz                       |    |    |              |    |    |
| EPRE ratio of PSS to SSS                 |                         | dB         | 0                           |    |    |              |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                         |            |                             |    |    |              |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                         |            |                             |    |    |              |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                         |            |                             |    |    |              |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                         |            |                             |    |    |              |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                         |            |                             |    |    |              |    |    |
| EPRE ratio of PDSCH to PDSCH             |                         |            |                             |    |    |              |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                         |            |                             |    |    |              |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                         |            |                             |    |    |              |    |    |
| $N_{oc}$ <sup>Note2</sup>                |                         |            |                             |    |    |              |    |    |
| $N_{oc}$ <sup>Note2</sup>                | Config 1,2,4,5          | dBm/SCS    | -104                        |    |    |              |    |    |
|  | Config 3,6              |            | -101                        |    |    |              |    |    |
| $\hat{E}_s / I_{ot}$                     |                         | dB         | 17                          |    |    |              |    |    |
| $\hat{E}_s / N_{oc}$                     |                         | dB         | 17                          |    |    |              |    |    |
| SS-RSRP <sup>Note3</sup>                 | Config 1,2,4,5          | dBm/SCS    | -87                         |    |    |              |    |    |
|  | Config 3,6              |            | -84                         |    |    |              |    |    |
| SCH_RP <sup>Note 3</sup>                 |                         | dBm/15 kHz | -87                         |    |    |              |    |    |
| Propagation condition                    |                         | -          | AWGN                        |    |    |              |    |    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.  |

#### A.4.5.3.5.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot  $(m+k+T_{RRC\_process})$ . UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot  $(m+k+T_{RRC\_process})$  was interrupted is checked by monitoring ACK/NACK sent in PCell in slot  $(m+k+T_{RRC\_process})$ .

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $m + \frac{N_{direct}}{NR\ slot\ length}$ .  $N_{direct} = T_{RRC\_Process} + T_1 + T_{activation\_time} + T_{CSI\_Reporting} - 3ms$ , where  $T_{RRC\_Process} = 20\ ms$  and other components are defined in clause 8.3.4.

During T2 interruption of PSCell during direct SCell activation shall not happen outside the slot  $m + 1$  to  $m + 1 + \frac{T_{RRC\_Process} + T_1 + T_X}{NR\ slot\ length} + N_{interruption}$ , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe  $m_1 + 1$  to subframe  $m_2 + 1 + \frac{T_{RRC\_Process} + T_1 + T_X}{NR\ slot\ length} + N_{interruption}$ , as defined in clause 8.3.4.

The interruption of PSCell shall not be more than the values specified for EN-DC in Clause 8.2.1.2.8.

All of the above test requirements shall be fulfilled in order for the observed direct SCell activation delay to be counted as correct. The rate of correct observed direct SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot  $m + \frac{T_{RRC\_Process} + T_1 + T_X}{NR\ slot\ length}$  as defined in clause 8.3.4 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### A.4.5.4 UE UL carrier RRC reconfiguration Delay

#### A.4.5.4.1 UE UL carrier RRC reconfiguration Delay

**Table A.4.5.4.1-1 - Table A.4.5.4.1-4 : Void**

##### A.4.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are three cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and FR1 SCell (Cell 3). For SCell, both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test parameters for PSCell and SCell are given in Table A. 4.5.4.1.1-1, Table A. 4.5.4.1.1-2, Table A. 4.5.4.1.1-3 and Table A. 4.5.4.1.1-4 below. The test parameters and applicability for E-UTRAN PCell are defined in A.3.7.2. The test consists two tests. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 3 is configured to UE. At the start of T2, a supplementary uplink of cell3 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementary uplink on cell 3 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

Table A.4.5.4.1.1-1: Supported test configurations

| Configuration | PSCell (Cell2)  | SCell (Cell3)   |
|---------------|---|---|
| 1             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  | DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 2             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  | DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 3             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  | DL and UL: 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, $\geq 40$ MHz bandwidth, SUL duplex mode |
| 4             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  | DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode        |
| 5             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  | DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode        |
| 6             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  | DL and UL: 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, $\geq 40$ MHz bandwidth, SUL duplex mode |
| 7             | 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  | DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 8             | 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  | DL and UL: 15kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 9             | 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  | DL and UL: 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, $\geq 40$ MHz bandwidth, SUL duplex mode |
| Note 1:       | The UE is only required to be tested in one of the supported test configurations  |   |
| Note 2:       | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration, |   |

**Table A.4.5.4.1.1-2: General test parameters for EN-DC UE UL carrier RRC reconfiguration Delay**

| Parameter                  | Unit | Test configuration             | Value  | Comment   |
|----------------------------|------|--------------------------------|--|---|
| RF Channel Number          |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 1, 2, 3  | Three radio channels are used for these two tests.  |
| Active cell                |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Cell 1: E-UTRAN PCell<br>Cell 2: FR1 PSCell<br>Cell 3: FR1 SCell | E-UTRAN PCell on RF channel number 1<br>FR1 PSCell on RF channel number 2<br>FR1 SCell on RF channel number 3 |
| CP length                  |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Normal   |   |
| DRX                        |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF  |   |
| Measurement gap pattern Id |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF  |   |
| Filter coefficient         |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 0  | L3 filtering is not used  |
| T1                         | s    | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5  |   |
| T2                         | s    | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5  |   |
| T3                         | s    | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5  |   |

**Table A.4.5.4.1.1-3: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on PSCell (Cell 2)**

| Parameter | Unit | Test Configuration | Test 1 |    |    | Test 2 |    |    |
|-----------|------|--------------------|--------|----|----|--------|----|----|
|           |      |                    | T1     | T2 | T3 | T1     | T2 | T3 |

|  |     |                                |                        |                        |
|--|-----|--------------------------------|------------------------|------------------------|
| Channel number   |     | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 2                      | 2                      |
| TDD configuration  |     | Conf 1, 2, 3                   | N/A                    | N/A                    |
|  |     | Conf 4, 5, 6                   | TDD Conf.1.1           | TDD Conf.1.1           |
|  |     | Conf 7, 8, 9                   | TDD Conf.2.1           | TDD Conf.2.1           |
| BW <sub>channel</sub>  | MHz | Conf 1, 2, 3                   | Note 6                 | Note 6                 |
|  |     | Conf 4, 5, 6                   | Note 6                 | Note 6                 |
|  |     | Conf 7, 8, 9                   | Note 6                 | Note 6                 |
| BW <sub>occupied</sub>   | RB  | Conf 1, 2, 3                   | 52 <sup>Note 4</sup>   | 52 <sup>Note 4</sup>   |
|  |     | Conf 4, 5, 6                   | 52 <sup>Note 4</sup>   | 52 <sup>Note 4</sup>   |
|  |     | Conf 7, 8, 9                   | 106 <sup>Note 5</sup>  | 106 <sup>Note 5</sup>  |
| PDSCH reference measurement channel as defined in A.3.1.1        |     | Conf 1, 2, 3                   | SR.1.1 FDD             | SR.1.1 FDD             |
|  |     | Conf 4, 5, 6                   | SR.1.1 TDD             | SR.1.1 TDD             |
|  |     | Conf 7, 8, 9                   | SR.2.1 TDD             | SR.2.1 TDD             |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |     | Conf 1, 2, 3                   | CR.1.1 FDD             | CR.1.1 FDD             |
|  |     | Conf 4, 5, 6                   | CR.1.1 TDD             | CR.1.1 TDD             |
|  |     | Conf 7, 8, 9                   | CR.2.1 TDD             | CR.2.1 TDD             |
| RMC CORESET reference measurement channel as defined in A.3.1.3  |     | Conf 1, 2, 3                   | CCR.1.1 FDD            | CCR.1.1 FDD            |
|  |     | Conf 4, 5, 6                   | CCR.1.1 TDD            | CCR.1.1 TDD            |
|  |     | Conf 7, 8, 9                   | CCR.2.1 TDD            | CCR.2.1 TDD            |
| OCNG Pattern <sup>Note 1</sup>                                   |     | Conf 1, 2, 3, 4, 5, 6          | OP.1 <sup>Note 4</sup> | OP.1 <sup>Note 4</sup> |
|  |     | Config 7, 8, 9                 | OP.1 <sup>Note 5</sup> | OP.1 <sup>Note 5</sup> |
| SSB configuration  |     | Conf 1, 2, 3, 4, 5, 6          | SSB.1 FR1              | SSB.1 FR1              |
|  |     | Conf 7, 8, 9                   | SSB.2 FR1              | SSB.2 FR1              |
| SMTC configuration   |     | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1                 | SMTC.1                 |
| CSI-RS for tracking  |     | Conf 1                         | TRS.1.1 FDD            | TRS.1.1 FDD            |
|  |     | Conf 2                         | TRS.1.1 FDD            | TRS.1.1 FDD            |
|  |     | Conf 3                         | TRS.1.1 FDD            | TRS.1.1 FDD            |
|  |     | Conf 4                         | TRS.1.1 TDD            | TRS.1.1 TDD            |
|  |     | Conf 5                         | TRS.1.1 TDD            | TRS.1.1 TDD            |
|  |     | Conf 6                         | TRS.1.1 TDD            | TRS.1.1 TDD            |
|  |     | Conf 7                         | TRS.1.2 TDD            | TRS.1.2 TDD            |
|  |     | Conf 8                         | TRS.1.2 TDD            | TRS.1.2 TDD            |
|  |     | Conf 9                         | TRS.1.2 TDD            | TRS.1.2 TDD            |
| DL initial BWP configuration                                     |     | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1              | DLBWP.0.1              |
| DL dedicated BWP configuration                                   |     | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1              | DLBWP.1.1              |
| UL dedicated BWP configuration                                   |     | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1              | ULBWP.1.1              |
| EPRE ratio of PSS to SSS   | dB  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0                      | 0                      |
| EPRE ratio of PBCH_DMRS to SSS                                   |     |                                |                        |                        |
| EPRE ratio of PBCH to PBCH_DMRS                                  |     |                                |                        |                        |
| EPRE ratio of PDCCH_DMRS to SSS                                  |     |                                |                        |                        |
| EPRE ratio of PDCCH to PDCCH_DMRS                                |     |                                |                        |                        |
| EPRE ratio of PDSCH_DMRS to SSS                                  |     |                                |                        |                        |



|  |                |                                |       |       |       |       |       |       |
|--|----------------|--------------------------------|-------|-------|-------|-------|-------|-------|
| EPRE ratio of PDSCH to PDSCH_DMRS  |                |                                |       |       |       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |                |                                |       |       |       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |                |                                |       |       |       |       |       |       |
| $N_{oc}$ <small>Note 2</small>   | dBm / 15kHz    | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102  |       |       | -102  |       |       |
|  | dBm/ SCS       | Conf 1,2,3,4,5,6               | -102  |       |       | -102  |       |       |
|  |                | Conf 7,8,9                     | -99   |       |       | -99   |       |       |
| $\hat{E}_s / N_{oc}$   | dB             | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16    | 16    | 16    | 16    | 16    | 16    |
| $\hat{E}_s / I_{ot}$ <small>Note 3</small>   | dB             | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16    | 16    | 16    | 16    | 16    | 16    |
| SS-RSRP <small>Note 3</small>  | dBm/ SCS       | Conf 1,2,3,4,5,6               | -86   | -86   | -86   | -86   | -86   | -86   |
|  |                | Conf 7,8,9                     | -83   | -83   | -83   | -83   | -83   | -83   |
| $I_o$ <small>Note 3</small>  | dBm/ 9.36 MHz  | Conf 1,2,3,4,5,6               | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 |
|  | dBm/ 38.16 MHz | Conf 7,8,9                     | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation Condition  |                | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN  |       |       | AWGN  |       |       |
| Antenna configuration  |                | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 |       |       | 1 x 2 |       |       |
| <p>NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled within <math>BW_{occupied}</math>.</p> <p>NOTE 3: <math>\hat{E}_s / I_{ot}</math>, <math>I_o</math>, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 10 MHz, 52 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 5: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 40 MHz, 106 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 6: <math>N_{RB,c}</math> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured <math>BW_{channel}</math>.</p> |                |                                |       |       |       |       |       |       |

**Table A.4.5.4.1.1-4: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on SCell (Cell 3)**

| Parameter  | Unit | Test Configuration             | Test 1                    |                           |                           | Test 2                    |                           |                           |
|--|------|--------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
|  |      |                                | T1                        | T2                        | T3                        | T1                        | T2                        | T3                        |
| Channel number   |      | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 3                         |                           |                           | 3                         |                           |                           |
| TDD configuration  |      | Conf 1, 4, 7                   | N/A                       |                           |                           | N/A                       |                           |                           |
|  |      | Conf 2, 5, 8                   | TDDConf.1.1               |                           |                           | TDDConf.1.1               |                           |                           |
|  |      | Conf 3, 6, 9                   | TDDConf.2.1               |                           |                           | TDDConf.2.1               |                           |                           |
| BW <sub>channel</sub>  | MHz  | Conf 1, 4, 7                   | Note 6                    |                           |                           | Note 6                    |                           |                           |
|  |      | Conf 2, 5, 8                   | Note 6                    |                           |                           | Note 6                    |                           |                           |
|  |      | Conf 3, 6, 9                   | Note 6                    |                           |                           | Note 6                    |                           |                           |
| BW <sub>occupied</sub>   | RB   | Conf 1, 4, 7                   | 52 <sup>Note 4</sup>      |                           |                           | 52 <sup>Note 4</sup>      |                           |                           |
|  |      | Conf 2, 5, 8                   | 52 <sup>Note 4</sup>      |                           |                           | 52 <sup>Note 4</sup>      |                           |                           |
|  |      | Conf 3, 6, 9                   | 106 <sup>Note 5</sup>     |                           |                           | 106 <sup>Note 5</sup>     |                           |                           |
| PUSCH parameters for NR UL carrier                               |      | Conf 1, 4, 7                   | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | N/A                       |
|  |      | Conf 2, 5, 8                   | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | N/A                       |
|  |      | Conf 3, 6, 9                   | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       | N/A                       | G-FR1-A3-14 in [13]       | N/A                       |
| PUCCH parameters For NR UL carrier                               |      | Conf 1, 4, 7                   | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | N/A                       | N/A                       | N/A                       |
|  |      | Conf 2, 5, 8                   | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | N/A                       | N/A                       | N/A                       |
|  |      | Conf 3, 6, 9                   | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | N/A                       | N/A                       | N/A                       |
| PUSCH parameters for supplementary UL                            |      | Conf 1, 4, 7                   | N/A                       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       |
|  |      | Conf 2, 5, 8                   | N/A                       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       |
|  |      | Conf 3, 6, 9                   | N/A                       | G-FR1-A3-14 in [13]       | N/A                       | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       |
| PUCCH parameters for supplementary UL                            |      | Conf 1, 4, 7                   | N/A                       | N/A                       | N/A                       | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
|  |      | Conf 2, 5, 8                   | N/A                       | N/A                       | N/A                       | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
|  |      | Conf 3, 6, 9                   | N/A                       | N/A                       | N/A                       | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] |
| PDSCH reference measurement channel as defined in A.3.1.1        |      | Conf 1, 4, 7                   | SR.1.1 FDD                |                           |                           | SR.1.1 FDD                |                           |                           |
|  |      | Conf 2, 5, 8                   | SR.1.1 TDD                |                           |                           | SR.1.1 TDD                |                           |                           |
|  |      | Conf 3, 6, 9                   | SR 2.1 TDD                |                           |                           | SR 2.1 TDD                |                           |                           |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |      | Conf 1, 4, 7                   | CR.1.1 FDD                |                           |                           | CR.1.1 FDD                |                           |                           |
|  |      | Conf 2, 5, 8                   | CR.1.1 TDD                |                           |                           | CR.1.1 TDD                |                           |                           |
|  |      | Conf 3, 6, 9                   | CR.2.1 TDD                |                           |                           | CR.2.1 TDD                |                           |                           |
| RMC CORESET reference  |      | Conf 1, 4, 7                   | CCR.1.1 FDD               |                           |                           | CCR.1.1 FDD               |                           |                           |
|  |      | Conf 2, 5, 8                   | CCR.1.1 TDD               |                           |                           | CCR.1.1 TDD               |                           |                           |

|   |              |                                |                        |       |       |                        |       |       |
|---|--------------|--------------------------------|------------------------|-------|-------|------------------------|-------|-------|
| measurement channel as defined in A.3.1.3 |              | Conf 3, 6, 9                   | CCR.2.1 TDD            |       |       | CCR.2.1 TDD            |       |       |
| OCNG Pattern <sup>Note 1</sup>            |              | Conf 1, 2, 4, 5, 7, 8          | OP.1 <sup>Note 4</sup> |       |       | OP.1 <sup>Note 4</sup> |       |       |
|   |              | Conf 3, 6, 9                   | OP.1 <sup>Note 5</sup> |       |       | OP.1 <sup>Note 5</sup> |       |       |
| SSB configuration                         |              | Conf 1, 2, 4, 5, 7,8           | SSB.1 FR1              |       |       | SSB.1 FR1              |       |       |
|   |              | Conf 3, 6, 9                   | SSB.2 FR1              |       |       | SSB.2 FR1              |       |       |
| SMTC configuration                        |              | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1                 |       |       | SMTC.1                 |       |       |
| CSI-RS for tracking                       |              | Conf 1                         | TRS.1.1 FDD            |       |       | TRS.1.1 FDD            |       |       |
|   |              | Conf 2                         | TRS.1.1 TDD            |       |       | TRS.1.1 TDD            |       |       |
|   |              | Conf 3                         | TRS.1.2 TDD            |       |       | TRS.1.2 TDD            |       |       |
|   |              | Conf 4                         | TRS.1.1 FDD            |       |       | TRS.1.1 FDD            |       |       |
|   |              | Conf 5                         | TRS.1.1 TDD            |       |       | TRS.1.1 TDD            |       |       |
|   |              | Conf 6                         | TRS.1.2 TDD            |       |       | TRS.1.2 TDD            |       |       |
|   |              | Conf 7                         | TRS.1.1 FDD            |       |       | TRS.1.1 FDD            |       |       |
|   |              | Conf 8                         | TRS.1.1 TDD            |       |       | TRS.1.1 TDD            |       |       |
|   |              | Conf 9                         | TRS.1.2 TDD            |       |       | TRS.1.2 TDD            |       |       |
| DL initial BWP configuration              |              | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1              |       |       | DLBWP.0.1              |       |       |
| DL dedicated BWP configuration            |              | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1              |       |       | DLBWP.1.1              |       |       |
| UL dedicated BWP configuration            |              | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1              |       |       | ULBWP.1.1              |       |       |
| EPRE ratio of PSS to SSS                  | dB           | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0                      |       |       | 0                      |       |       |
| EPRE ratio of PBCH_DMRS to SSS            |              |                                |                        |       |       |                        |       |       |
| EPRE ratio of PBCH to PBCH_DMRS           |              |                                |                        |       |       |                        |       |       |
| EPRE ratio of PDCCH_DMRS to SSS           |              |                                |                        |       |       |                        |       |       |
| EPRE ratio of PDCCH to PDCCH_DMRS         |              |                                |                        |       |       |                        |       |       |
| EPRE ratio of PDSCH_DMRS to SSS           |              |                                |                        |       |       |                        |       |       |
| EPRE ratio of PDSCH to PDSCH_DMRS         |              |                                |                        |       |       |                        |       |       |
| EPRE ratio of OCNG DMRS to SSS            |              |                                |                        |       |       |                        |       |       |
| EPRE ratio of OCNG to OCNG DMRS           |              |                                |                        |       |       |                        |       |       |
| $N_{oc}$ <sup>Note 2</sup>                | dBm / 15kHz  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102                   |       |       | -102                   |       |       |
|   | dBm/SCS      | Conf 1, 2, 4, 5, 7,8           | -102                   |       |       | -102                   |       |       |
|   |              | Conf 3, 6, 9                   | -99                    |       |       | -99                    |       |       |
| $\hat{E}_s / N_{oc}$                      | dB           | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16                     | 16    | 16    | 16                     | 16    | 16    |
| $\hat{E}_s / I_{ot}$ <sup>Note 3</sup>    | dB           | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16                     | 16    | 16    | 16                     | 16    | 16    |
| SS-RSRP <sup>Note 3</sup>                 | dBm/SCS      | Conf 1, 2, 4, 5, 7,8           | -86                    | -86   | -86   | -86                    | -86   | -86   |
|   |              | Conf 3, 6, 9                   | -83                    | -83   | -83   | -83                    | -83   | -83   |
| $I_o$ <sup>Note 3</sup>                   | dBm/9.36 MHz | Conf 1, 2, 4, 5, 7,8           | -57.9                  | -57.9 | -57.9 | -57.9                  | -57.9 | -57.9 |

|  |                      |                                   |       |       |       |       |       |       |
|--|----------------------|-----------------------------------|-------|-------|-------|-------|-------|-------|
|  | dBm/<br>38.16<br>MHz | Conf 3, 6, 9                      | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation<br>Condition   |                      | Conf 1, 2, 3, 4,<br>5, 6, 7, 8, 9 | AWGN  |       |       | AWGN  |       |       |
| Antenna<br>configuration   |                      | Conf 1, 2, 3, 4,<br>5, 6, 7, 8, 9 | 1 x 2 |       |       | 1 x 2 |       |       |
| NOTE 1: OCNB shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                      |                                   |       |       |       |       |       |       |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$ . |                      |                                   |       |       |       |       |       |       |
| NOTE 3: $\hat{E}_s/I_{ot}$ , $I_o$ , and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                      |                                   |       |       |       |       |       |       |
| NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.  |                      |                                   |       |       |       |       |       |       |
| NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_o$ is independent of the $BW_{channel}$ configured.   |                      |                                   |       |       |       |       |       |       |
| NOTE 6: $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .   |                      |                                   |       |       |       |       |       |       |

#### A.4.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

### A.4.5.5 Beam Failure Detection and Link recovery procedures

#### A.4.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

##### A.4.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.1.1-1, A.4.5.5.1.1-2, A.4.5.5.1.1-3 and A.4.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.4.5.5.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

**Table A.4.5.5.1.1-1: Supported test configurations for FR1 PCell**

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

**Table A.4.5.5.1.1-2: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter                                      |  | Unit | Value             | Comment |
|--|--|------|-------------------|---------|
|  |  |      | Test 1            |         |
| Active E-UTRA PCell                            |  |      | Cell 1            |         |
| E-UTRA RF Channel Number                       |  |      | 1                 |         |
| Active PSCell                                  |  |      | Cell 2            |         |
| RF Channel Number                              |  |      | 2                 |         |
| Duplex mode                                    | Config 1, 4  |      | FDD               |         |
|  | Config 2, 3, 5, 6  |      | TDD               |         |
| BWchannel                                      | Config 1, 4  | MHz  | 10: NRB,c = 52    |         |
|  | Config 2, 5  |      | 10: NRB,c = 52    |         |
|  | Config 3, 6  |      | 40: NRB,c = 106   |         |
| DL initial BWP configuration                   | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.0.1         |         |
| DL dedicated BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.1.1         |         |
| UL initial BWP configuration                   | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.0.1         |         |
| UL dedicated BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.1.1         |         |
| TDD Configuration                              | Config 1, 4  |      | Not Applicable    |         |
|  | Config 2, 5  |      | TDDConf.1.1       |         |
|  | Config 3, 6  |      | TDDConf.2.1       |         |
| RMSI CORESET Reference Channel                 | Config 1, 4  |      | CR.1.1 FDD        |         |
|  | Config 2, 5  |      | CR.1.1 TDD        |         |
|  | Config 3, 6  |      | CR.2.1 TDD        |         |
| Dedicated CORESET Reference Channel            | Config 1, 4  |      | CCR.1.1 FDD       |         |
|  | Config 2, 5  |      | CCR.1.1 TDD       |         |
|  | Config 3, 6  |      | CCR.2.1 TDD       |         |
| SSB Configuration                              | Config 1, 4  |      | SSB.3 FR1         |         |
|  | Config 2, 5  |      | SSB.3 FR1         |         |
|  | Config 3, 6  |      | SSB.4 FR1         |         |
| SMTTC Configuration                            | Config 1, 2, 4, 5  |      | SMTTC.1           |         |
|  | Config 3, 6  |      | SMTTC.1           |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1, 2, 4, 5  |      | 15 KHz            |         |
|  | Config 3, 6  |      | 30 KHz            |         |
| PRACH Configuration                            | Config 1, 2, 4, 5  |      | Table A.3.8.2.2-1 |         |
|  | Config 3, 6  |      | Table A.3.8.2.2-1 |         |
| SSB Index assigned as BFD RS ( $q_0$ )         |  |      | 0                 |         |
| SSB Index assigned as CBD RS ( $q_1$ )         |  |      | 1                 |         |
| OCNG parameters                                |  |      | OP.1              |         |
| CP length                                      |  |      | Normal            |         |
| Correlation Matrix and Antenna Configuration   |  |      | 2x2 Low           |         |
| Beam failure detection transmission parameters | DCI format   |      | 1-0               |         |
|  | Number of Control OFDM symbols                                 |      | 2                 |         |
|  | Aggregation level  | CCE  | 8                 |         |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB   | 0                 |         |

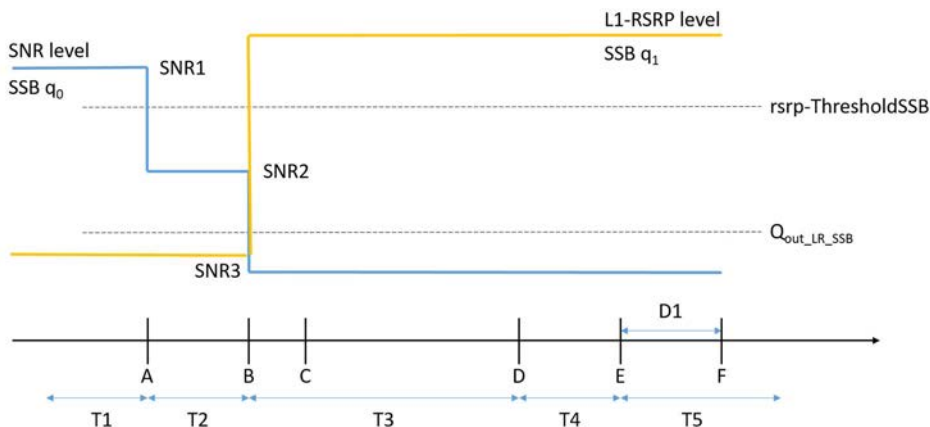


|   |  |             |                 |  |
|---|--|-------------|-----------------|--|
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB          | 0               |  |
|   | DMRS precoder granularity  |             | REG bundle size |  |
|   | REG bundle size  |             | 6               |  |
| DRX   |  |             | OFF             |  |
| Gap pattern ID  |  |             | gp0             |  |
| gapOffset   |  |             | 0               |  |
| rlmInSyncOutOfSyncThreshold   |  |             | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2, 4, 5  | dBm/SCS kHz | -98             | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|   | Config 3, 6  |             | -95             |  |
| powerControlOffsetSS  |  |             | db0             | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount   |  |             | n1              | see TS 38.321 [7], clause 5.17   |
| beamFailureDetectionTimer   |  |             | pbfd4           | see TS 38.321 [7], clause 5.17   |
| CSI-RS configuration for CSI reporting  | Config 1, 4  |             | CSI-RS.1.1 FDD  |  |
|   | Config 2, 5  |             | CSI-RS.1.1 TDD  |  |
|   | Config 3, 6  |             | CSI-RS.2.1 TDD  |  |
| CSI-RS for tracking   | Config 1, 4  |             | TRS.1.1 FDD     |  |
|   | Config 2, 5  |             | TRS.1.1 TDD     |  |
|   | Config 3, 6  |             | TRS.1.2 TDD     |  |
| SSB Index assigned as RLM RS  |  |             | 0,1             |  |
| T310 timer  |  | ms          | 1000            |  |
| N310  |  |             | 2               |  |
| T1  |  | s           | 0.2             | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |  | s           | 0.37            |  |
| T3  |  | s           | 0.24            |  |
| T4  |  | s           | 0               |  |
| T5  |  | s           | 0.17            |  |
| D1  |  | s           | 0.13            |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |             |                 |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |             |                 |  |
| Note 3: E-UTRAN is in non-DRX mode under test.  |  |             |                 |  |

**Table A.4.5.5.1.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |             | Unit           | Test 1            |      |     |     |     |
|--|-------------|----------------|-------------------|------|-----|-----|-----|
|  |             |                | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB             | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of PSS to SSS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS  |             | dB             |                   |      |     |     |     |
| SNR_SSB of set q <sub>0</sub>  | Config 1, 4 | dB             | 5                 | -3   | -12 | -12 | -12 |
|  | Config 2, 5 |                | 5                 | -3   | -12 | -12 | -12 |
|  | Config 3, 6 |                | 5                 | -3   | -12 | -12 | -12 |
| SNR_SSB of set q <sub>1</sub>  | Config 1, 4 | dB             | -10               | -10  | 10  | 10  | 10  |
|  | Config 2, 5 |                | -10               | -10  | 10  | 10  | 10  |
|  | Config 3, 6 |                | -10               | -10  | 10  | 10  | 10  |
| SSB_RP of set q <sub>1</sub>   | Config 1, 4 | dBm/SCS<br>kHz | -108              | -108 | -88 | -88 | -88 |
|  | Config 2, 5 |                | -108              | -108 | -88 | -88 | -88 |
|  | Config 3, 6 |                | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$   | Config 1, 4 | dBm/15<br>KHz  | -98               |      |     |     |     |
|  | Config 2, 5 |                | -98               |      |     |     |     |
|  | Config 3, 6 |                | -98               |      |     |     |     |
| Propagation condition  |             |                | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |             |                |                   |      |     |     |     |

**Table A.4.5.5.1.1-4: Void**



**Figure A.4.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### A.4.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 120+10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.4.5.5.2 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

#### A.4.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.2.1-1, A.4.5.5.2.1-2, A.4.5.5.2.1-3, A.4.5.5.2.1-4 and A.4.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.4.5.5.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.4.5.5.2.1-1: Supported test configurations for FR1 PCell**

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

**Table A.4.5.5.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter                                      |  | Unit | Value             | Comment |
|--|--|------|-------------------|---------|
|  |  |      | Test 1            |         |
| Active E-UTRA PCell                            |  |      | Cell 1            |         |
| E-UTRA RF Channel Number                       |  |      | 1                 |         |
| Active PSCell                                  |  |      | Cell 2            |         |
| RF Channel Number                              |  |      | 2                 |         |
| Duplex mode                                    | Config 1, 4  |      | FDD               |         |
|  | Config 2, 3, 5, 6  |      | TDD               |         |
| BWchannel                                      | Config 1, 4  | MHz  | 10: NRB,c = 52    |         |
|  | Config 2, 5  |      | 10: NRB,c = 52    |         |
|  | Config 3, 6  |      | 40: NRB,c = 106   |         |
| DL initial BWP configuration                   | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.0.1         |         |
| DL dedicated BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | DLBWP.1.1         |         |
| UL initial BWP configuration                   | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.0.1         |         |
| UL dedicated BWP configuration                 | Config 1, 2, 3, 4, 5, 6  |      | ULBWP.1.1         |         |
| TDD Configuration                              | Config 1, 4  |      | Not Applicable    |         |
|  | Config 2, 5  |      | TDDConf.1.1       |         |
|  | Config 3, 6  |      | TDDConf.2.1       |         |
| RMSI CORESET Reference Channel                 | Config 1, 4  |      | CR.1.1 FDD        |         |
|  | Config 2, 5  |      | CR.1.1 TDD        |         |
|  | Config 3, 6  |      | CR.2.1 TDD        |         |
| Dedicated CORESET Reference Channel            | Config 1, 4  |      | CCR.1.1 FDD       |         |
|  | Config 2, 5  |      | CCR.1.1 TDD       |         |
|  | Config 3, 6  |      | CCR.2.1 TDD       |         |
| SSB Configuration                              | Config 1, 4  |      | SSB.3 FR1         |         |
|  | Config 2, 5  |      | SSB.3 FR1         |         |
|  | Config 3, 6  |      | SSB.4 FR1         |         |
| SMTC Configuration                             | Config 1, 2, 4, 5  |      | SMTC.1            |         |
|  | Config 3, 6  |      | SMTC.1            |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1, 2, 4, 5  |      | 15 KHz            |         |
|  | Config 3, 6  |      | 30 KHz            |         |
| PRACH Configuration                            | Config 1, 2, 4, 5  |      | Table A.3.8.2.2-1 |         |
|  | Config 3, 6  |      | Table A.3.8.2.2-1 |         |
| SSB Index assigned as BFD RS ( $q_0$ )         |  |      | 0                 |         |
| SSB Index assigned as CBD RS ( $q_1$ )         |  |      | 1                 |         |
| OCNG parameters                                |  |      | OP.1              |         |
| CP length                                      |  |      | Normal            |         |
| Correlation Matrix and Antenna Configuration   |  |      | 2x2 Low           |         |
| Beam failure detection transmission parameters | DCI format   |      | 1-0               |         |
|  | Number of Control OFDM symbols                                   |      | 2                 |         |
|  | Aggregation level  | CCE  | 8                 |         |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                 |         |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                 |         |
|  | DMRS precoder granularity  |      | REG bundle size   |         |
|  | REG bundle size  |      | 6                 |         |

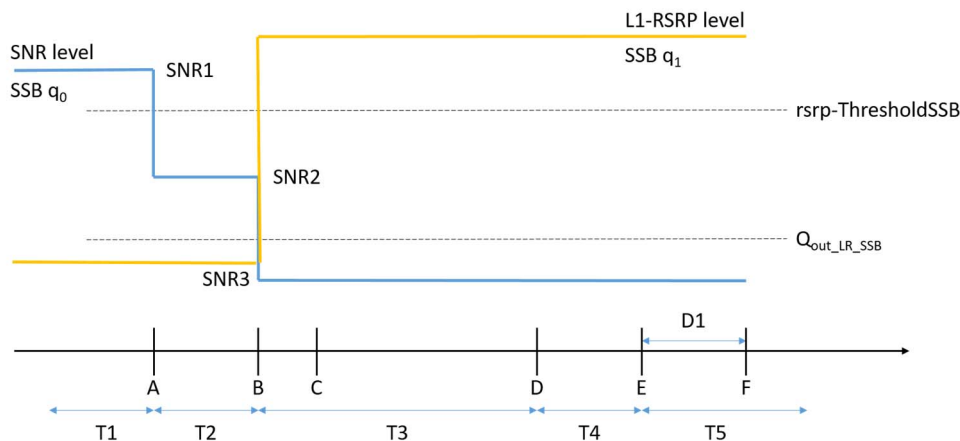
| DRX   |                   |             | DRX.7          | A.3.3.7  |
|---|-------------------|-------------|----------------|--|
| Gap pattern ID  |                   |             | N.A.           |  |
| rimInSyncOutOfSyncThreshold   |                   |             | absent         | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2, 4, 5 | dBm/SCS kHz | -98            | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|   | Config 3, 6       |             | -95            |  |
| powerControlOffsetSS  |                   |             | db0            | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount   |                   |             | n1             | see TS 38.321 [7], clause 5.17   |
| beamFailureDetectionTimer   |                   |             | pbfd4          | see TS 38.321 [7], clause 5.17   |
| CSI-RS configuration for CSI reporting  | Config 1, 4       |             | CSI-RS.1.1 FDD |  |
|   | Config 2, 5       |             | CSI-RS.1.1 TDD |  |
|   | Config 3, 6       |             | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking   | Config 1, 4       |             | TRS.1.1 FDD    |  |
|   | Config 2, 5       |             | TRS.1.1 TDD    |  |
|   | Config 3, 6       |             | TRS.1.2 TDD    |  |
| SSB Index assigned as RLM RS  |                   |             | 0,1            |  |
| T310 Timer  |                   | ms          | 1000           |  |
| N310  |                   |             | 2              |  |
| T1  |                   | s           | 1              | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |                   | s           | 5.17           |  |
| T3  |                   | s           | 3.24           |  |
| T4  |                   | s           | 0              |  |
| T5  |                   | s           | 1.97           |  |
| D1  |                   | s           | 1.93           |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |                   |             |                |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |                   |             |                |  |
| Note 3: E-UTRAN is in non-DRX mode under test.  |                   |             |                |  |

**Table A.4.5.5.2.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter   | Unit        | Test 1      |                   |      |     |     |     |
|---|-------------|-------------|-------------------|------|-----|-----|-----|
|   |             | T1          | T2                | T3   | T4  | T5  |     |
| EPRE ratio of PDCCH DMRS to SSS   | dB          | 0           |                   |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   | dB          |             |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  | dB          |             |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   | dB          |             |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  | dB          |             |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   | dB          |             |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   | dB          |             |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  | dB          |             |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   | dB          |             |                   |      |     |     |     |
| SNR_SSB of set $q_0$  | Config 1, 4 | dB          | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2, 5 |             | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3, 6 |             | 5                 | -3   | -12 | -12 | -12 |
| SNR_SSB of set $q_1$  | Config 1, 4 | dB          | -10               | -10  | 10  | 10  | 10  |
|   | Config 2, 5 |             | -10               | -10  | 10  | 10  | 10  |
|   | Config 3, 6 |             | -10               | -10  | 10  | 10  | 10  |
| SSB_RP of set $q_1$   | Config 1, 4 | dBm/SCS kHz | -108              | -108 | -88 | -88 | -88 |
|   | Config 2, 5 |             | -108              | -108 | -88 | -88 | -88 |
|   | Config 3, 6 |             | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1, 4 | dBm/15 KHz  | -98               |      |     |     |     |
|   | Config 2, 5 |             | -98               |      |     |     |     |
|   | Config 3, 6 |             | -98               |      |     |     |     |
| Propagation condition   |             |             | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |             |             |                   |      |     |     |     |

**Table A.4.5.5.2.1-4: Void**

**Table A.4.5.5.2.1-5: Void**



**Figure A.4.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.4.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 1920 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.4.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

##### A.4.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.3.1-1, A.4.5.5.3.1-2, and A.4.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.3.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

**Table A.4.5.5.3.1-1: Supported test configurations for FR1 PSCell**

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



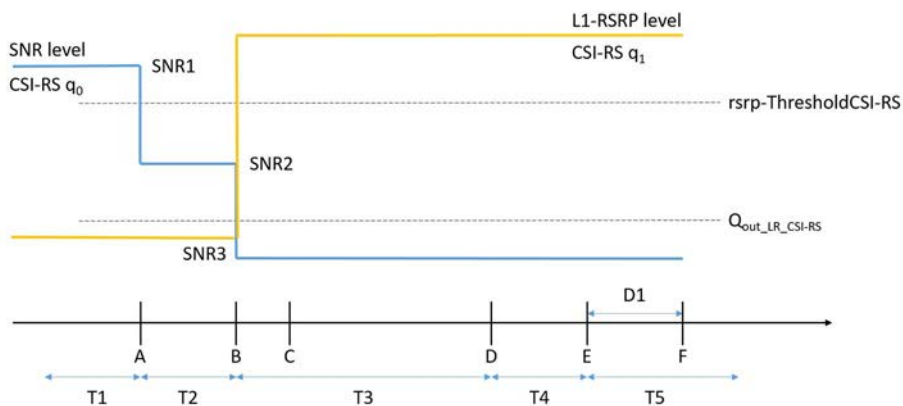
**Table A.4.5.5.3.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |   | Unit | Value                     | Comment |
|---|---|------|---------------------------|---------|
|   |   |      | Test 1                    |         |
| Active PCell  |   |      | Cell 1                    |         |
| RF Channel Number   |   |      | 1                         |         |
| Active PSCell   |   |      | Cell 2                    |         |
| RF Channel Number   |   |      | 2                         |         |
| Duplex mode   | Config 1, 4   |      | FDD                       |         |
|   | Config 2, 3, 5, 6   |      | TDD                       |         |
| BWchannel   | Config 1, 4   | MHz  | 10: NRB,c = 52            |         |
|   | Config 2, 5   |      | 10: NRB,c = 52            |         |
|   | Config 3, 6   |      | 40: NRB,c = 106           |         |
| DL initial BWP configuration                                    | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1                 |         |
| DL dedicated BWP configuration                                  | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1                 |         |
| UL initial BWP configuration                                    | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1                 |         |
| UL dedicated BWP configuration                                  | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1                 |         |
| TDD Configuration   | Config 1, 4   |      | Not Applicable            |         |
|   | Config 2, 5   |      | TDDConf.1.1               |         |
|   | Config 3, 6   |      | TDDConf.2.1               |         |
| RMSI CORESET Reference Channel                                  | Config 1, 4   |      | CR.1.1 FDD                | A.3.1.2 |
|   | Config 2, 5   |      | CR.1.1 TDD                |         |
|   | Config 3, 6   |      | CR.2.1 TDD                |         |
| Dedicated CORESET Reference Channel                             | Config 1, 4   |      | CCR.1.1 FDD               | A.3.1.3 |
|   | Config 2, 5   |      | CCR.1.1 TDD               |         |
|   | Config 3, 6   |      | CCR.2.1 TDD               |         |
| SSB Configuration   | Config 1, 4   |      | SSB.3 FR1                 | A.3.10  |
|   | Config 2, 5   |      | SSB.3 FR1                 |         |
|   | Config 3, 6   |      | SSB.4 FR1                 |         |
| SMTc Configuration  | Config 1, 2, 4, 5   |      | SMTc.1                    | A.3.11  |
|   | Config 3, 6   |      | SMTc.1                    |         |
| PDSCH/PDCCH subcarrier spacing                                  | Config 1, 2, 4, 5   |      | 15 KHz                    |         |
|   | Config 3, 6   |      | 30 KHz                    |         |
| PRACH Configuration   | Config 1, 2, 4, 5   |      | FR1 PRACH configuration 4 | A.3.8.2 |
|   | Config 3, 6   |      | FR1 PRACH configuration 4 | A.3.8.2 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ |   |      | 0                         |         |
| OCNG parameters   |   |      | OP.1                      | A.3.2.1 |
| CP length   |   |      | Normal                    |         |
| Correlation Matrix and Antenna Configuration                    |   |      | 2x2 Low                   |         |
| Beam failure detection transmission parameters                  | DCI format  |      | 1-0                       |         |
|   | Number of Control OFDM symbols                                      |      | 2                         |         |
|   | Aggregation level   | CCE  | 8                         |         |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                         |         |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0                         |         |
|   | DMRS precoder granularity   |      | REG bundle size           |         |

|   |                   |         |                |  |
|---|-------------------|---------|----------------|--|
|   | REG bundle size   |         | 6              |  |
| DRX   |                   |         | OFF            |  |
| Gap pattern ID  |                   |         | N.A.           |  |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ |                   |         | 1              |  |
| rlmInSyncOutOfSyncThreshold                                       |                   |         | absent         | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2, 4, 5 | dBm/SCS | -98            | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|   | Config 3, 6       | kHz     | -95            |  |
| powerControlOffsetSS  |                   |         | db0            | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount                                       |                   |         | n1             | see TS 38.321 [7], clause 5.17   |
| beamFailureDetectionTimer   |                   |         | pbfd4          | see TS 38.321 [7], clause 5.17   |
| CSI-RS configuration for $q_0$ and $q_1$                          | Config 1, 4       |         | CSI-RS.1.2 FDD | A.3.14   |
|   | Config 2, 5       |         | CSI-RS.1.2 TDD |  |
|   | Config 3, 6       |         | CSI-RS.2.2 TDD |  |
| CSI-RS configuration for CSI reporting                            | Config 1, 4       |         | CSI-RS.1.1 FDD | A.3.14   |
|   | Config 2, 5       |         | CSI-RS.1.1 TDD |  |
|   | Config 3, 6       |         | CSI-RS.2.1 TDD |  |
| TRS configuration   | Config 1, 4       |         | TRS.1.1 FDD    |  |
|   | Config 2, 5       |         | TRS.1.1 TDD    |  |
|   | Config 3, 6       |         | TRS.1.2 TDD    |  |
| csi-RS-Index assigned as RLM RS                                   | Config 1, 4       |         | CSI-RS.1.2 FDD | A.3.14   |
|   | Config 2, 5       |         | CSI-RS.1.2 TDD |  |
|   | Config 3, 6       |         | CSI-RS.2.2 TDD |  |
| T310 Timer  |                   | ms      | 1000           |  |
| N310  |                   |         | 2              |  |
| T1  |                   | s       | 1              | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |                   | s       | 0.18           |  |
| T3  |                   | s       | 0.14           |  |
| T4  |                   | s       | 0              |  |
| T5  |                   | s       | 0.08           |  |
| D1  |                   | s       | 0.04           |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.     |                   |         |                |  |

**Table A.4.5.3.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |             | Unit           | Test 1            |      |     |     |     |
|---|-------------|----------------|-------------------|------|-----|-----|-----|
|   |             |                | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB             | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB             |                   |      |     |     |     |
| SNR_CSI-RS of set $q_0$   | Config 1, 4 | dB             | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2, 5 |                | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3, 6 |                | 5                 | -3   | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$   | Config 1, 4 | dB             | -10               | -10  | 10  | 10  | 10  |
|   | Config 2, 5 |                | -10               | -10  | 10  | 10  | 10  |
|   | Config 3, 6 |                | -10               | -10  | 10  | 10  | 10  |
| CSI-RS_RP of set $q_1$  | Config 1, 4 | dBm/SCS<br>kHz | -108              | -108 | -88 | -88 | -88 |
|   | Config 2, 5 |                | -108              | -108 | -88 | -88 | -88 |
|   | Config 3, 6 |                | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1, 4 | dBm/15<br>KHz  | -98               |      |     |     |     |
|   | Config 2, 5 |                | -98               |      |     |     |     |
|   | Config 3, 6 |                | -98               |      |     |     |     |
| Propagation condition   |             |                | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |             |                |                   |      |     |     |     |



**Figure A.4.5.3.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

#### A.4.5.5.3.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 30+10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.4.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in DRX mode

##### A.4.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.4.1-1, A.4.5.5.4.1-2, A.4.5.5.4.1-3, and A.4.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.4.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.4.5.5.4.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.5.4.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter   |   | Unit | Value                     | Comment |
|---|---|------|---------------------------|---------|
|   |   |      | Test 1                    |         |
| Active PCell  |   |      | Cell 1                    |         |
| RF Channel Number   |   |      | 1                         |         |
| Active PSCell   |   |      | Cell 2                    |         |
| RF Channel Number   |   |      | 2                         |         |
| Duplex mode   | Config 1, 4   |      | FDD                       |         |
|   | Config 2, 3, 5, 6   |      | TDD                       |         |
| BWchannel   | Config 1, 4   | MHz  | 10: NRB,c = 52            |         |
|   | Config 2, 5   |      | 10: NRB,c = 52            |         |
|   | Config 3, 6   |      | 40: NRB,c = 106           |         |
| DL initial BWP configuration                                    | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1                 |         |
| DL dedicated BWP configuration                                  | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1                 |         |
| UL initial BWP configuration                                    | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1                 |         |
| UL dedicated BWP configuration                                  | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1                 |         |
| TDD Configuration   | Config 1, 4   |      | Not Applicable            |         |
|   | Config 2, 5   |      | TDDConf.1.1               |         |
|   | Config 3, 6   |      | TDDConf.2.1               |         |
| RMSI CORESET Reference Channel                                  | Config 1, 4   |      | CR.1.1 FDD                | A.3.1.2 |
|   | Config 2, 5   |      | CR.1.1 TDD                |         |
|   | Config 3, 6   |      | CR.2.1 TDD                |         |
| Dedicated CORESET Reference Channel                             | Config 1, 4   |      | CCR.1.1 FDD               | A.3.1.3 |
|   | Config 2, 5   |      | CCR.1.1 TDD               |         |
|   | Config 3, 6   |      | CCR.2.1 TDD               |         |
| SSB Configuration   | Config 1, 4   |      | SSB.3 FR1                 | A.3.10  |
|   | Config 2, 5   |      | SSB.3 FR1                 |         |
|   | Config 3, 6   |      | SSB.4 FR1                 |         |
| SMTC Configuration  | Config 1, 2, 4, 5   |      | SMTC.1                    | A.3.11  |
|   | Config 3, 6   |      | SMTC.1                    |         |
| PDSCH/PDCCH subcarrier spacing                                  | Config 1, 2, 4, 5   |      | 15 KHz                    |         |
|   | Config 3, 6   |      | 30 KHz                    |         |
| PRACH Configuration   | Config 1, 2, 4, 5   |      | FR1 PRACH configuration 4 | A.3.8.2 |
|   | Config 3, 6   |      | FR1 PRACH configuration 4 | A.3.8.2 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ |   |      | 0                         |         |
| OCNG parameters   |   |      | OP.1                      | A.3.2.1 |
| CP length   |   |      | Normal                    |         |
| Correlation Matrix and Antenna Configuration                    |   |      | 2x2 Low                   |         |
| Beam failure detection transmission parameters                  | DCI format  |      | 1-0                       |         |
|   | Number of Control OFDM symbols                                    |      | 2                         |         |
|   | Aggregation level   | CCE  | 8                         |         |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB   | 0                         |         |

|   |   |             |                 |  |
|---|---|-------------|-----------------|--|
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB          | 0               |  |
|   | DMRS precoder granularity   |             | REG bundle size |  |
|   | REG bundle size   |             | 6               |  |
| DRX   |   |             | DRX.7           | A.3.3.7  |
| Gap pattern ID  |   |             | N.A.            |  |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ |   |             | 1               |  |
| rlmInSyncOutOfSyncThreshold                                       |   |             | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2, 4, 5   | dBm/SCS kHz | -98             | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|   | Config 3, 6   |             | -95             |  |
| powerControlOffsetSS  |   |             | db0             | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount                                       |   |             | n1              | see TS 38.321 [7], clause 5.17   |
| beamFailureDetectionTimer   |   |             | pbfd4           | see TS 38.321 [7], clause 5.17   |
| CSI-RS configuration for $q_0$ and $q_1$                          | Config 1, 4   |             | CSI-RS.1.2 FDD  | A.3.14   |
|   | Config 2, 5   |             | CSI-RS.1.2 TDD  |  |
|   | Config 3, 6   |             | CSI-RS.2.2 TDD  |  |
| CSI-RS configuration for CSI reporting                            | Config 1, 4   |             | CSI-RS.1.1 FDD  | A.3.14   |
|   | Config 2, 5   |             | CSI-RS.1.1 TDD  |  |
|   | Config 3, 6   |             | CSI-RS.2.1 TDD  |  |
| TRS configuration   | Config 1, 4   |             | TRS.1.1 FDD     |  |
|   | Config 2, 5   |             | TRS.1.1 TDD     |  |
|   | Config 3, 6   |             | TRS.1.2 TDD     |  |
| csi-RS-Index assigned as RLM RS                                   | Config 1, 4   |             | CSI-RS.1.2 FDD  | A.3.14   |
|   | Config 2, 5   |             | CSI-RS.1.2 TDD  |  |
|   | Config 3, 6   |             | CSI-RS.2.2 TDD  |  |
| T310 Timer  |   | ms          | 1000            |  |
| N310  |   |             | 2               |  |
| T1  |   | s           | 1               | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |   | s           | 8.37            |  |
| T3  |   | s           | 6.44            |  |
| T4  |   | s           | 0               |  |
| T5  |   | s           | 1.97            |  |
| D1  |   | s           | 1.93            |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.     |   |             |                 |  |



**Table A.4.5.5.4.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter   |             | Unit           | Test 1            |      |     |     |     |
|---|-------------|----------------|-------------------|------|-----|-----|-----|
|   |             |                | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB             | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB             |                   |      |     |     |     |
| EPRE ratio of OCNB DMRS to SSS  |             | dB             |                   |      |     |     |     |
| EPRE ratio of OCNB to OCNB DMRS   |             | dB             |                   |      |     |     |     |
| SNR_CSI-RS of set $q_0$   | Config 1, 4 | dB             | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2, 5 |                | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3, 6 |                | 5                 | -3   | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$   | Config 1, 4 | dB             | -10               | -10  | 10  | 10  | 10  |
|   | Config 2, 5 |                | -10               | -10  | 10  | 10  | 10  |
|   | Config 3, 6 |                | -10               | -10  | 10  | 10  | 10  |
| CSI-RS_RP of set $q_1$  | Config 1, 4 | dBm/SCS<br>kHz | -108              | -108 | -88 | -88 | -88 |
|   | Config 2, 5 |                | -108              | -108 | -88 | -88 | -88 |
|   | Config 3, 6 |                | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1, 4 | dBm/15<br>KHz  | -98               |      |     |     |     |
|   | Config 2, 5 |                | -98               |      |     |     |     |
|   | Config 3, 6 |                | -98               |      |     |     |     |
| Propagation condition   |             |                | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNB shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNB.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |             |                |                   |      |     |     |     |

Table A.4.5.5.4.1-4: Void

Table A.4.5.5.4.1-5: Void

Table A.4.5.5.4.1-6: Void

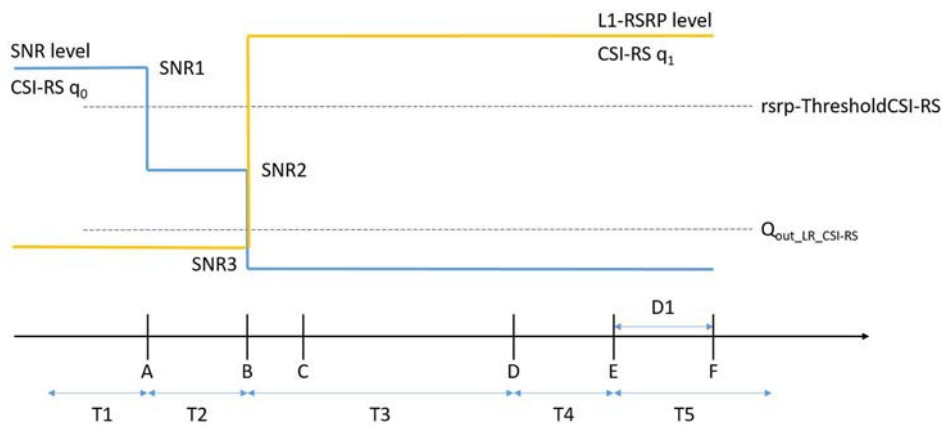


Figure A.4.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

#### A.4.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 1920 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.4.5.5.5 EN-DC Beam Failure Detection and Link Recovery Test for FR1 SCell configured with CSI-RS-based BFD and SSB-based LR in non-DRX mode

##### A.4.5.5.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.5.1-1, A.4.5.5.5.1-2, and A.4.5.5.5.1-3 below. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PCell and cell 3 is the SCell, in the test. UE is not provided by *schedulingRequestID-BFR-SCell-r16*, i.e., no configuration for PUCCH transmission resources, and UE shall perform the random access procedure to recover the beam failure. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.5.1-1 shows the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate beam failure. Figure A.4.5.5.5.1-1 additionally shows the variation of the downlink L1-RSRP of the

SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

**Table A.4.5.5.1-1: Supported test configurations for FR1 PCell and SCell**

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

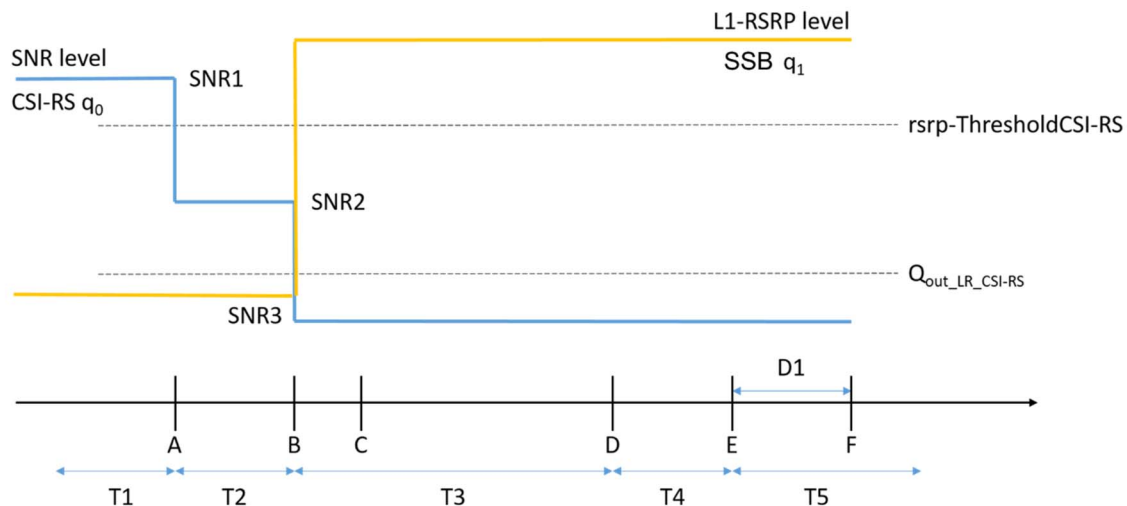
**Table A.4.5.5.1-2: General test parameters for FR1 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |   | Unit | Value                | Comment |
|--|---|------|----------------------|---------|
|  |   |      | Test 1               |         |
| Active PCell   |   |      | Cell 1               |         |
| E-UTRA RF Channel Number   |   |      | 1                    |         |
| Active PSCell  |   |      | Cell 2               |         |
| RF Channel Number for PSCell   |   |      | 2                    |         |
| Active SCell   |   |      | Cell 3               |         |
| RF Channel Number for SCell  |   |      | 3                    |         |
| Duplex mode  | Config 1, 4   |      | FDD                  |         |
|  | Config 2, 3, 5, 6   |      | TDD                  |         |
| BW channel   | Config 1, 4   | MHz  | 10: NRB,c = 52       |         |
|  | Config 2, 5   |      | 10: NRB,c = 52       |         |
|  | Config 3, 6   |      | 40: NRB,c = 106      |         |
| DL initial BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1            |         |
| DL dedicated BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1            |         |
| UL initial BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1            |         |
| UL dedicated BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1            |         |
| TDD Configuration  | Config 1, 4   |      | Not Applicable       |         |
|  | Config 2, 5   |      | TDDConf.1.1          |         |
|  | Config 3, 6   |      | TDDConf.2.1          |         |
| CORESET Reference Channel  | Config 1, 4   |      | CR.1.1 FDD           | A.3.1.2 |
|  | Config 2, 5   |      | CR.1.1 TDD           |         |
|  | Config 3, 6   |      | CR.2.1 TDD           |         |
| SSB Configuration  | Config 1, 4   |      | SSB.1 FR1            | A.3.10  |
|  | Config 2, 5   |      | SSB.1 FR1            |         |
|  | Config 3, 6   |      | SSB.2 FR1            |         |
| SMTC Configuration   | Config 1, 2, 3, 4, 5, 6   |      | SMTC.1               | A.3.11  |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2, 4, 5   | kHz  | 15                   |         |
|  | Config 3, 6   |      | 30                   |         |
| PRACH Configuration  | Config 1, 2, 4, 5   |      | Table A.3.8.2.2-1    |         |
|  | Config 3, 6   |      | Table A.3.8.2.2-1    |         |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell |   |      | 0                    |         |
| OCNG parameters  |   |      | OP.1                 | A.3.2.1 |
| CP length  |   |      | Normal               |         |
| Correlation Matrix and Antenna Configuration                                       |   |      | 2x2 Low              |         |
| Beam failure detection transmission parameters                                     | DCI format  |      | 1-0                  |         |
|  | Number of Control OFDM symbols                                      |      | 2                    |         |
|  | Aggregation level   | CCE  | 8                    |         |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                    |         |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0                    |         |
|  | DMRS precoder granularity<br>REG bundle size                        |      | REG bundle size<br>6 |         |
| DRX  |   |      | OFF                  |         |
| Gap pattern ID   |   |      | N.A.                 |         |

|   |                   |         |                |   |
|---|-------------------|---------|----------------|---|
| schedulingRequestID-BFR-SCell-r16                             |                   |         | absent         | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell          |                   |         | 0              |   |
| rlmInSyncOutOfSyncThreshold                                   |                   |         | absent         | When the field is absent, the UE applies the value 0. (Table 8.1.1-1).                |
| rsrp-ThresholdBFR   | Config 1, 2, 4, 5 | dBm/SCS | -98            | Threshold used for $Q_{in\_LR\_SSB}$  |
|   | Config 3, 6       |         | -95            |   |
| powerControlOffsetSS  |                   |         | db0            | Used for deriving rsrp-ThresholdCSI-RS  |
| beamFailureInstanceMaxCount                                   |                   |         | n1             | see TS 38.321 [7], clause 5.17  |
| beamFailureDetectionTimer                                     |                   |         | pbfd4          | see TS 38.321 [7], clause 5.17  |
| CSI-RS configuration for $q_0$ in activated SCell             | Config 1, 4       |         | CSI-RS.1.2 FDD | A.3.14  |
|   | Config 2, 5       |         | CSI-RS.1.2 TDD |   |
|   | Config 3, 6       |         | CSI-RS.2.2 TDD |   |
| CSI-RS configuration for CSI reporting                        | Config 1, 4       |         | CSI-RS.1.1 FDD | A.3.14  |
|   | Config 2, 5       |         | CSI-RS.1.1 TDD |   |
|   | Config 3, 6       |         | CSI-RS.2.1 TDD |   |
| TRS configuration   | Config 1, 4       |         | TRS.1.1 FDD    |   |
|   | Config 2, 5       |         | TRS.1.1 TDD    |   |
|   | Config 3, 6       |         | TRS.1.2 TDD    |   |
| csi-RS-Index assigned as RLM RS in PSCell                     | Config 1, 4       |         | CSI-RS.1.2 FDD | A.3.14  |
|   | Config 2, 5       |         | CSI-RS.1.2 TDD |   |
|   | Config 3, 6       |         | CSI-RS.2.2 TDD |   |
| T310 Timer  |                   | ms      | 1000           |   |
| N310  |                   |         | 2              |   |
| T1  |                   | s       | 1              | During this time the the UE shall be fully synchronized to cell 1                     |
| T2  |                   | s       | 0.18           |   |
| T3  |                   | s       | 0.14           |   |
| T4  |                   | s       | 0              |   |
| T5  |                   | s       | 0.17           |   |
| D1  |                   | s       | 0.13           |   |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |                   |         |                |   |

**Table A.4.5.5.1-3: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |             | Unit        | Cell2                   | Test 1 Cell3      |      |     |     |     |
|---|-------------|-------------|-------------------------|-------------------|------|-----|-----|-----|
|   |             |             | T1 to T5                | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB          | 0                       | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |             | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB          |                         |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |             | dB          |                         |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB          |                         |                   |      |     |     |     |
| SNR_CSI-RS of set $q_0$   | Config 1, 4 | dB          | 5                       | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2, 5 |             | 5                       | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3, 6 |             | 5                       | 5                 | -3   | -12 | -12 | -12 |
| SNR_SSB of set $q_1$  | Config 1, 4 | dB          | -10                     | -10               | -10  | 10  | 10  | 10  |
|   | Config 2, 5 |             | -10                     | -10               | -10  | 10  | 10  | 10  |
|   | Config 3, 6 |             | -10                     | -10               | -10  | 10  | 10  | 10  |
| SSB_RP of set $q_1$   | Config 1, 4 | dBm/SCS kHz | -108                    | -108              | -108 | -88 | -88 | -88 |
|   | Config 2, 5 |             | -108                    | -108              | -108 | -88 | -88 | -88 |
|   | Config 3, 6 |             | -105                    | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1, 4 | dBm/15 kHz  | -98                     | -98               |      |     |     |     |
|   | Config 2, 5 |             | -98                     | -98               |      |     |     |     |
|   | Config 3, 6 |             | -98                     | -98               |      |     |     |     |
| Propagation condition   |             |             | TDL-C<br>300ns<br>100Hz | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].</p> |             |             |                         |                   |      |     |     |     |



**Figure A.4.5.5.1-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in non-DRX mode**

#### A.4.5.5.5.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 120 + 10$  ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set  $q_1$  for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.4.5.5.6 EN-DC Beam Failure Detection and Link Recovery Test for FR1 SCell configured with CSI-RS-based BFD and SSB-based LR in DRX mode

##### A.4.5.5.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS based beam failure in the set  $q_0$  configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.6.1-1, A.4.5.5.6.1-2, and A.4.5.5.6.1-3 below. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell and cell 3 is the SCell, in the test. UE is not provided by *schedulingRequestID-BFR-SCell-r16*, i.e., no configuration for PUCCH transmission resources, and UE shall perform the random access procedure to recover the beam failure. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.6.1-1 shows the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate beam failure. Figure A.4.5.5.6.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to



cell 1, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in SCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.4.5.5.6.1-1: Supported test configurations for FR1 PCell and SCell**

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

**Table A.4.5.5.6.1-2: General test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode**

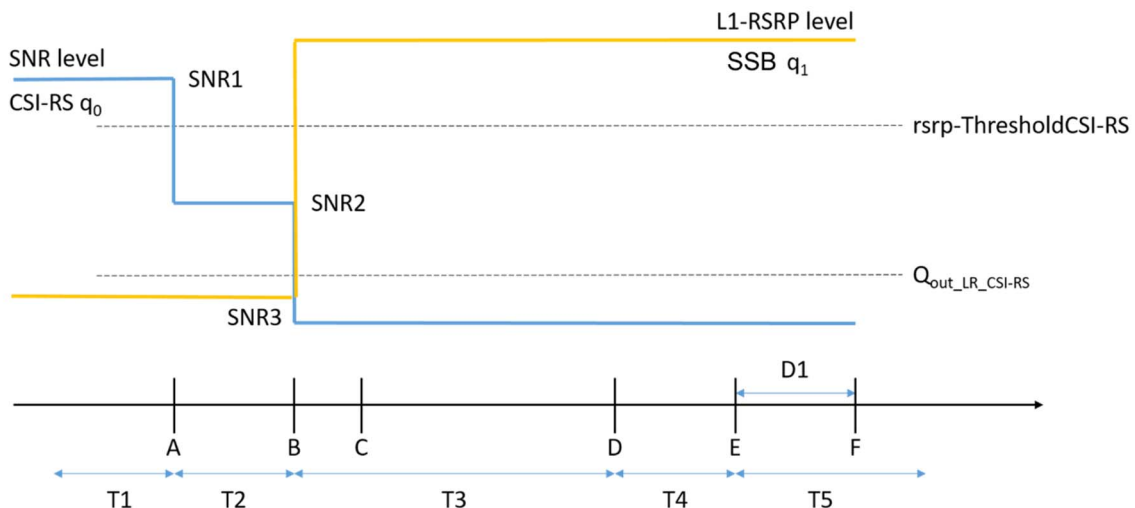
| Parameter  |   | Unit | Value             | Comment |
|--|---|------|-------------------|---------|
|  |   |      | Test 1            |         |
| Active PCell   |   |      | Cell 1            |         |
| E-UTRA RF Channel Number   |   |      | 1                 |         |
| Active PSCell  |   |      | Cell 2            |         |
| RF Channel Number for PSCell   |   |      | 2                 |         |
| Active SCell   |   |      | Cell 3            |         |
| RF Channel Number for SCell  |   |      | 3                 |         |
| Duplex mode  | Config 1, 4   |      | FDD               |         |
|  | Config 2, 3, 5, 6   |      | TDD               |         |
| BW channel   | Config 1, 4   | MHz  | 10: NRB,c = 52    |         |
|  | Config 2, 5   |      | 10: NRB,c = 52    |         |
|  | Config 3, 6   |      | 40: NRB,c = 106   |         |
| DL initial BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.0.1         |         |
| DL dedicated BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | DLBWP.1.1         |         |
| UL initial BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.0.1         |         |
| UL dedicated BWP configuration   | Config 1, 2, 3, 4, 5, 6   |      | ULBWP.1.1         |         |
| TDD Configuration  | Config 1, 4   |      | Not Applicable    |         |
|  | Config 2, 5   |      | TDDConf.1.1       |         |
|  | Config 3, 6   |      | TDDConf.2.1       |         |
| CORESET Reference Channel  | Config 1, 4   |      | CR.1.1 FDD        | A.3.1.2 |
|  | Config 2, 5   |      | CR.1.1 TDD        |         |
|  | Config 3, 6   |      | CR.2.1 TDD        |         |
| SSB Configuration  | Config 1, 4   |      | SSB.1 FR1         | A.3.10  |
|  | Config 2, 5   |      | SSB.1 FR1         |         |
|  | Config 3, 6   |      | SSB.2 FR1         |         |
| SMTTC Configuration  | Config 1, 2, 3, 4, 5, 6   |      | SMTTC.1           | A.3.11  |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2, 4, 5   | kHz  | 15                |         |
|  | Config 3, 6   |      | 30                |         |
| PRACH Configuration  | Config 1, 2, 4, 5   |      | Table A.3.8.2.2-1 |         |
|  | Config 3, 6   |      | Table A.3.8.2.2-1 |         |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell |   |      | 0                 |         |
| OCNG parameters  |   |      | OP.1              | A.3.2.1 |
| CP length  |   |      | Normal            |         |
| Correlation Matrix and Antenna Configuration                                       |   |      | 2x2 Low           |         |
| Beam failure detection transmission parameters                                     | DCI format  |      | 1-0               |         |
|  | Number of Control OFDM symbols                                    |      | 2                 |         |
|  | Aggregation level   | CCE  | 8                 |         |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB   | 0                 |         |

|  |   |         |                 |   |
|--|---|---------|-----------------|---|
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB      | 0               |   |
|  | DMRS precoder granularity   |         | REG bundle size |   |
|  | REG bundle size   |         | 6               |   |
| DRX  |   |         | DRX.7           | A.3.3.7   |
| Gap pattern ID                                       |   |         | N.A.            |   |
| schedulingRequestID-BFR-SCell-r16                    |   |         | absent          | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell |   |         | 1               |   |
| rimInSyncOutOfSyncThreshold                          |   |         | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1).                |
| rsrp-ThresholdBFR                                    | Config 1, 2, 4, 5   | dBm/SCS | -98             | Threshold used for $Q_{in\_LR\_SSB}$  |
|  | Config 3, 6   |         | -95             |   |
| powerControlOffsetSS                                 |   |         | db0             | Used for deriving rsrp-ThresholdCSI-RS  |
| beamFailureInstanceMaxCount                          |   |         | n1              | see TS 38.321 [7], clause 5.17  |
| beamFailureDetectionTimer                            |   |         | pbfd4           | see TS 38.321 [7], clause 5.17  |
| CSI-RS configuration for $q_0$ in activated SCell    | Config 1, 4   |         | CSI-RS.1.2 FDD  | A.3.14  |
|  | Config 2, 5   |         | CSI-RS.1.2 TDD  |   |
|  | Config 3, 6   |         | CSI-RS.2.2 TDD  |   |
| CSI-RS configuration for CSI reporting               | Config 1, 4   |         | CSI-RS.1.1 FDD  | A.3.14  |
|  | Config 2, 5   |         | CSI-RS.1.1 TDD  |   |
|  | Config 3, 6   |         | CSI-RS.2.1 TDD  |   |
| TRS configuration                                    | Config 1, 4   |         | TRS.1.1 FDD     |   |
|  | Config 2, 5   |         | TRS.1.1 TDD     |   |
|  | Config 3, 6   |         | TRS.1.2 TDD     |   |
| csi-RS-Index assigned as RLM RS in PSCell            | Config 1, 4   |         | CSI-RS.1.2 FDD  | A.3.14  |
|  | Config 2, 5   |         | CSI-RS.1.2 TDD  |   |
|  | Config 3, 6   |         | CSI-RS.2.2 TDD  |   |
| T310 Timer   |   | ms      | 1000            |   |
| N310   |   |         | 2               |   |
| T1   |   | s       | 1               | During this time the the UE shall be fully synchronized to cell 1                     |

|   |   |      |  |
|---|---|------|--|
| T2  | s | 8.37 |  |
| T3  | s | 6.44 |  |
| T4  | s | 0    |  |
| T5  | s | 1.97 |  |
| D1  | s | 1.93 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |      |  |

**Table A.4.5.5.6.1-3: Cell specific test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter   |             | Unit        | Cell2             | Test 1 Cell3      |      |     |     |     |
|---|-------------|-------------|-------------------|-------------------|------|-----|-----|-----|
|   |             |             | T1 to T5          | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB          | 0                 | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             |             |                   |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |             |             |                   |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |             |             |                   |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |             |             |                   |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |             |             |                   |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             |             |                   |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |             |             |                   |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB          | 5                 | 5                 | -3   | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_0$   | Config 1, 4 |             |                   |                   |      |     |     |     |
|   | Config 2, 5 |             |                   |                   |      |     |     |     |
|   | Config 3, 6 |             |                   |                   |      |     |     |     |
| SNR_SSB of set $q_1$  | Config 1, 4 | dB          | -10               | -10               | -10  | 10  | 10  | 10  |
|   | Config 2, 5 |             |                   |                   |      |     |     |     |
|   | Config 3, 6 |             |                   |                   |      |     |     |     |
| SSB_RP of set $q_1$   | Config 1, 4 | dBm/SCS kHz | -108              | -108              | -108 | -88 | -88 | -88 |
|   | Config 2, 5 |             |                   |                   |      |     |     |     |
|   | Config 3, 6 |             |                   |                   |      |     |     |     |
| $N_{oc}$  | Config 1, 4 | dBm/ 15 kHz | -98               | -98               |      |     |     |     |
|   | Config 2, 5 |             |                   |                   |      |     |     |     |
|   | Config 3, 6 |             |                   |                   |      |     |     |     |
| Propagation condition   |             |             | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |             |             |                   |                   |      |     |     |     |



**Figure A.4.5.5.6.1-1: SNR and L1-RSRP variation for beam failure detection and LR testing for SCell in DRX mode**

#### A.4.5.5.6.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 120 + 10$  ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set  $q_1$  for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.4.5.6 Active BWP switch

#### A.4.5.6.1 DCI-based and Timer-based Active BWP Switch

##### A.4.5.6.1.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

###### A.4.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.32.2.7. Supported test configurations are shown in Table A.4.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.4.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.4.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after DL slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after DL slot ( $i+T_{BWPswitchDelay}$ ).

The starting time of PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after DL slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after DL slot ( $j+T_{BWPswitchDelay}$ ).

The starting time of PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

**Table A.4.5.6.1.1.1-1: DL BWP switch supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |

Note 1: The UE is only required to be tested in one of the supported test configurations.  
Note 2: A UE which fulfils the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.

**Table A.4.5.6.1.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2      | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    | For both PCell and PSCell                      |
| <i>bwp-InactivityTimer</i>                              | ms   | [200]  |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| T1  | s    | [0.2]  |  |
| T2  | s    | [0.2]  |  |
| T3  | s    | [0.2]  |  |



**Table A.4.5.6.1.1.1-3.: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter                                    |                | Unit      | Cell 2                          |
|--|----------------|-----------|---------------------------------|
| Frequency Range                              |                |           | FR1                             |
| Duplex mode                                  | Config 1,4     |           | FDD                             |
|  | Config 2,3,5,6 |           | TDD                             |
| TDD configuration                            | Config 1,4     |           | Not Applicable                  |
|  | Config 2,5     |           | TDDConf.1.1                     |
|  | Config 3,6     |           | TDDConf.2.1                     |
| BW <sub>channel</sub>                        | Config 1,4     |           | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 2,5     |           | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 3,6     |           | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID                                |                |           | 1, 2                            |
| Initial DL BWP Configuration                 | Config 1,4     |           | DLBWP.0.2 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active DL BWP-1 Configuration                | Config 1,4     |           | DLBWP.1.1 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active DL BWP-2 Configuration                | Config 1,4     |           | DLBWP.1.3 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Initial UL BWP Configuration                 | Config 1,4     |           | ULBWP.0.2 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active UL BWP-1 Configuration                | Config 1,4     |           | ULBWP.1.1 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active UL BWP-2 Configuration                | Config 1,4     |           | N/A                             |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| PDSCH Reference measurement channel          | Config 1,4     |           | SR.1.1 FDD                      |
|  | Config 2,5     |           | SR.1.1 TDD                      |
|  | Config 3,6     |           | SR.2.1 TDD                      |
| RMSI CORESET parameters                      | Config 1,4     |           | CR.1.1 FDD                      |
|  | Config 2,5     |           | CR.1.1 TDD                      |
|  | Config 3,6     |           | CR.2.1 TDD                      |
| Dedicated CORESET parameters                 | Config 1,4     |           | CCR.1.2 FDD                     |
|  | Config 2,5     |           | CCR.1.2 TDD                     |
|  | Config 3,6     |           | CCR.2.4TDD                      |
| OCNG Patterns                                |                |           | OP.1                            |
| SSB Configuration                            | Config 1,2,4,5 |           | SSB.1 FR1                       |
|  | Config 3,6     |           | SSB.2 FR1                       |
| SMTTC Configuration                          |                |           | SMTTC.1                         |
| Correlation Matrix and Antenna Configuration |                |           | 1x2 Low                         |
| TRS Configuration                            | Config 1,4     |           | TRS.1.1 FDD                     |
|  | Config 2,5     |           | TRS.1.1 TDD                     |
|  | Config 3,6     |           | TRS.1.2 TDD                     |
| EPRE ratio of PSS to SSS                     |                | dB        | 0                               |
| EPRE ratio of PBCH DMRS to SSS               |                |           |                                 |
| EPRE ratio of PBCH to PBCH DMRS              |                |           |                                 |
| EPRE ratio of PDCCH DMRS to SSS              |                |           |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |           |                                 |
| EPRE ratio of PDSCH DMRS to SSS              |                |           |                                 |
| EPRE ratio of PDSCH to PDSCH                 |                |           |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |           |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |           |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>            | Config 1,2,4,5 | dBm/SCS   | [-104]                          |
|  | Config 3,6     |           | [-101]                          |
| N <sub>oc</sub> <sup>Note 2</sup>            |                | dBm/15kHz | -104                            |
| SS-RSRP <sup>Note 3</sup>                    | Config 1,2,4,5 | dBm/SCS   | [-87]                           |
|  | Config 3,6     |           | [-90]                           |
| $\hat{E}_s/I_{ot}$                           |                | dB        | 17                              |
| $\hat{E}_s/N_{oc}$                           |                | dB        | 17                              |

|                       |   |              |         |
|-----------------------|---|--------------|---------|
| Io <sup>Note3</sup>   | Config 1,2,4,5  | dBm/9.36MHz  | [-59]   |
|                       | Config 3,6  | dBm/38.16MHz | [-61.9] |
| Propagation Condition |   |              | AWGN    |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |         |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.   |              |         |
| Note 3:               | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |         |
| Note 4:               | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. |              |         |

#### A.4.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.4.5.6.1.2 E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC

##### A.4.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirements for NR victim cell defined in clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [15]. Supported test configurations are shown in Table A.4.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.4.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of SCell's DL slot ( $i+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell no later than on the first UL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-2 starting from the first DL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}$ ).

E-UTRA PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

PSCell(Cell 2) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of SCell's DL slot ( $j+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell no later than on the first UL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-1 starting from the first DL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}$ ).

E-UTRA PCell(Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

PSCell(Cell 2) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell and NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in E-UTRA PCell and PSCell during BWP switch of SCell, respectively.

Table A.4.5.6.1.2.1-1: DL BWP switch supported test configurations

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode   |
| 2       | LTE FDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode   |
| 3       | LTE FDD, NR 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  |
| 4       | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode   |
| 5       | LTE TDD, NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode   |
| 6       | LTE TDD, NR 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  |
| Note 1: | The UE is only required to be tested in one of the supported test configurations   |
| Note 2: | A UE which fulfils the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.   |
| Note 3: | NR configuration is the same for PSCell and SCells.  |
| Note 4: | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration |

Table A.4.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC

| Parameter   | Unit          | Value  | Comment  |
|---|---------------|--------|--|
| E-UTRA RF Channel Number                                |               | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |               | 2, 3   | Two NR radio channel is used for this test     |
| Active PCell  |               | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |               | Cell 2 | PSCell on RF channel number 2.                 |
| Active SCell  |               | Cell 3 | SCell on RF channel number 3.                  |
| CP length   |               | Normal |  |
| DRX   |               | OFF    |  |
| <i>bwp-InactivityTimer</i>                              | ms            | [200]  |  |
| Cell-individual offset for cells on RF channel number 1 | dB            | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB            | 0      | Individual offset for cells on PSCC.           |
| Cell-individual offset for cells on RF channel number 3 | dB            | 0      | Individual offset for cells on SCC.            |
| Cell2 timing offset to cell1                            | $\mu\text{s}$ | 3      | Synchronous EN-DC                              |
| Cell3 timing offset to cell2                            | $\mu\text{s}$ | 3      | Synchronous cells                              |
| T1  | s             | [0.2]  |  |
| T2  | s             | [0.2]  |  |
| T3  | s             | [0.2]  |  |

Table A.4.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter                     |                | Unit | Cell 2                | Cell 3    |
|-------------------------------|----------------|------|-----------------------|-----------|
| Frequency Range               |                |      | FR1                   |           |
| Duplex mode                   | Config 1,4     |      | FDD                   |           |
|                               | Config 2,3,5,6 |      | TDD                   |           |
| TDD configuration             | Config 1,4     |      | Not Applicable        |           |
|                               | Config 2,5     |      | TDDConf.1.1           |           |
|                               | Config 3,6     |      | TDDConf.2.1           |           |
| $BW_{\text{channel}}$         | Config 1,4     |      | Note 7                |           |
|                               | Config 2,5     |      | Note 7                |           |
|                               | Config 3,6     |      | Note 7                |           |
| $BW_{\text{occupied}}$        | Config 1,4     | RB   | 52 <sup>Note 5</sup>  |           |
|                               | Config 2,5     |      | 52 <sup>Note 5</sup>  |           |
|                               | Config 3,6     |      | 106 <sup>Note 6</sup> |           |
| Active BWP ID                 |                |      | 0                     | 1,2       |
| Initial DL BWP Configuration  | Config 1,4     |      | DLBWP.0.2             | DLBWP.0.2 |
|                               | Config 2,5     |      |                       |           |
|                               | Config 3,6     |      |                       |           |
| Active DL BWP-0 Configuration | Config 1,4     |      | DLBWP.0.2             | N.A.      |
|                               | Config 2,5     |      |                       |           |
|                               | Config 3,6     |      |                       |           |

|   |                |              |                        |           |
|---|----------------|--------------|------------------------|-----------|
| Active DL BWP-1 Configuration                     | Config 1,4     |              | N.A.                   | DLBWP.1.3 |
|   | Config 2,5     |              |                        |           |
|   | Config 3,6     |              |                        |           |
| Active DL BWP-2 Configuration                     | Config 1,4     |              | N.A.                   | DLBWP.1.1 |
|   | Config 2,5     |              |                        |           |
|   | Config 3,6     |              |                        |           |
| Initial UL BWP Configuration                      | Config 1,4     |              | ULBWP.0.2              | N.A.      |
|   | Config 2,5     |              |                        |           |
|   | Config 3,6     |              |                        |           |
| Active UL BWP-0 Configuration                     | Config 1,4     |              | ULBWP.0.2              | N.A.      |
|   | Config 2,5     |              |                        |           |
|   | Config 3,6     |              |                        |           |
| Active UL BWP-1 Configuration                     | Config 1,4     |              | N.A.                   | N.A.      |
|   | Config 2,5     |              |                        |           |
|   | Config 3,6     |              |                        |           |
| Active UL BWP-2 Configuration                     | Config 1,4     |              | N.A.                   | N.A.      |
|   | Config 2,5     |              |                        |           |
|   | Config 3,6     |              |                        |           |
| PDSCH Reference measurement channel               | Config 1,4     |              | SR.1.1 FDD             |           |
|   | Config 2,5     |              | SR.1.1 TDD             |           |
|   | Config 3,6     |              | SR.2.1 TDD             |           |
| RMSI CORESET parameters                           | Config 1,4     |              | CR.1.1 FDD             |           |
|   | Config 2,5     |              | CR.1.1 TDD             |           |
|   | Config 3,6     |              | CR.2.1 TDD             |           |
| Dedicated CORESET parameters                      | Config 1,4     |              | CCR.1.2 FDD            |           |
|   | Config 2,5     |              | CCR.1.2 TDD            |           |
|   | Config 3,6     |              | CCR.2.4 TDD            |           |
| OCNG Patterns                                     | Config 1,2,4,5 |              | OP.1 <sup>Note 5</sup> |           |
|   | Config 3,6     |              | OP.1 <sup>Note 6</sup> |           |
| SSB Configuration                                 | Config 1,2,4,5 |              | SSB.1 FR1              |           |
|   | Config 3,6     |              | SSB.2 FR1              |           |
| SMTC Configuration                                |                |              | SMTC.1                 |           |
| TRS Configuration                                 | Config 1,4     |              | TRS.1.1 FDD            |           |
|   | Config 2,5     |              | TRS.1.1 TDD            |           |
|   | Config 3,6     |              | TRS.1.2 TDD            |           |
| Antenna Configuration                             |                |              | 1x2                    |           |
| Propagation Condition                             |                |              | AWGN                   |           |
| EPRE ratio of PSS to SSS                          |                | dB           | 0                      | 0         |
| EPRE ratio of PBCH DMRS to SSS                    |                |              |                        |           |
| EPRE ratio of PBCH to PBCH DMRS                   |                |              |                        |           |
| EPRE ratio of PDCCH DMRS to SSS                   |                |              |                        |           |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                |              |                        |           |
| EPRE ratio of PDSCH DMRS to SSS                   |                |              |                        |           |
| EPRE ratio of PDSCH to PDSCH                      |                |              |                        |           |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                |              |                        |           |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |                |              |                        |           |
| $N_{oc}$ <sup>Note 2</sup>                        |                |              |                        |           |
| SS-RSRP <sup>Note 3</sup>                         |                | dBm/15 kHz   | [-87]                  | [-87]     |
| $\bar{E}_s/I_{ot}$                                |                | dB           | 17                     | 17        |
| $\bar{E}_s/N_{oc}$                                |                | dB           | 17                     | 17        |
| $I_o$ <sup>Note 3</sup>                           | Config 1,2,4,5 | dBm/9.36MHz  | [-59]                  | [-59]     |
|   | Config 3,6     | dBm/38.16MHz | [-61.9]                | [-61.9]   |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$ . |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].                            |
| Note 5: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.  |
| Note 6: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$ , and $I_0$ is independent of the $BW_{channel}$ configured.   |
| Note 7: | $N_{RB,c}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$ .   |

#### A.4.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for SCell from the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK/NACK for SCell from the first UL slot that occurs after the beginning of DLslot  $(j+T_{BWPswitchDelay}+kI)$ .

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [15].

During T1, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

**NOTE:** During T1, T3 if there are no uplink resources for reporting the ACK in the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

*Editor's note: FFS value of  $kI$  for type 1 and type 2 UE.*

## A.4.5.6.2 RRC-based Active BWP Switch

### A.4.5.6.2.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

#### A.4.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.4.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.4.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.4.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PSCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

If the *RRCReconfiguration* is embedded in E-UTRA RRC message, time period T1 starts when a E-UTRA RRC message *RRCConnectionReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side from PCell in PSCell's slot # denoted *i*. Otherwise, i.e., if the *RRCReconfiguration* is not embedded in E-UTRA RRC message, time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in from PSCell in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ).

$T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.



**Table A.4.5.6.2.1.1-1: DL BWP switch supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6  | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.4.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit    | Value  | Comment  |
|---|---------|--------|--|
| E-UTRA RF Channel Number                                |         | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |         | 2      | One NR radio channel is used for this test     |
| Active PCell  |         | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |         | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |         | Normal |  |
| DRX   |         | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB      | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB      | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | $\mu$ s | 3      | Synchronous EN-DC                              |
| T1  | s       | [0.2]  |  |

**Table A.4.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter                           |                               | Unit       | Cell 2                          |           |
|-------------------------------------|-------------------------------|------------|---------------------------------|-----------|
| <b>Frequency Range</b>              |                               |            | <b>FR1</b>                      |           |
| Duplex mode                         | Config 1,4                    |            | FDD                             |           |
|                                     | Config 2,3,5,6                |            | TDD                             |           |
| TDD configuration                   | Config 1,4                    |            | Not Applicable                  |           |
|                                     | Config 2,5                    |            | TDDConf.1.1                     |           |
|                                     | Config 3,6                    |            | TDDConf.2.1                     |           |
| BW <sub>channel</sub>               | Config 1,4                    |            | 10 MHz: N <sub>RB,c</sub> = 52  |           |
|                                     | Config 2,5                    |            | 10 MHz: N <sub>RB,c</sub> = 52  |           |
|                                     | Config 3,6                    |            | 40 MHz: N <sub>RB,c</sub> = 106 |           |
| Active DL BWP ID                    |                               |            | 1, 2                            |           |
| Initial DL BWP Configuration        | Config 1,4                    |            | DLBWP.0.2                       |           |
|                                     | Config 2,5                    |            |                                 |           |
|                                     | Config 3,6                    |            |                                 |           |
| Initial UL BWP Configuration        | Config 1,4                    |            | ULBWP.0.2                       |           |
|                                     | Config 2,5                    |            |                                 |           |
|                                     | Config 3,6                    |            |                                 |           |
| Initial Condition                   | Active DL BWP-1 Configuration | Config 1,4 | DLBWP.1.3                       |           |
|                                     |                               | Config 2,5 |                                 |           |
|                                     |                               | Config 3,6 |                                 |           |
|                                     | Active UL BWP-1 Configuration | Config 1,4 |                                 | ULBWP.1.3 |
|                                     |                               | Config 2,5 |                                 |           |
|                                     |                               | Config 3,6 |                                 |           |
| Final Condition                     | Active DL BWP-1 Configuration | Config 1,4 | DLBWP.1.1                       |           |
|                                     |                               | Config 2,5 |                                 |           |
|                                     |                               | Config 3,6 |                                 |           |
|                                     | Active UL BWP-1 Configuration | Config 1,4 |                                 | ULBWP.1.1 |
|                                     |                               | Config 2,5 |                                 |           |
|                                     |                               | Config 3,6 |                                 |           |
| Initial UL BWP Configuration        | Config 1,4                    |            | ULBWP.0.2                       |           |
|                                     | Config 2,5                    |            |                                 |           |
|                                     | Config 3,6                    |            |                                 |           |
| Active UL BWP-1 Configuration       | Config 1,4                    |            | ULBWP.1.3                       |           |
|                                     | Config 2,5                    |            |                                 |           |
|                                     | Config 3,6                    |            |                                 |           |
| Active UL BWP-2 Configuration       | Config 1,4                    |            | ULBWP.1.1                       |           |
|                                     | Config 2,5                    |            |                                 |           |
|                                     | Config 3,6                    |            |                                 |           |
| PDSCH Reference measurement channel | Config 1,4                    |            | SR.1.1 FDD                      |           |
|                                     | Config 2,5                    |            | SR.1.1 TDD                      |           |
|                                     | Config 3,6                    |            | SR.2.1 TDD                      |           |
| RMSI CORESET parameters             | Config 1,4                    |            | CR.1.1 FDD                      |           |
|                                     | Config 2,5                    |            | CR.1.1 TDD                      |           |
|                                     | Config 3,6                    |            | CR.2.1 TDD                      |           |
| Dedicated CORESET parameters        | Config 1,4                    |            | CCR.1.2 FDD                     |           |
|                                     | Config 2,5                    |            | CCR.1.2 TDD                     |           |
|                                     | Config 3,6                    |            | CCR.2.4 TDD                     |           |
| OCNG Patterns                       |                               |            | OP.1                            |           |
| SSB Configuration                   | Config 1,2,4,5                |            | SSB.1 FR1                       |           |
|                                     | Config 3,6                    |            | SSB.2 FR1                       |           |
| SMTc Configuration                  |                               |            | SMTc.1                          |           |
| TRS Configuration                   | Config 1,4                    |            | TRS.1.1 FDD                     |           |
|                                     | Config 2,5                    |            | TRS.1.1 TDD                     |           |
|                                     | Config 3,6                    |            | TRS.1.2 TDD                     |           |
| Antenna Configuration               |                               |            | 1x2                             |           |
| Propagation Condition               |                               |            | AWGN                            |           |
| EPRE ratio of PSS to SSS            |                               | dB         | 0                               |           |
| EPRE ratio of PBCH DMRS to SSS      |                               |            |                                 |           |
| EPRE ratio of PBCH to PBCH DMRS     |                               |            |                                 |           |
| EPRE ratio of PDCCH DMRS to SSS     |                               |            |                                 |           |
| EPRE ratio of PDCCH to PDCCH DMRS   |                               |            |                                 |           |
| EPRE ratio of PDSCH DMRS to SSS     |                               |            |                                 |           |

|  |                |                  |         |
|--|----------------|------------------|---------|
| EPRE ratio of PDSCH to PDSCH   |                |                  |         |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                |                  |         |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                |                  |         |
| $N_{oc}$ <sup>Note 2</sup>   |                | dBm/15 kHz       | [-104]  |
| SS-RSRP <sup>Note 3</sup>  |                | dBm/15 kHz       | [-87]   |
| $\hat{E}_s/I_{ot}$   |                | dB               | 17      |
| $\hat{E}_s/N_{oc}$   |                | dB               | 17      |
| $I_o$ <sup>Note3</sup>   | Config 1,2,4,5 | dBm/9.36MHz      | [-59]   |
|  | Config 3,6     | dBm/38.16MH<br>z | [-61.9] |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |                |                  |         |

#### A.4.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot ( $i + T_{RRCPprocessingDelay} + T_{BWPswitchDelayRRC}$ ).

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

#### A.4.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

##### A.4.5.6.3.1 Simultaneous E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in EN-DC on multiple CCs

###### A.4.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirement of DL BWP switch delay on multiple CCs in TS38.133 clause 8.6.2A.1, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.32.2.7. Supported test configurations are shown in Table A.4.5.6.3.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.3.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.4.5.6.3.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration T2 when BWPs are switching on Cell 2 and Cell 3.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3(SCell) on radio channel 3.
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell and SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $i$ . The UE shall switch its PSCell bandwidth part from BWP-1 to BWP-2. On the same slot on Cell 3 test equipment shall send a DCI format 1\_1 command for SCell DL BWP switch. The UE shall switch its SCell bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on PSCell and SCell at the beginning of the DL slot right after DL slot ( $i + T_{MultipleBWPswitchDelay}$ ) as defined in clause 8.6.2A.1 and starts to report valid ACK/NACK for the PSCell and SCell no later than at the beginning of the DL slot right after DL slot ( $i + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on both PCell's and SCell's BWP-2 starting from the beginning of the DL slot right after DL slot ( $i + T_{MultipleBWPswitchDelay}$ ).

The starting time of PCell(Cell 1) interruption due to BWP switch on PSCell and SCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2) and SCell(Cell 3).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the *bwp-InactivityTimer* timer expires on PSCell. *bwp-InactivityTimer* timer on SCell shall also expire on slot # $j$ . The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1 on both PSCell and SCell. The UE shall be able to receive PDSCH on both PSCell and SCell at the beginning of the DL slot right after DL slot ( $j + T_{MultipleBWPswitchDelay}$ ) as defined in clause 8.6.2B.1 and starts to report valid ACK/NACK for the PSCell and SCell at latest at the beginning of the DL slot right after DL slot ( $j + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on both PSCell's and SCell's BWP-1 starting from the beginning of the DL slot right after DL slot ( $j + T_{MultipleBWPswitchDelay}$ ).

The starting time of PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell and SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell and SCell.

**Table A.4.5.6.3.1.1-1: DL BWP switch supported test configurations**

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

**Table A.4.5.6.3.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2,3    | Two NR radio channels are used for this test   |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| Active SCell  |      | Cell 3 | SCell on RF channel number 3.                  |
| CP length   |      | Normal |  |
| DRX   |      | OFF    | For both PCell and PSCell                      |
| <i>bwp-InactivityTimer</i>                              | ms   | [200]  | For both PSCell and SCell                      |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell-individual offset for cells on RF channel number 3 | dB   | 0      | Individual offset for cells on SCC.            |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| Cell3 timing offset to cell2                            | μs   | 3      | Synchronous EN-DC                              |
| T1  | s    | [0.2]  |  |
| T2  | s    | [0.2]  |  |
| T3  | s    | [0.2]  |  |

**Table A4.5.6.3.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   |                | Unit      | Cell 2                          | Cell 3 |
|---|----------------|-----------|---------------------------------|--------|
| Frequency Range                                   |                |           | FR1                             |        |
| Duplex mode                                       | Config 1,4     |           | FDD                             |        |
|   | Config 2,3,5,6 |           | TDD                             |        |
| TDD configuration                                 | Config 1,4     |           | Not Applicable                  |        |
|   | Config 2,5     |           | TDDConf.1.1                     |        |
|   | Config 3,6     |           | TDDConf.2.1                     |        |
| BW <sub>channel</sub>                             | Config 1,4     |           | 10 MHz: N <sub>RB,c</sub> = 52  |        |
|   | Config 2,5     |           | 10 MHz: N <sub>RB,c</sub> = 52  |        |
|   | Config 3,6     |           | 40 MHz: N <sub>RB,c</sub> = 106 |        |
| Active BWP ID                                     |                |           | 1, 2                            |        |
| Initial DL BWP Configuration                      | Config 1,4     |           | DLBWP.0.2 <i>Note 4</i>         |        |
|   | Config 2,5     |           |                                 |        |
|   | Config 3,6     |           |                                 |        |
| Active DL BWP-1 Configuration                     | Config 1,4     |           | DLBWP.1.1 <i>Note 4</i>         |        |
|   | Config 2,5     |           |                                 |        |
|   | Config 3,6     |           |                                 |        |
| Active DL BWP-2 Configuration                     | Config 1,4     |           | DLBWP.1.3 <i>Note 4</i>         |        |
|   | Config 2,5     |           |                                 |        |
|   | Config 3,6     |           |                                 |        |
| Initial UL BWP Configuration                      | Config 1,4     |           | ULBWP.0.2 <i>Note 4</i>         |        |
|   | Config 2,5     |           |                                 |        |
|   | Config 3,6     |           |                                 |        |
| Active UL BWP-1 Configuration                     | Config 1,4     |           | ULBWP.1.1 <i>Note 4</i>         |        |
|   | Config 2,5     |           |                                 |        |
|   | Config 3,6     |           |                                 |        |
| Active UL BWP-2 Configuration                     | Config 1,4     |           | ULBWP.1.3 <i>Note 4</i>         |        |
|   | Config 2,5     |           |                                 |        |
|   | Config 3,6     |           |                                 |        |
| PDSCH Reference measurement channel               | Config 1,4     |           | SR.1.1 FDD                      |        |
|   | Config 2,5     |           | SR.1.1 TDD                      |        |
|   | Config 3,6     |           | SR.2.1 TDD                      |        |
| RMSI CORESET parameters                           | Config 1,4     |           | CR.1.1 FDD                      |        |
|   | Config 2,5     |           | CR.1.1 TDD                      |        |
|   | Config 3,6     |           | CR.2.1 TDD                      |        |
| Dedicated CORESET parameters                      | Config 1,4     |           | CCR.1.1 FDD                     |        |
|   | Config 2,5     |           | CCR.1.1 TDD                     |        |
|   | Config 3,6     |           | CCR.2.1 TDD                     |        |
| OCNG Patterns                                     |                |           | OP.1                            |        |
| SSB Configuration                                 | Config 1,2,4,5 |           | SSB.1 FR1                       |        |
|   | Config 3,6     |           | SSB.2 FR1                       |        |
| SMTC Configuration                                |                |           | SMTC.1                          |        |
| Correlation Matrix and Antenna Configuration      |                |           | 1x2 Low                         |        |
| TRS Configuration                                 | Config 1,4     |           | TRS.1.1 FDD                     |        |
|   | Config 2,5     |           | TRS.1.1 TDD                     |        |
|   | Config 3,6     |           | TRS.1.2 TDD                     |        |
| EPRE ratio of PSS to SSS                          |                | dB        | 0                               |        |
| EPRE ratio of PBCH DMRS to SSS                    |                |           |                                 |        |
| EPRE ratio of PBCH to PBCH DMRS                   |                |           |                                 |        |
| EPRE ratio of PDCCH DMRS to SSS                   |                |           |                                 |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                |           |                                 |        |
| EPRE ratio of PDSCH DMRS to SSS                   |                |           |                                 |        |
| EPRE ratio of PDSCH to PDSCH                      |                |           |                                 |        |
| EPRE ratio of OCNG DMRS to SSS( <i>Note 1</i> )   |                |           |                                 |        |
| EPRE ratio of OCNG to OCNG DMRS ( <i>Note 1</i> ) |                |           |                                 |        |
| N <sub>oc</sub> <sup><i>Note 2</i></sup>          | Config 1,2,4,5 | dBm/SCS   | [-104]                          |        |
|   | Config 3,6     |           | [-101]                          |        |
| N <sub>oc</sub> <sup><i>Note 2</i></sup>          |                | dBm/15kHz | [-104]                          |        |
| SS-RSRP <sup><i>Note 3</i></sup>                  | Config 1,2,4,5 | dBm/SCS   | [-87]                           |        |
|   | Config 3,6     |           | [-90]                           |        |



|  |                |                  |         |
|--|----------------|------------------|---------|
| $\dot{E}_s/I_{ot}$   |                | dB               | [17]    |
| $\dot{E}_s/N_{oc}$   |                | dB               | [17]    |
| $I_{o}^{Note3}$  | Config 1,2,4,5 | dBm/<br>9.36MHz  | [-59]   |
|  | Config 3,6     | dBm/<br>38.16MHz | [-61.9] |
| Propagation Condition  |                |                  | AWGN    |
| Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                |                  |         |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                |                  |         |
| Note 3: SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                |                  |         |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |                |                  |         |

#### A.4.5.6.3.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ( $i + T_{MultipleBWPswitchDelay} + kI$ ).

During T3, the UE shall start to send the ACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ( $j + T_{MultipleBWPswitchDelay} + kI$ ).

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability, UE shall finish BWP switch within the time duration  $T_{MultipleBWPswitchDelay}$  defined in 8.6.2A.1.

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

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

During T1, the start time of PCell interruption during PSCell and SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell and SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot ( $i + T_{MultipleBWPswitchDelay} + kI$ ), ( $j + T_{MultipleBWPswitchDelay} + kI$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.4.5.6.4 SCell dormancy switch

##### A.4.5.6.4.1 E-UTRAN – NR FR1 PSCell SCell dormancy switch of single FR1 SCell outside active time

###### A.4.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL dormant BWP switch delay requirement defined in clause 8.6, and interruption requirements for NR victim cell defined in clause 8.2.1.2.15 and interruption requirement for E-UTRA victim cell defined in clause 7.32 of TS 36.133 [15]. Supported test configurations are shown in Table A.4.5.6.4.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.4.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.4.5.6.4.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when the SCell is in dormancy during T2.

The UE is configured to monitor PDCCH for DCI format 2\_6 at *ps-Offset* before the start of *onDuration*. Two tests are specified, where a UE that only supports triggering within the first three OFDM symbols of a slot shall undergo Test1 only, and a UE that supports triggering also in remaining OFDM symbols of a slot shall undergo both Test1 and Test2. In the tested scenario, *ps-Offset* is selected to correspond to the dormancy switching time specified in clause 8.6.2A.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-1 in Cell 3 before starting the test.
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB. BWP-1 is configured in *OutsideActiveTimeConfig* as *firstOutsideActiveTimeBWP*. BWP-2 is configured as *dormantBWP*.
- UE is configured with RRM measurement on SCC.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is configured to monitor DCI format 2\_6, and to be active during *onDuration* even when no DCI format 2\_6 is detected (*ps-WakeUp*).

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

Time period T1 starts when a DCI format 2\_6 command for SCell switch from non-dormant to dormancy, sent from the test equipment to the UE, is received at the UE side at *ps-Offset* before *onDuration*. The UE shall switch its SCell bandwidth part from BWP-1 to BWP-2 into dormancy. During T1, test equipment verifies that:

The UE shall be able to receive CSI-RS on SCell BWP-2 at the beginning of the DL slot right after SCell's DL slot ( $i+T_{dormantBWPswitchDelay}$ ) as defined in clause 8.6. TE shall observe the periodic reporting of CQI for SCell starting from slot ( $i+T_{dormantBWPswitchDelay}$ ).

PCell (Cell 1) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

PSCell (Cell 2) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

Time period T2 starts when T1 is completed. During T2, the test equipment continues to schedule the UE continuously in PCell and PSCell. The UE shall carry out CSI and RRM measurements on the dormant SCells. The UE shall report ACK/NACK in PCell and PSCell in response to scheduled PDSCH, with the maximum loss of transmitted ACK/NACKs fulfilling the requirement in clause 8.2.1.2.15. The test equipment verifies that the loss of ACK/NACKs is no larger than 1.5%.

Time period T3 starts when T2 is completed. During T3, the test equipment does not schedule the UE, by which the inactivity timer expires and the UE stops monitoring PDCCH except for signalling using DCI format 2\_6 at wake-up signalling occasions.

Time period T4 starts when the UE at *ps-Offset* before *onDuration* detects a DCI format 2\_6 carrying dormancy indication that indicates that SCell1 and SCell2 are to be switched from dormancy to non-dormancy. During T4, the test equipment schedules the UE with new data indication in PCell, PSCell and SCell during *onDuration*. The test equipment verifies that:

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $j+T_{dormantBWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell at latest at the beginning of the DL slot right after slot ( $j+T_{dormantBWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on SCell's BWP-1 starting from the beginning of the DL slot right after slot ( $j+T_{dormantBWPswitchDelay}$ ).

PCell (Cell 1) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

PSCell (Cell 2) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

**Table A.4.5.6.4.1.1-1: DL BWP switch supported test configurations**

| Config  | Description   |
|---------|---|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3       | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode   |
| 6       | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: | The UE is only required to be tested in one of the supported test configurations  |
| Note 2: | A UE which fulfils the requirements in the test case in clause A.4.5.6.4.2 can skip the test cases in current clause A.4.5.6.4.1. |
| Note 3: | NR configuration is the same for PSCell and SCells.   |

Table A.4.5.6.4.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

| Parameter  | Unit | Value                      |        | Comment   |
|--|------|----------------------------|--------|---|
|  |      | Test1                      | Test2  |   |
| E-UTRA RF Channel Number   |      | 1                          |        | One E-UTRA radio channel is used for this test  |
| NR RF Channel Number   |      | 2, 3                       |        | Two NR radio channel is used for this test  |
| Active PCell   |      | Cell 1                     |        | PCell on RF channel number 1.   |
| Active PSCell  |      | Cell 2                     |        | PSCell on RF channel number 2.  |
| Active SCell   |      | Cell 3                     |        | SCell on RF channel number 3.   |
| CP length  |      | Normal                     |        |   |
| CSI reporting periodicity, Non-dormant BWP                                 | ms   | 2                          |        | CSI reporting periodicity for periodic reporting of CQI for PCell and non-dormant SCells  |
| CSI reporting periodicity, Dormant BWP                                     | ms   | 40                         |        | CSI reporting periodicity for periodic reporting of CQI for dormant SCells  |
| ps-Offset  |      | Depending on UE capability |        | Monitoring of DCI 2_6 ahead of start of drx-onDurationTimer. Value of ps-Offset shall correspond to SCell dormancy switching time for switching of two SCells, as specified in clause 8.6.2A. Actual value depends on reported UE capabilities. |
| ps-WakeUp  |      | true                       |        | Wake up for onDuration in case DCI format 2_6 is not detected.  |
| DRX  |      | DRX.1                      |        |   |
| <i>'bwp-InactivityTimer</i>  | ms   | 200                        |        |   |
| Cell-individual offset for cells on RF channel number 1                    | dB   | 0                          |        | Individual offset for cells on PCC.   |
| Cell-individual offset for cells on RF channel number 2                    | dB   | 0                          |        | Individual offset for cells on PSCC.  |
| Cell-individual offset for cells on RF channel number 3                    | dB   | 0                          |        | Individual offset for cells on SCC.   |
| Cell2 timing offset to cell1   | μs   | 3                          |        | Synchronous EN-DC   |
| Cell3 timing offset to cell2   | μs   | 3                          |        | Synchronous cells   |
| Number of CSI-RS ports   |      | 4                          |        | The number of CSI-RS ports in a single resource without CRI report  |
| OFDM symbol range in slot for transmission of DCI with dormancy indication |      | 0 – 2                      | 3 – 11 | Test1 is based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 is based on that the triggering DCI is received later than within the first three OFDM symbols of a slot.                                |
| T1   | s    | 0.2                        |        |   |
| T2   | s    | 10                         |        |   |
| T3   | s    | 0.2                        |        |   |
| T4   | s    | 0.2                        |        |   |

**Table A.4.5.6.4.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   |                | Unit       | Cell 2                          | Cell 3    |
|---|----------------|------------|---------------------------------|-----------|
| Frequency Range                                   |                |            | FR1                             |           |
| Duplex mode                                       | Config 1,4     |            | FDD                             |           |
|   | Config 2,3,5,6 |            | TDD                             |           |
| TDD configuration                                 | Config 1,4     |            | Not Applicable                  |           |
|   | Config 2,5     |            | TDDConf.1.1                     |           |
|   | Config 3,6     |            | TDDConf.1.2                     |           |
| BW <sub>channel</sub>                             | Config 1,4     |            | 10 MHz: N <sub>RB,c</sub> = 52  |           |
|   | Config 2,5     |            | 10 MHz: N <sub>RB,c</sub> = 52  |           |
|   | Config 3,6     |            | 40 MHz: N <sub>RB,c</sub> = 106 |           |
| Active BWP ID                                     |                |            | 1, 2                            | 0         |
| Initial BWP Configuration                         | Config 1,4     |            | DLBWP.0.2                       | DLBWP.0.2 |
|   | Config 2,5     |            |                                 |           |
|   | Config 3,6     |            |                                 |           |
| Active BWP-0 Configuration                        | Config 1,4     |            | NA                              | DLBWP.0.2 |
|   | Config 2,5     |            |                                 |           |
|   | Config 3,6     |            |                                 |           |
| Active BWP-1 Configuration                        | Config 1,4     |            | DLBWP.1.3                       | NA        |
|   | Config 2,5     |            |                                 |           |
|   | Config 3,6     |            |                                 |           |
| Active BWP-2 Configuration                        | Config 1,4     |            | DLBWP.1.1                       | NA        |
|   | Config 2,5     |            |                                 |           |
|   | Config 3,6     |            |                                 |           |
| PDSCH Reference measurement channel               | Config 1,4     |            | SR.1.1 FDD                      |           |
|   | Config 2,5     |            | SR.1.1 TDD                      |           |
|   | Config 3,6     |            | SR2.1 TDD                       |           |
| RMSI CORESET parameters                           | Config 1,4     |            | CR.1.1 FDD                      |           |
|   | Config 2,5     |            | CR.1.1 TDD                      |           |
|   | Config 3,6     |            | CR2.1 TDD                       |           |
| Dedicated CORESET parameters, Test 1              | Config 1,4     |            | CCR.1.1 FDD                     |           |
|   | Config 2,5     |            | CCR.1.1 TDD                     |           |
|   | Config 3,6     |            | CCR.2.1 TDD                     |           |
| Dedicated CORESET parameters, Test 2              | Config 1,4     |            | CCR.1.5 FDD                     |           |
|   | Config 2,5     |            | CCR.1.5 TDD                     |           |
|   | Config 3,6     |            | CCR.2.3 TDD                     |           |
| OCNG Patterns                                     |                |            | OP.1                            |           |
| SSB Configuration                                 | Config 1,2,4,5 |            | SSB.1 FR1                       |           |
|   | Config 3,6     |            | SSB.2 FR1                       |           |
| SMTTC Configuration                               |                |            | SMTTC.1                         |           |
| TRS Configuration                                 | Config 1,4     |            | TRS.1.1 FDD                     |           |
|   | Config 2,5     |            | TRS.1.1 TDD                     |           |
|   | Config 3,6     |            | TRS.1.2 TDD                     |           |
| Antenna Configuration                             |                |            | 1x2                             |           |
| Propagation Condition                             |                |            | AWGN                            |           |
| EPRE ratio of PSS to SSS                          |                |            |                                 |           |
| EPRE ratio of PBCH DMRS to SSS                    |                |            |                                 |           |
| EPRE ratio of PBCH to PBCH DMRS                   |                |            |                                 |           |
| EPRE ratio of PDCCH DMRS to SSS                   |                |            |                                 |           |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                |            |                                 |           |
| EPRE ratio of PDSCH DMRS to SSS                   |                |            |                                 |           |
| EPRE ratio of PDSCH to PDSCH                      |                |            |                                 |           |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                |            |                                 |           |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |                |            |                                 |           |
| N <sub>oc</sub> <sup>Note 2</sup>                 |                | dBm/15 kHz | -104                            | -104      |
| SS-RSRP <sup>Note 3</sup>                         |                | dBm/15 kHz | -87                             | -87       |
| E <sub>s</sub> /I <sub>ot</sub>                   |                | dB         | 17                              | 17        |
| E <sub>s</sub> /N <sub>oc</sub>                   |                | dB         | 17                              | 17        |
| I <sub>o</sub> <sup>Note 3</sup>                  | Config 1,2,4,5 | -59        | -59                             | [-59]     |
|   | Config 3,6     | -61.9      | -61.9                           | [-61.9]   |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and $l_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |

#### A.4.5.6.4.1.2 Test Requirements

During T1, any interruption on PCell and PSCell due to dormancy switching of SCell shall be within the requirement specified in clause 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell. Starting from *onDuration* in time period T1, the UE shall transmit ACK/NACK in response to scheduling in PCell and PSCell. There shall be no loss of ACK/NACK.

During time period T2, the UE shall transmit ACK/NACKs in response to scheduling in PCell and the rate of missed ACK/NACKs shall be no more than 1.5%.

During T1, any interruption on PCell and PSCell due to dormancy switching of SCell shall be within the requirement specified in clause 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell. Starting from *onDuration* in time period T4, the UE shall transmit ACK/NACK in response to scheduling in PCell, SCell1 and SCell2. There shall be no loss of ACK/NACK.

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

#### A.4.5.6.4.2 E-UTRAN – NR FR1 PSCell SCell dormancy switch of two FR1 SCells inside active time

##### A.4.5.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify the delay requirement of BWP switching from dormancy to non-dormancy and from non-dormancy to dormancy on SCell defined in clause 8.6.2, and interruption requirements for NR victim cell defined in clause 8.2.1.2.15 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [15]. Supported test configurations are shown in Table A.4.5.6.4.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and two NR SCells (Cell 3, and Cell 4) as given in Table A.4.5.6.4.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCells are specified in Table A.4.5.6.4.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3, and Cell 4) to ensure that the UE would have ACK/NACK sending except for the time duration when SCell (Cell2) performs the dormancy switching and stays in the dormant BWP.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC), Cell 3 (SCell) on radio channel 3 (SCC) and Cell 4 (SCell) on radio channel 4 (SCC).
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0, in Cell 2 before starting the test. BWP-0 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 2 UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2 in Cell 3 and Cell 4 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PSCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in all SCells.

- UE is indicated in *dormantBWP-Id* that the dormant BWP is BWP-2 in all SCells.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for entering dormant BWP in SCell, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. Upon reception of the PDCCH indicating entering dormant BWP in PCell, UE shall switch the DL BWP-1 to DL BWP-2 in all SCells, i.e., switching from non-dormant BWP to dormant BWP.

The UE shall be able to receive PDSCH and report valid ACK/NACK on the PCell and PSCell all the time except interruption.

The starting time of PCell (Cell 1) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

The starting time of PSCell (Cell 2) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on all SCells.

The UE shall be able to receive PDSCH and report valid ACK/NACK on the PCell and PSCell all the time except interruption.

During T3,

Time period T3 starts when a DCI format 1\_1 command for leaving dormant BWP in SCells, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *j*. Upon reception of the PDCCH indicating leaving dormant BWP in PSCell, UE shall switch the DL BWP-2 to DL BWP-1 in SCells, i.e., switching from dormant BWP to non-dormant BWP.

The UE shall be able to receive PDSCH on all SCells no later than the first DL slot that occurs after the beginning of PSCell's DL slot ( $j + T_{\text{multipleDormantBWPSwitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK on all SCells no later than the first UL slot that occurs after the beginning of slot ( $j+N$ ) as defined in clause 10.3 in TS38.213.

The UE shall be able to receive PDSCH and report valid ACK/NACK on the PCell and PSCell all the time except interruption.

The starting time of PCell (Cell 1) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

The starting time of PSCell (Cell 2) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

The test equipment verifies that potential interruption to E-UTRA PCell and NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell and PSCell during dormant BWP switch of SCells, respectively.



Table A.4.5.6.4.2.1-1: Dormant BWP switch supported test configurations

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6  | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations   |   |
| Note 2: A UE which fulfils the requirements in the test case in current clause A.4.5.6.4.2 can skip the test cases in clause A.4.5.6.4.1 |   |
| Note 3: NR configuration is the same for PSCell and SCells.  |   |

Table A.4.5.6.4.2.1-2: General test parameters for Dormant BWP switch in synchronous EN-DC

| Parameter  | Unit | Value   |        | Comment  |
|--|------|---------|--------|--|
|  |      | Test 1  | Test 2 |  |
| E-UTRA RF Channel Number   |      | 1       |        | One E-UTRA radio channel is used for this test |
| NR RF Channel Number   |      | 2, 3, 4 |        | Three NR radio channels are used for this test |
| Active PCell   |      | Cell 1  |        | PCell on RF channel number 1.                  |
| Active PSCell  |      | Cell 2  |        | PSCell on RF channel number 2.                 |
| Active SCell   |      | Cell 3  |        | SCell on RF channel number 3.                  |
| Active SCell   |      | Cell 4  |        | SCell on RF channel number 4.                  |
| CP length  |      | Normal  |        |  |
| DRX  |      | OFF     |        |  |
| <i>bwp-InactivityTimer</i>   | ms   | 200     |        |  |
| Cell-individual offset for cells on RF channel number 1                    | dB   | 0       |        | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2                    | dB   | 0       |        | Individual offset for cells on PSCC.           |
| Cell-individual offset for cells on RF channel number 3                    | dB   | 0       |        | Individual offset for cells on SCC.            |
| Cell2 timing offset to cell1   | μs   | 3       |        | Synchronous EN-DC                              |
| Cell3 timing offset to cell2   | μs   | 3       |        | Synchronous cells                              |
| Cell4 timing offset to cell2   | μs   | 3       |        | Synchronous cells                              |
| OFDM symbol range in slot for transmission of DCI with dormancy indication |      | 0 – 2   | 3 – 11 |  |
| T1   | s    | 0.2     |        |  |
| T2   | s    | 0.2     |        |  |
| T3   | s    | 0.2     |        |  |

**Table A.4.5.6.4.2.1-3: NR Cell specific test parameters for Dormant BWP switch in synchronous EN-DC**

| Parameter   |                | Unit         | Cell 2                          | Cell 3    | Cell 4 |
|---|----------------|--------------|---------------------------------|-----------|--------|
| Frequency Range                                   |                |              | FR1                             |           |        |
| Duplex mode                                       | Config 1,4     |              | FDD                             |           |        |
|   | Config 2,3,5,6 |              | TDD                             |           |        |
| TDD configuration                                 | Config 1,4     |              | Not Applicable                  |           |        |
|   | Config 2,5     |              | TDDConf.1.1                     |           |        |
|   | Config 3,6     |              | TDDConf.1.2                     |           |        |
| BW <sub>channel</sub>                             | Config 1,4     |              | 10 MHz: N <sub>RB,c</sub> = 52  |           |        |
|   | Config 2,5     |              | 10 MHz: N <sub>RB,c</sub> = 52  |           |        |
|   | Config 3,6     |              | 40 MHz: N <sub>RB,c</sub> = 106 |           |        |
| Active BWP ID                                     |                |              | 0                               | 1, 2      |        |
| Initial BWP Configuration                         | Config 1,4     |              | DLBWP.0.2                       | NA        |        |
|   | Config 2,5     |              |                                 |           |        |
|   | Config 3,6     |              |                                 |           |        |
| Active BWP-0 Configuration                        | Config 1,4     |              | DLBWP.0.2                       | NA        |        |
|   | Config 2,5     |              |                                 |           |        |
|   | Config 3,6     |              |                                 |           |        |
| Active BWP-1 Configuration                        | Config 1,4     |              | NA                              | DLBWP.1.1 |        |
|   | Config 2,5     |              |                                 |           |        |
|   | Config 3,6     |              |                                 |           |        |
| Active BWP-2 Configuration                        | Config 1,4     |              | NA                              | DLBWP.1.3 |        |
|   | Config 2,5     |              |                                 |           |        |
|   | Config 3,6     |              |                                 |           |        |
| PDSCH Reference measurement channel               | Config 1,4     |              | SR.1.1 FDD                      |           |        |
|   | Config 2,5     |              | SR.1.1 TDD                      |           |        |
|   | Config 3,6     |              | SR2.1 TDD                       |           |        |
| RMSI CORESET parameters                           | Config 1,4     |              | CR.1.1 FDD                      |           |        |
|   | Config 2,5     |              | CR.1.1 TDD                      |           |        |
|   | Config 3,6     |              | CR2.1 TDD                       |           |        |
| Dedicated CORESET parameters, Test 1              | Config 1,4     |              | CCR.1.1 FDD                     |           |        |
|   | Config 2,5     |              | CCR.1.1 TDD                     |           |        |
|   | Config 3,6     |              | CCR.2.1 TDD                     |           |        |
| Dedicated CORESET parameters, Test 2              | Config 1,4     |              | CCR.1.5 FDD                     |           |        |
|   | Config 2,5     |              | CCR.1.5 TDD                     |           |        |
|   | Config 3,6     |              | CCR.2.3 TDD                     |           |        |
| OCNG Patterns                                     |                |              | OP.1                            |           |        |
| SSB Configuration                                 | Config 1,2,4,5 |              | SSB.1 FR1                       |           |        |
|   | Config 3,6     |              | SSB.2 FR1                       |           |        |
| SMTTC Configuration                               |                |              | SMTTC.1                         |           |        |
| TRS Configuration                                 | Config 1,4     |              | TRS.1.1 FDD                     |           |        |
|   | Config 2,5     |              | TRS.1.1 TDD                     |           |        |
|   | Config 3,6     |              | TRS.1.2 TDD                     |           |        |
| Antenna Configuration                             |                |              | 1x2                             |           |        |
| Propagation Condition                             |                |              | AWGN                            |           |        |
| EPRE ratio of PSS to SSS                          |                | dB           | 0                               | 0         |        |
| EPRE ratio of PBCH DMRS to SSS                    |                |              |                                 |           |        |
| EPRE ratio of PBCH to PBCH DMRS                   |                |              |                                 |           |        |
| EPRE ratio of PDCCH DMRS to SSS                   |                |              |                                 |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                |              |                                 |           |        |
| EPRE ratio of PDSCH DMRS to SSS                   |                |              |                                 |           |        |
| EPRE ratio of PDSCH to PDSCH                      |                |              |                                 |           |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                |              |                                 |           |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |                |              |                                 |           |        |
| N <sub>oc</sub> <sup>Note 2</sup>                 |                | dBm/15 kHz   | -104                            | -104      |        |
| SS-RSRP <sup>Note 3</sup>                         |                | dBm/15 kHz   | -87                             | -87       |        |
| E <sub>s</sub> /I <sub>ot</sub>                   |                | dB           | 17                              | 17        |        |
| E <sub>s</sub> /N <sub>oc</sub>                   |                | dB           | 17                              | 17        |        |
| I <sub>o</sub> <sup>Note3</sup>                   | Config 1,2,4,5 | dBm/9.36MHz  | -59                             | -59       |        |
|   | Config 3,6     | dBm/38.16MHz | -61.9                           | -61.9     |        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and $l_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |

#### A.4.5.6.4.2.2 Test Requirements

During T1, the UE shall be able to send the ACK/NACK for all SCells before UE PDCCH indicating entering dormant BWP is received in PSCell's slot # denoted.

During T3, the UE shall start to send the ACK/NACK for all SCells from the first UL slot that occurs after the beginning of DL slot ( $j+N$ ).

Where,  $N$  is the timing that UE provide HARQ-ACK information in response to a detection of a DCI format 1\_1 indicating SCell dormancy as specified in [3].

All of the above test requirements shall be fulfilled in order for the observed SCell dormant BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T1, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [15].

The interruption of PSCell shall not be longer than the interruption duration specified for dormant BWP switch in clause 8.6.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first DL slot that occurs after the beginning of DL slot ( $i+N$ ), ( $j+N$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.4.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

##### A.4.5.6.5.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC on multiple CCs

###### A.4.5.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement on multiple CCs for RRC-based BWP switch defined in clause 8.6.3A.1. Supported test configurations are shown in Table A.4.5.6.5.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.5.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and NR SCell are specified in Table A.4.5.6.5.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), PSCell (Cell 2) on radio channel 2 (PSCC) and SCell (Cell 3) on radio channel 3 (SCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for PSCell (Cell 2) and SCell (Cell 3)
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell (Cell 2) and SCell (Cell 3).

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration for both PSCell(Cell 2) and SCell(Cell 3), sent from the test equipment to the UE, is completely received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part configuration on PSCell(Cell 2) and SCell(Cell 3).

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ) as defined in clause 8.6.3A.1 and be ready for the reception of uplink grant for the PSCell(Cell 2) and SCell(Cell 3) no later than at the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ). The UE shall be continuously scheduled on PSCell's BWP-1 and SCell's BWP-1 starting from the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ).

$T_{RRCprocessingDelay}$ ,  $T_{BWPswitchDelayRRC}$ ,  $D_{RRC}$  are defined in clause 8.6.3A.1 .

The test equipment verifies the DL BWP switch time in PSCell(Cell 2) and SCell(Cell 3) by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration sent till the time when RRC Reconfiguration Complete message is received.

**Table A.4.5.6.5.1.1-1: DL BWP switch supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6  | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.4.5.6.5.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit    | Value  | Comment  |
|---|---------|--------|--|
| E-UTRA RF Channel Number                                |         | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |         | 2,3    | Two NR radio channel is used for this test     |
| Active PCell  |         | Cell 1 | Pcell on RF channel number 1.                  |
| Active PSCell   |         | Cell 2 | PSCell on RF channel number 2.                 |
| Active SCell  |         | Cell 3 | SCell on RF channel number 3.                  |
| CP length   |         | Normal |  |
| DRX   |         | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB      | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB      | 0      | Individual offset for cells on PSCC.           |
| Cell-individual offset for cells on RF channel number 3 | dB      | 0      | Individual offset for cells on SCC.            |
| Cell2 timing offset to cell1                            | $\mu$ s | 3      | Synchronous EN-DC                              |
| Cell3 timing offset to cell2                            | $\mu$ s | 3      | Synchronous cells                              |
| T1  | s       | [0.2]  |  |

**Table A.4.5.6.5.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter                                |                               | Unit       | Cell 2                          | Cell 3    |
|--|-------------------------------|------------|---------------------------------|-----------|
| Frequency Range                          |                               |            | FR1                             |           |
| Duplex mode                              | Config 1,4                    |            | FDD                             |           |
|  | Config 2,3,5,6                |            | TDD                             |           |
| TDD configuration                        | Config 1,4                    |            | Not Applicable                  |           |
|  | Config 2,5                    |            | TDDConf.1.1                     |           |
|  | Config 3,6                    |            | TDDConf.1.2                     |           |
| BW <sub>channel</sub>                    | Config 1,4                    |            | 10 MHz: N <sub>RB,c</sub> = 52  |           |
|  | Config 2,5                    |            | 10 MHz: N <sub>RB,c</sub> = 52  |           |
|  | Config 3,6                    |            | 40 MHz: N <sub>RB,c</sub> = 106 |           |
| Active DL BWP ID                         |                               |            | 1                               |           |
| Initial DL BWP Configuration             | Config 1,4                    |            | DLBWP.0.2                       |           |
|  | Config 2,5                    |            |                                 |           |
|  | Config 3,6                    |            |                                 |           |
| Initial UL BWP Configuration             | Config 1,4                    |            | ULBWP.0.2                       |           |
|  | Config 2,5                    |            |                                 |           |
|  | Config 3,6                    |            |                                 |           |
| Initial Condition                        | Active DL BWP-1 Configuration | Config 1,4 |                                 | DLBWP.1.3 |
|  |                               | Config 2,5 |                                 |           |
|  |                               | Config 3,6 |                                 |           |
|  | Active UL BWP-1 Configuration | Config 1,4 |                                 | ULBWP.1.3 |
|  |                               | Config 2,5 |                                 |           |
|  |                               | Config 3,6 |                                 |           |
| Final Condition                          | Active DL BWP-1 Configuration | Config 1,4 |                                 | DLBWP.1.1 |
|  |                               | Config 2,5 |                                 |           |
|  |                               | Config 3,6 |                                 |           |
|  | Active UL BWP-1 Configuration | Config 1,4 |                                 | ULBWP.1.1 |
|  |                               | Config 2,5 |                                 |           |
|  |                               | Config 3,6 |                                 |           |
| PDSCH Reference measurement channel      | Config 1,4                    |            | SR.1.1 FDD                      |           |
|  | Config 2,5                    |            | SR.1.1 TDD                      |           |
|  | Config 3,6                    |            | SR2.1 TDD                       |           |
| RMSI CORESET parameters                  | Config 1,4                    |            | CR.1.1 FDD                      |           |
|  | Config 2,5                    |            | CR.1.1 TDD                      |           |
|  | Config 3,6                    |            | CR2.1 TDD                       |           |
| Dedicated CORESET parameters             | Config 1,4                    |            | CCR.1.1 FDD                     |           |
|  | Config 2,5                    |            | CCR.1.1 TDD                     |           |
|  | Config 3,6                    |            | CCR.2.1 TDD                     |           |
| OCNG Patterns                            |                               |            | OP.1                            |           |
| SSB Configuration                        | Config 1,2,4,5                |            | SSB.1 FR1                       |           |
|  | Config 3,6                    |            | SSB.2 FR1                       |           |
| SMTc Configuration                       |                               |            | SMTc.1                          |           |
| TRS Configuration                        | Config 1,4                    |            | TRS.1.1 FDD                     |           |
|  | Config 2,5                    |            | TRS.1.1 TDD                     |           |
|  | Config 3,6                    |            | TRS.1.2 TDD                     |           |
| Antenna Configuration                    |                               |            | 1x2                             |           |
| Propagation Condition                    |                               |            | AWGN                            |           |
| EPRE ratio of PSS to SSS                 |                               | dB         | 0                               |           |
| EPRE ratio of PBCH DMRS to SSS           |                               |            |                                 |           |
| EPRE ratio of PBCH to PBCH DMRS          |                               |            |                                 |           |
| EPRE ratio of PDCCH DMRS to SSS          |                               |            |                                 |           |
| EPRE ratio of PDCCH to PDCCH DMRS        |                               |            |                                 |           |
| EPRE ratio of PDSCH DMRS to SSS          |                               |            |                                 |           |
| EPRE ratio of PDSCH to PDSCH             |                               |            |                                 |           |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                               |            |                                 |           |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                               |            |                                 |           |
| N <sub>oc</sub> <sup>Note 2</sup>        |                               |            |                                 |           |
| SS-RSRP <sup>Note 3</sup>                |                               |            | [-87]                           |           |



|  |                |                  |         |
|--|----------------|------------------|---------|
| $\bar{E}_s/I_{ot}$   |                | dB               | 17      |
| $\bar{E}_s/N_{oc}$   |                | dB               | 17      |
| $I_{o}^{Note3}$  | Config 1,2,4,5 | dBm/<br>9.36MHz  | [-59]   |
|  | Config 3,6     | dBm/<br>38.16MHz | [-61.9] |
| Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                |                  |         |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                |                  |         |
| Note 3: SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                |                  |         |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |                |                  |         |

#### A.4.5.6.5.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell and SCell in the beginning of the DL slot right after slot  $(i + \frac{T_{RRCP\text{processingDelay}} + T_{BWP\text{switchDelayRRC}} + D_{RRC}}{NR\text{slot length}})$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

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

### A.4.5.7 PSCell addition and release delay

#### A.4.5.7.1 Addition and Release Delay of known NR PSCell

##### A.4.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in clause 7.31.2 [15] for the case when the PSCell is known by the UE at the time of addition.

Supported test configurations are shown in A.4.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.4.5.7.1.1-2 and cell-specific parameters in A.4.5.7.1.1-3 below. The test consists of five successive time periods with duration of T1, T2, T3, T4 and T5 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event B1 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event B1. After receiving the Event B1, the test system shall send a RRC message to the UE to release the measurement gaps.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T2, after the measurement gaps are released by the test system. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T3.

The test system shall observe the periodic reporting of CSI for PSCell during T4. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T4.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T4, after the UE has sent at least one CQI report with non-

zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T5.

**Table A.4.5.7.1.1-1: Supported test configurations for FR1 PSCell**

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

**Table A.4.5.7.1.1-2: General Test Parameters for PSCell Addition and Release**

| Parameter   |                                 | Unit | Value                     | Comment  |
|---|---------------------------------|------|---------------------------|--|
| RF Channel Number                                       |                                 |      | 1, 2                      | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell  |
| Initial   | Active PCell                    |      | Cell1                     | PCell on RF channel number 1.  |
|   | Neighbour cell                  |      | Cell2                     | Neighbour cell on RF channel number 2.   |
| Final Condition   | Active PCell                    |      | Cell1                     | PCell on RF channel number 1.  |
|   | Neighbour Cell                  |      | Cell2                     | PSCell released on RF channel number 2.  |
| B1  | Hysteresis                      | dB   | 0                         | Hysteresis for evaluation of event B1.   |
|   | Threshold RSRP (Config 1,2,4,5) | dBm  | -96                       | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [15] into account plus margin. |
|   | Threshold RSRP (Config 3,6)     | dBm  | -93                       | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [15] into account plus margin. |
|   | Time to Trigger                 | S    | 0                         |  |
| DRX   |                                 |      | OFF                       | Continuous monitoring of primary cell  |
| Measurement gap pattern Id                              |                                 |      | 0                         | Gaps are configured before T2 and released before T3.  |
| PRACH configuration on cell2                            |                                 |      | FR1 PRACH configuration 1 | Captured in A.3.8.2.1  |
| Cell-individual offset for cells on RF channel number 1 |                                 | dB   | 0                         | Individual offset for cells on primary component carrier.  |
| Cell-individual offset for cells on RF channel number 2 |                                 | dB   | 0                         | Individual offset for cells on carrier frequency of cell2.   |
| T1  |                                 | s    | 1                         | During this time the PCell shall be known and cell2 shall be unknown.  |
| T2  |                                 | s    | 1.5                       | During this time the UE shall identify neighbour cell (cell2) and report event B1.   |
| T3  |                                 | s    | 0.5                       | During this time the UE adds the PSCell.   |
| T4  |                                 | s    | 0.5                       | During this time the UE sends CSI reports for PSCell.  |
| T5  |                                 | s    | 0.5                       | During this time the UE releases the PSCell.   |

**Table A.4.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release**

| Parameter | Unit | Config | Test |    |    |    |    |
|-----------|------|--------|------|----|----|----|----|
|           |      |        | T1   | T2 | T3 | T4 | T5 |

|  |            |             |                             |     |
|--|------------|-------------|-----------------------------|-----|
| E-UTRA RF Channel Number                 |            | 1,2,3,4,5,6 | 1                           |     |
| NR RF Channel Number                     |            | 1,2,3,4,5,6 | 2                           |     |
| TDD configuration                        |            | 1,4         | Not Applicable              |     |
|  |            | 2,5         | TDDConf.1.1                 |     |
|  |            | 3,6         | TDDConf.2.1                 |     |
| BW <sub>channel</sub>                    | MHz        | 1,4         | 10: N <sub>RB,c</sub> = 52  |     |
|  |            | 2,5         | 10: N <sub>RB,c</sub> = 52  |     |
|  |            | 3,6         | 40: N <sub>RB,c</sub> = 106 |     |
| Initial BWP Configuration                |            | 1,2,3       | DLBWP.0.1<br>ULBWP.0.1      |     |
| Dedicated BWP Configuration              |            | 1,2,3       | DLBWP.1.1<br>ULBWP.1.1      |     |
| PDSCH Reference measurement channel      |            | 1,4         | SR.1.1 FDD                  |     |
|  |            | 2,5         | SR.1.1 TDD                  |     |
|  |            | 3,6         | SR.2.1 TDD                  |     |
| RMSI CORESET Reference Channel           |            | 1,4         | CR.1.1 FDD                  |     |
|  |            | 2,5         | CR.1.1 TDD                  |     |
|  |            | 3,6         | CR.2.1 TDD                  |     |
| Dedicated CORESET Reference Channel      |            | 1,4         | CCR.1.1 FDD                 |     |
|  |            | 2,5         | CCR.1.1 TDD                 |     |
|  |            | 3,6         | CCR.2.1 TDD                 |     |
| OCNG Patterns                            |            | 1,2,3,4,5,6 | OP.1                        |     |
| SSB configuration                        |            | 1,2,4,5     | SSB.1 FR1                   |     |
|  |            | 3,6         | SSB.2 FR1                   |     |
| SMTC configuration                       |            | 1,2,4,5     | SMTC.1                      |     |
|  |            | 3,6         | SMTC.1                      |     |
| TRS Configuration                        |            | 1,4         | TRS.1.1 FDD                 |     |
|  |            | 2,5         | TRS.1.1 TDD                 |     |
|  |            | 3,6         | TRS.1.2 TDD                 |     |
| CSI-RS configuration for CSI reporting   |            | 1,4         | CSI-RS.1.1 FDD              |     |
|  |            | 2,5         | CSI-RS.1.1 TDD              |     |
|  |            | 3,6         | CSI-RS.2.1 TDD              |     |
| reportConfigType                         |            | 1,2,3,4,5,6 | periodic                    |     |
| reportQuantity                           |            | 1,2,3,4,5,6 | cri-RI-PMI-CQI              |     |
| CSI reporting periodicity                | slot       | 1,2,4,5     | 5                           |     |
|  |            | 3,6         | 10                          |     |
| CSI reporting offset                     | slot       | 1,2,4,5     | 2                           |     |
|  |            | 3,6         | 4                           |     |
| EPRE ratio of PSS to SSS                 | dB         | 1,2,3,4,5,6 | 0                           |     |
| EPRE ratio of PBCH DMRS to SSS           |            |             |                             |     |
| EPRE ratio of PBCH to PBCH DMRS          |            |             |                             |     |
| EPRE ratio of PDCCH DMRS to SSS          |            |             |                             |     |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |             |                             |     |
| EPRE ratio of PDSCH DMRS to SSS          |            |             |                             |     |
| EPRE ratio of PDSCH to PDSCH DMRS        |            |             |                             |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |             |                             |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |             |                             |     |
| $N_{oc}$ <sup>Note2</sup>                | dBm/15 kHz | 1,2,3,4,5,6 | N/A                         | -88 |
| $N_{oc}$ <sup>Note2</sup>                | dBm/SCS    | 1,2,4,5     | N/A                         | -88 |
|  |            | 3,6         | N/A                         | -85 |
| $\hat{E}_s/I_{ot}$                       |            | 1,2,3,4,5,6 | -infinity                   | 0   |
| $\hat{E}_s/N_{oc}$                       |            | 1,2,3,4,5,6 | -infinity                   | 0   |

|                                 |  |             |           |     |
|---------------------------------|--|-------------|-----------|-----|
| SS-RSRP <sup>Note3</sup>        | dBm/SCS  | 1,2,4,5     | -infinity | -88 |
|                                 |  | 3,6         | -infinity | -85 |
| I <sub>o</sub> <sup>Note3</sup> | dBm/9.36MHz  | 1,2,4,5     | N/A       | -57 |
|                                 | dBm/38.1MHz  | 3,6         | N/A       | -51 |
| Propagation condition           |  | 1,2,3,4,5,6 | AWGN      |     |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |             |           |     |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |             |           |     |
| Note 3:                         | SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |             |           |     |
| Note 4:                         | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |             |           |     |

#### A.4.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell no later than 82 ms<sup>Note1</sup> from the start of T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T5.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 [15]:

$$T_{\text{config\_PSCell}} = T_{\text{RRC\_delay}} + T_{\text{processing}} + T_{\text{search}} + T_{\Delta} + T_{\text{PSCell\_DU}} + 2\text{ms}$$

Where:

$$T_{\text{RRC\_delay}} = 20\text{ms}$$

$$T_{\text{processing}} = 20\text{ms}$$

$$T_{\text{search}} = 0$$

$$T_{\Delta} = 20\text{ms}$$

$$T_{\text{PSCell\_DU}} = 1 \cdot 10 + 10 = 20\text{ms}$$

### A.4.5.8 DL Interruptions at switching between two uplink carriers

#### A.4.5.8.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers defined in clause 8.2.1.2.14. The test case is applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present.

There are two cells: E-UTRAN FDD PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters for PSCell are given in Table A. 4.5.8.1-1, Table A. 4.5.8.1-2 and Table A. 4.5.8.1-3 below.

Aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting 6dB on following symbol on the special slot on NR TDD carrier (Cell 2):

- symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption-r16*;
- otherwise,

- symbol#5 if UE capability *uplinkTxSwitchingPeriod* is 140us or
- symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

The test parameters and applicability for E-UTRAN FDD PCell are defined in A.3.7.2. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *uplinkTxSwitching* is indicated to UE. This test verifies that the UE correctly report the L1-RSRP reporting.

**Table A. 4.5.8.1-1: Supported test configurations**

| Configuration | PSCell (Cell2)                                    |
|---------------|---|
| 1             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A. 4.5.8.1-2: General test parameters for DL Interruptions at switching between two uplink carriers in EN-DC**

| Parameter                                  | Unit | Test configuration | Value   | Comment   |
|--|------|--------------------|---|---|
| RF Channel Number                          |      | Config 1           | 1, 2  | Two radio channels are used for the test.                                     |
| Active cell                                |      | Config 1           | Cell 1: E-UTRAN FDD PCell<br>Cell 2: FR1 PSCell | E-UTRAN FDD PCell on RF channel number 1<br>FR1 PSCell on RF channel number 2 |
| CP length                                  |      | Config 1           | Normal  |   |
| DRX  |      | Config 1           | OFF   |   |
| Measurement gap pattern Id                 |      | Config 1           | OFF   |   |
| Filter coefficient                         |      | Config 1           | 0   | L3 filtering is not used  |
| CSI-RS configuration for L1-RSRP reporting |      | Config 1           | CSI-RS.2.5 TDD                                  |   |
| T1   | s    | Config 1           | 5   |   |

**Table A. 4.5.8.1-3: NR Cell specific test parameters for DL Interruptions at switching between two uplink carriers in EN-DC (Cell 2)**

| Parameter  |          | Unit         | Cell2   |
|--|----------|--------------|---|
| Frequency Range  |          |              | FR1   |
| Duplex mode  | Config 1 |              | TDD   |
| TDD configuration  | Config 1 |              | TDDConf.2.1 except that:<br>S='11DL:1GP:2UL';<br>nrofDownlinkSymbols:11<br>nrofUplinkSymbols: 2 |
| BW <sub>channel</sub>  | Config 1 |              | 40 MHz; N <sub>RB,c</sub> = 106   |
| Initial BWP Configuration  | Config 1 |              | DLBWP.0.1   |
| DL dedicated BWP configuration   | Config 1 |              | DLBWP.1.1   |
| UL dedicated BWP configuration   |          |              | ULBWP.1.1   |
| SRS configuration  |          |              | SRSConf.4 in Table A.4.5.8.1-4  |
| PDSCH Reference measurement channel  | Config 1 |              | SR.2.1 TDD  |
| RMSI CORESET parameters  | Config 1 |              | CR.2.1 TDD  |
| Dedicated CORESET parameters   | Config 1 |              | CCR.2.1 TDD   |
| OCNG Patterns  |          |              | OP.1  |
| SMTC Configuration   |          |              | SMTC.1  |
| SSB Configuration  | Config 1 |              | SSB.2 FR1   |
| Correlation Matrix and Antenna Configuration   |          |              | 2x2 low   |
| EPRE ratio of PSS to SSS   |          | dB           | 0   |
| EPRE ratio of PBCH DMRS to SSS   |          |              |   |
| EPRE ratio of PBCH to PBCH DMRS  |          |              |   |
| EPRE ratio of PDCCH DMRS to SSS  |          |              |   |
| EPRE ratio of PDCCH to PDCCH DMRS  |          |              |   |
| EPRE ratio of PDSCH DMRS to SSS  |          |              |   |
| EPRE ratio of PDSCH to PDSCH   |          |              |   |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |          |              |   |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |          |              |   |
| N <sub>oc</sub> <sup>Note 2</sup>  |          | dBm/15 kHz   | -104  |
| SS-RSRP <sup>Note 3</sup>  |          | dBm/SSB SCS  | -84   |
| CSI-RS RSRP <sup>Note 6</sup>  |          | dBm/SCS      | -78   |
| $\bar{E}_s/I_{ot}$   |          | dB           | 17  |
| $\bar{E}_s/N_{oc}$   |          | dB           | 17  |
| N <sub>oc</sub> <sup>Note 2</sup>  | Config 1 | dBm/SCS      | -101  |
| I <sub>o</sub> <sup>Note 3</sup> on symbols without CSI-RS   | Config 1 | dBm/38.16MHz | -52.86  |
| I <sub>o</sub> <sup>Note 6</sup> on symbols with CSI-RS  | Config 1 | dBm/38.16MHz | -50.5   |
| Time offset to Cell1 <sup>Note 5</sup>   |          | μs           | 0   |
| Propagation Condition  |          |              | AWGN  |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.</p> <p>Note 6: CSI-RS RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |          |              |   |

**Table A.4.5.8.1-4: SRS Configuration for DL Interruptions at switching between two uplink carriers**

|                 | Field                            | SRSCnf.4          | Comments                             |
|-----------------|----------------------------------|-------------------|--------------------------------------|
| SRS-ResourceSet | srs-ResourceSetId                | 0                 |                                      |
|                 | srs-ResourceIdList               | 0                 |                                      |
|                 | resourceType                     | Periodic          |                                      |
|                 | Usage                            | Codebook          |                                      |
| SRS-Resource    | SRS-ResourceId                   | 0                 |                                      |
|                 | nrofSRS-Ports                    | Port2             |                                      |
|                 | transmissionComb                 | n2                |                                      |
|                 | combOffset-n2                    | 0                 |                                      |
|                 | cyclicShift-n2                   | 0                 |                                      |
|                 | resourceMapping startPosition    | 1                 |                                      |
|                 | resourceMapping nrofSymbols      | n2                |                                      |
|                 | resourceMapping repetitionFactor | n1                |                                      |
|                 | freqDomainPosition               | 0                 |                                      |
|                 | freqDomainShift                  | 0                 |                                      |
|                 | freqHopping c-SRS                | 0                 | Matches $N_{RB,c}$                   |
|                 | freqHopping b-SRS                | 0                 |                                      |
|                 | freqHopping b-hop                | 0                 |                                      |
|                 | groupOrSequenceHopping           | Neither           |                                      |
|                 | resourceType                     | Periodic          |                                      |
|                 | periodicityAndOffset-p           | sl8, 3            | Offset to align with DRx periodicity |
| sequenceId      | 0                                | Any 10 bit number |                                      |

### A.4.5.8.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.1.2.14.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.2.

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

### A.4.5.9 UE specific CBW change

#### A.4.5.9.1 UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN- DC

##### A.4.5.9.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13.1. Supported test configurations are shown in Table A.4.5.9.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.4.5.9.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.4.5.9.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).



- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PSCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PSCell.
- UE is indicated in *SCS-SpecificCarrier* that the active CBW is CBW-1 of initial condition in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated CBW configuration, sent from the test equipment to the UE, is completely received at the UE side in PSCell’s slot # denoted *i*. The UE shall reconfigure its CBW with the updated CBW of final condition.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell’s DL slot ( $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ ) as defined in clause 8.13.1 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ ). The UE shall be continuously scheduled on PSCell’s BWP-1 of CBW-1 starting from the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ ).

$T_{RRCprocessingDelay}$  and  $T_{CBWchangeDelayRRC}$  are defined in clause 8.13.1.

The test equipment verifies the UE specific CBW change time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated CBW configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.4.5.9.1.1-1: UE specific CBW change supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6  | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.4.5.9.1.1-2: General test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2      | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| T1  | s    | [0,2]  |  |

**A.4.5.9.1.1-3: NR Cell specific test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter  |                               | Unit       | Cell 2                          |
|--|-------------------------------|------------|---------------------------------|
| <b>Frequency Range</b>   |                               |            | <b>FR1</b>                      |
| Duplex mode  | Config 1,4                    |            | FDD                             |
|  | Config 2,3,5,6                |            | TDD                             |
| TDD configuration  | Config 1,4                    |            | Not Applicable                  |
|  | Config 2,5                    |            | TDDConf.1.1                     |
|  | Config 3,6                    |            | TDDConf.1.2                     |
| BW <sub>channel</sub>  | Config 1,4                    |            | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 2,5                    |            | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 3,6                    |            | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active DL BWP ID   |                               |            | 1                               |
| Initial DL BWP Configuration (BWP-1) before and after UE specific CBW change | Config 1,4                    |            | DLBWP.0.2                       |
|  | Config 2,5                    |            |                                 |
|  | Config 3,6                    |            |                                 |
| Initial UL BWP Configuration before and after UE specific CBW change         | Config 1,4                    |            | ULBWP.0.2                       |
|  | Config 2,5                    |            |                                 |
|  | Config 3,6                    |            |                                 |
| Initial Condition  | Active DL CBW-1 Configuration | Config 1,4 | DLCBW.1.1                       |
|  |                               | Config 2,5 |                                 |
|  |                               | Config 3,6 |                                 |
|  | Active UL CBW-1 Configuration | Config 1,4 | ULCBW.1.1                       |
|  |                               | Config 2,5 |                                 |
|  |                               | Config 3,6 |                                 |
| Final Condition  | Active DL CBW-1 Configuration | Config 1,4 | DLCBW.1.2                       |
|  |                               | Config 2,5 |                                 |
|  |                               | Config 3,6 |                                 |
|  | Active UL CBW-1 Configuration | Config 1,4 | ULCBW.1.2                       |
|  |                               | Config 2,5 |                                 |
|  |                               | Config 3,6 |                                 |
| PDSCH Reference measurement channel  | Config 1,4                    |            | SR.1.1 FDD                      |
|  | Config 2,5                    |            | SR.1.1 TDD                      |
|  | Config 3,6                    |            | SR.2.1 TDD                      |
| RMSI CORESET parameters  | Config 1,4                    |            | CR.1.1 FDD                      |
|  | Config 2,5                    |            | CR.1.1 TDD                      |
|  | Config 3,6                    |            | CR.2.1 TDD                      |
| Dedicated CORESET parameters   | Config 1,4                    |            | CCR.1.1 FDD                     |
|  | Config 2,5                    |            | CCR.1.1 TDD                     |
|  | Config 3,6                    |            | CCR.2.1 TDD                     |
| OCNG Patterns  |                               |            | OP.1                            |
| SSB Configuration  | Config 1,2,4,5                |            | SSB.1 FR1                       |
|  | Config 3,6                    |            | SSB.2 FR1                       |
| SMTC Configuration   |                               |            | SMTC.1                          |
| TRS Configuration  | Config 1,4                    |            | TRS.1.1 FDD                     |
|  | Config 2,5                    |            | TRS.1.1 TDD                     |
|  | Config 3,6                    |            | TRS.1.2 TDD                     |
| Antenna Configuration  |                               |            | 1x2                             |
| Propagation Condition  |                               |            | AWGN                            |
| EPRE ratio of PSS to SSS   |                               | dB         | 0                               |
| EPRE ratio of PBCH DMRS to SSS   |                               |            |                                 |
| EPRE ratio of PBCH to PBCH DMRS  |                               |            |                                 |
| EPRE ratio of PDCCH DMRS to SSS  |                               |            |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS  |                               |            |                                 |
| EPRE ratio of PDSCH DMRS to SSS  |                               |            |                                 |
| EPRE ratio of PDSCH to PDSCH   |                               |            |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                       |                               |            |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                     |                               |            |                                 |

|                            |  |                  |         |
|----------------------------|--|------------------|---------|
| $N_{oc}$ <sup>Note 2</sup> |  | dBm/15 kHz       | [-104]  |
| SS-RSRP <sup>Note 3</sup>  |  | dBm/15 kHz       | [-87]   |
| $\hat{E}_s/I_{ot}$         |  | dB               | 17      |
| $\hat{E}_s/N_{oc}$         |  | dB               | 17      |
| $I_o$ <sup>Note3</sup>     | Config 1,2,4,5   | dBm/9.36MHz      | [-59]   |
|                            | Config 3,6   | dBm/38.16MH<br>z | [-61.9] |
| Note 1:                    | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |         |
| Note 2:                    | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |         |
| Note 3:                    | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                  |         |
| Note 4:                    | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |                  |         |

#### A.4.5.9.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot  $(i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length})$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell UE specific CBW change delay to be counted as correct.

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

## A.4.6 Measurement procedure

### A.4.6.1 Intra-frequency Measurements

#### A.4.6.1.1 EN-DC event triggered reporting tests without gap under non-DRX

##### A.4.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

##### A.4.6.1.1.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.1.2-1, A.4.6.1.1.2-2, A.4.6.1.1.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

**Table A.4.6.1.1.2-1: Supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3       | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6       | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2       |

**Table A.4.6.1.1.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1**

| Parameter                                       | Unit | Test configuration | Value                             | Comment   |
|---|------|--------------------|-----------------------------------|---|
| Active cell                                     |      | 1, 2, 3, 4, 5, 6   | E-UTRAN Cell 1 and NR Cell 2      |   |
| Neighbour cell                                  |      | 1, 2, 3, 4, 5, 6   | NR Cell 3                         | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3, 4, 5, 6   | 1: Cell 1<br>2: Cell 2 and Cell 3 |   |
| SSB configuration                               |      | 1, 4               | SSB.1 FR1                         |   |
|   |      | 2, 5               | SSB.1 FR1                         |   |
|   |      | 3, 6               | SSB.2 FR1                         |   |
| SMTC configuration                              |      | 1, 4               | SMTC.2                            |   |
|   |      | 2, 5               | SMTC.1                            |   |
|   |      | 3, 6               | SMTC.1                            |   |
| A3-Offset                                       | dB   | 1, 2, 3, 4, 5, 6   | -4.5                              |   |
| CP length                                       |      | 1, 2, 3, 4, 5, 6   | Normal                            |   |
| Hysteresis                                      | dB   | 1, 2, 3, 4, 5, 6   | 0                                 |   |
| Time To Trigger                                 | s    | 1, 2, 3, 4, 5, 6   | 0                                 |   |
| Filter coefficient                              |      | 1, 2, 3, 4, 5, 6   | 0                                 | L3 filtering is not used  |
| DRX   |      | 1, 2, 3, 4, 5, 6   | N/A                               | OFF   |
| Time offset between PCell and PSCell            |      | 1, 2, 3, 4, 5, 6   | 3 $\mu$ s                         | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | 1, 4               | 3 ms                              | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|   |      | 2, 5               | 3 $\mu$ s                         | Synchronous cells   |
|   |      | 3, 6               | 3 $\mu$ s                         | Synchronous cells   |
| T1  | s    | 1, 2, 3, 4, 5, 6   | 5                                 |   |
| T2  | s    | 1, 2, 3, 4, 5, 6   | 5                                 |   |

**Table A.4.6.1.1.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1**

| Parameter                           | Unit   | Test configuration | Cell 2                 |        | Cell 3                 |        |
|-------------------------------------|--|--------------------|------------------------|--------|------------------------|--------|
|                                     |  |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration                   |  | 1, 4               | N/A                    |        | N/A                    |        |
|                                     |  | 2, 5               | TDDConf.1.1            |        | TDDConf.1.1            |        |
|                                     |  | 3, 6               | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration             |  | 1, 4               | SR.1.1 FDD             |        | N/A                    |        |
|                                     |  | 2, 5               | SR.1.1 TDD             |        |                        |        |
|                                     |  | 3, 6               | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration      |  | 1, 4               | CR.1.1 FDD             |        | N/A                    |        |
|                                     |  | 2, 5               | CR.1.1 TDD             |        | N/A                    |        |
|                                     |  | 3, 6               | CR.2.1 TDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration |  | 1, 4               | CCR.1.1 FDD            |        | N/A                    |        |
|                                     |  | 2, 5               | CCR.1.1 TDD            |        | N/A                    |        |
|                                     |  | 3, 6               | CCR.2.1 TDD            |        | N/A                    |        |
| OCNG Patterns                       |  | 1, 2, 3, 4, 5, 6   | OP.1                   |        | OP.1                   |        |
| TRS configuration                   |  | 1, 4               | TRS.1.1 FDD            |        | N/A                    |        |
|                                     |  | 2, 5               | TRS.1.1 TDD            |        | N/A                    |        |
|                                     |  | 3, 6               | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration           |  | 1, 2, 3, 4, 5, 6   | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration         |  | 1, 2, 3, 4, 5, 6   | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration         |  | 1, 2, 3, 4, 5, 6   | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS                              |  | 1, 2, 3, 4, 5, 6   | SSB                    |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/SCS  | 1, 4               | -98                    |        |                        |        |
|                                     |  | 2, 5               | -98                    |        |                        |        |
|                                     |  | 3, 6               | -95                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/15 kHz   | 1, 4               | -98                    |        |                        |        |
|                                     |  | 2, 5               |                        |        |                        |        |
|                                     |  | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$                  | dB   | 1, 4               | 4                      | -1.46  | -Infinity              | -1.46  |
|                                     |  | 2, 5               |                        |        |                        |        |
|                                     |  | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$                  | dB   | 1, 4               | 4                      | 4      | -Infinity              | 4      |
|                                     |  | 2, 5               |                        |        |                        |        |
|                                     |  | 3, 6               |                        |        |                        |        |
| SS-RSRP <sup>Note 3</sup>           | dBm/SCS kHz  | 1, 4               | -94                    | -94    | -Infinity              | -94    |
|                                     |  | 2, 5               | -94                    | -94    | -Infinity              | -94    |
|                                     |  | 3, 6               | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>                      | dBm/9.36 MHz   | 1, 4               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|                                     | dBm/9.36 MHz   | 2, 5               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|                                     | dBm/38.16 MHz  | 3, 6               | -58.50                 | -56.16 | -58.50                 | -56.16 |
| Propagation Condition               |  | 1, 2, 3, 4, 5, 6   | AWGN                   |        |                        |        |
| Note 1:                             | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |                    |                        |        |                        |        |
| Note 2:                             | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |                        |        |                        |        |
| Note 3:                             | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                    |                        |        |                        |        |

### A.4.6.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.1.2 EN-DC event triggered reporting tests without gap under DRX

#### A.4.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.4.6.1.2.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.2.1-1, A.4.6.1.2.1-2, A.4.6.1.2.1-3 and A.4.6.1.2.1-4 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.4.6.1.2.2-1: Supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3       | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6       | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2       |

**Table A.4.6.1.2.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX**

| Parameter                                       | Unit | Test configuration | Value                             |        | Comment   |
|---|------|--------------------|-----------------------------------|--------|---|
|   |      |                    | Test 1                            | Test 2 |   |
| Active cell                                     |      | 1, 2, 3, 4, 5, 6   | E-UTRAN Cell 1 and NR Cell 2      |        |   |
| Neighbour cell                                  |      | 1, 2, 3, 4, 5, 6   | NR Cell 3                         |        | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3, 4, 5, 6   | 1: Cell 1<br>2: Cell 2 and Cell 3 |        |   |
| SSB configuration                               |      | 1, 4               | SSB.1 FR1                         |        |   |
|   |      | 2, 5               | SSB.1 FR1                         |        |   |
|   |      | 3, 6               | SSB.2 FR1                         |        |   |
| SMTC configuration                              |      | 1, 4               | SMTC.2                            |        |   |
|   |      | 2, 5               | SMTC.1                            |        |   |
|   |      | 3, 6               | SMTC.1                            |        |   |
| A3-Offset                                       | dB   | 1, 2, 3, 4, 5, 6   | -4.5                              |        |   |
| CP length                                       |      | 1, 2, 3, 4, 5, 6   | Normal                            |        |   |
| Hysteresis                                      | dB   | 1, 2, 3, 4, 5, 6   | 0                                 |        |   |
| Time To Trigger                                 | s    | 1, 2, 3, 4, 5, 6   | 0                                 |        |   |
| Filter coefficient                              |      | 1, 2, 3, 4, 5, 6   | 0                                 |        | L3 filtering is not used  |
| DRX   |      | 1, 2, 3, 4, 5, 6   | DRX.1                             | DRX.7  |   |
| Time offset between PCell and PSCell            |      | 1, 2, 3, 4, 5, 6   | 3 $\mu$ s                         |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | 1, 4               | 3 ms                              |        | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|   |      | 2, 5               | 3 $\mu$ s                         |        | Synchronous cells   |
|   |      | 3, 6               | 3 $\mu$ s                         |        | Synchronous cells   |
| T1  | s    | 1, 2, 3, 4, 5, 6   | 5                                 |        |   |
| T2  | s    | 1, 2, 3, 4, 5, 6   | 5                                 | 10     |   |



**Table A.4.6.1.2.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX**

| Parameter   | Unit          | Test configuration | Cell 2                 |        | Cell 3                 |        |
|---|---------------|--------------------|------------------------|--------|------------------------|--------|
|   |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |               | 1, 4               | N/A                    |        | N/A                    |        |
|   |               | 2, 5               | TDDConf.1.1            |        | TDDConf.1.1            |        |
|   |               | 3, 6               | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration   |               | 1, 4               | SR.1.1 FDD             |        | N/A                    |        |
|   |               | 2, 5               | SR.1.1 TDD             |        |                        |        |
|   |               | 3, 6               | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration  |               | 1, 4               | CR.1.1 FDD             |        | N/A                    |        |
|   |               | 2, 5               | CR.1.1 TDD             |        | N/A                    |        |
|   |               | 3, 6               | CR.2.1 TDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |               | 1, 4               | CCR.1.1 FDD            |        | N/A                    |        |
|   |               | 2, 5               | CCR.1.1 TDD            |        | N/A                    |        |
|   |               | 3, 6               | CCR.2.1 TDD            |        | N/A                    |        |
| OCNG Patterns   |               | 1, 2, 3, 4, 5, 6   | OP.1                   |        | OP.1                   |        |
| TRS configuration   |               | 1, 4               | TRS.1.1 FDD            |        | N/A                    |        |
|   |               | 2, 5               | TRS.1.1 TDD            |        | N/A                    |        |
|   |               | 3, 6               | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration   |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS  |               | 1, 2, 3, 4, 5, 6   | SSB                    |        | SSB                    |        |
| $N_{oc}$ <small>Note 2</small>  | dBm/SCS       | 1, 4               | -98                    |        |                        |        |
|   |               | 2, 5               | -98                    |        |                        |        |
|   |               | 3, 6               | -95                    |        |                        |        |
| $N_{oc}$ <small>Note 2</small>  | dBm/15 kHz    | 1, 4               | -98                    |        |                        |        |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB            | 1, 4               | 4                      | -1.46  | -Infinity              | -1.46  |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1, 4               | 4                      | 4      | -Infinity              | 4      |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| SS-RSRP <small>Note 3</small>   | dBm/SCS kHz   | 1, 4               | -94                    | -94    | -Infinity              | -94    |
|   |               | 2, 5               | -94                    | -94    | -Infinity              | -94    |
|   |               | 3, 6               | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1, 4               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|   | dBm/9.36 MHz  | 2, 5               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|   | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | -58.50                 | -56.16 |
| Propagation Condition   |               | 1, 2, 3, 4, 5, 6   | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

#### A.4.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.1.3 EN-DC event triggered reporting tests with per-UE gaps under non-DRX

#### A.4.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.4.6.1.3.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.3.1-1 and A.4.6.1.3.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

**Table A.4.6.1.3.2-1: Supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3       | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6       | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2       |

**Table A.4.6.1.3.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1**

| Parameter                                       | Unit | Test configuration | Value                             | Comment  |
|---|------|--------------------|-----------------------------------|--|
| Active cell                                     |      | 1, 2, 3, 4, 5, 6   | E-UTRAN Cell 1 and NR Cell 2      |  |
| Neighbour cell                                  |      | 1, 2, 3, 4, 5, 6   | NR Cell 3                         | Cell to be identified.   |
| RF Channel Number                               |      | 1, 2, 3, 4, 5, 6   | 1: Cell 1<br>2: Cell 2 and Cell 3 |  |
| Measurement gap type                            |      | 1, 2, 3, 4, 5, 6   | Per-UE gaps                       |  |
| Measurement gap repetition periodicity          | ms   | 1, 2, 3, 4, 5, 6   | 40                                |  |
| Measurement gap length                          | ms   | 1, 2, 3, 4, 5, 6   | 6                                 |  |
| Measurement gap offset                          | ms   | 1, 2, 3, 4, 5, 6   | 39                                |  |
| SSB configuration                               |      | 1, 4               | SSB.1 FR1                         |  |
|   |      | 2, 5               | SSB.1 FR1                         |  |
|   |      | 3, 6               | SSB.2 FR1                         |  |
| SMTTC configuration                             |      | 1, 4               | SMTTC.2                           |  |
|   |      | 2, 5               | SMTTC.1                           |  |
|   |      | 3, 6               | SMTTC.1                           |  |
| CSI-RS parameters                               |      | 1, 4               | CSI-RS.1.2 FDD resource #0        |  |
|   |      | 2, 5               | CSI-RS.1.2 TDD resource #0        |  |
|   |      | 3, 6               | CSI-RS.2.2 TDD resource #0        |  |
| A3-Offset                                       | dB   | 1, 2, 3, 4, 5, 6   | -4.5                              |  |
| CP length                                       |      | 1, 2, 3, 4, 5, 6   | Normal                            |  |
| Hysteresis                                      | dB   | 1, 2, 3, 4, 5, 6   | 0                                 |  |
| Time To Trigger                                 | s    | 1, 2, 3, 4, 5, 6   | 0                                 |  |
| Filter coefficient                              |      | 1, 2, 3, 4, 5, 6   | 0                                 | L3 filtering is not used   |
| DRX   |      | 1, 2, 3, 4, 5, 6   | N/A                               | OFF  |
| Time offset between PCell and PSCell            |      | 1, 2, 3, 4, 5, 6   | 3 $\mu$ s                         | Synchronous EN-DC  |
| Time offset between serving and neighbour cells |      | 1, 4               | 3 ms                              | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|   |      | 2, 5               | 3 $\mu$ s                         | Synchronous cells  |
|   |      | 3, 6               | 3 $\mu$ s                         | Synchronous cells  |
| T1  | s    | 1, 2, 3, 4, 5, 6   | 5                                 |  |
| T2  | s    | 1, 2, 3, 4, 5, 6   | 5                                 |  |

**Table A.4.6.1.3.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1**

| Parameter   | Unit          | Test configuration | Cell 2                 |        | Cell 3                 |        |
|---|---------------|--------------------|------------------------|--------|------------------------|--------|
|   |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |               | 1, 4               | N/A                    |        | N/A                    |        |
|   |               | 2, 5               | TDDConf.1.1            |        | TDDConf.1.1            |        |
|   |               | 3, 6               | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration   |               | 1, 4               | SR.1.1 FDD             |        | N/A                    |        |
|   |               | 2, 5               | SR.1.1 TDD             |        |                        |        |
|   |               | 3, 6               | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration  |               | 1, 4               | CR.1.1 FDD             |        | N/A                    |        |
|   |               | 2, 5               | CR.1.1 TDD             |        | N/A                    |        |
|   |               | 3, 6               | CR.2.1 TDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |               | 1, 4               | CCR.1.2 FDD            |        | N/A                    |        |
|   |               | 2, 5               | CCR.1.2 TDD            |        | N/A                    |        |
|   |               | 3, 6               | CCR.2.1 TDD            |        | N/A                    |        |
| OCNG Patterns   |               | 1, 2, 3, 4, 5, 6   | OP.1                   |        | OP.1                   |        |
| TRS configuration   |               | 1, 4               | TRS.1.1 FDD            |        | N/A                    |        |
|   |               | 2, 5               | TRS.1.1 TDD            |        | N/A                    |        |
|   |               | 3, 6               | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration   |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | DLBWP.1.2              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | ULBWP.1.2              |        | ULBWP.1.1              |        |
| RLM-RS  |               | 1, 2, 3, 4, 5, 6   | CSI-RS                 |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/SCS       | 1, 4               | -98                    |        |                        |        |
|   |               | 2, 5               | -98                    |        |                        |        |
|   |               | 3, 6               | -95                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 kHz    | 1, 4               | -98                    |        |                        |        |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB            | 1, 4               | 4                      | -1.46  | -Infinity              | -1.46  |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1, 4               | 4                      | 4      | -Infinity              | 4      |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1, 4               | -94                    | -94    | -Infinity              | -94    |
|   |               | 2, 5               | -94                    | -94    | -Infinity              | -94    |
|   |               | 3, 6               | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1, 4               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|   | dBm/9.36 MHz  | 2, 5               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|   | dBm/38.16 MHz | 3, 6               | -58.50                 | -56.16 | -58.50                 | -56.16 |
| Propagation Condition   |               | 1, 2, 3, 4, 5, 6   | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

### A.4.6.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.1.4 EN-DC event triggered reporting tests with per-UE gaps under DRX

#### A.4.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.4.6.1.4.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.4.2-1, A.4.6.1.4.2-2, A.4.6.1.4.2-3 A.4.6.1.4.2-4 and A.4.6.1.4.2-5 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.4.6.1.4.2-1: Supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3       | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6       | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2       |

**Table A.4.6.1.4.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX**

| Parameter                                       | Unit | Test configuration | Value                             |        | Comment  |
|---|------|--------------------|-----------------------------------|--------|--|
|   |      |                    | Test 1                            | Test 2 |  |
| Active cell                                     |      | 1, 2, 3, 4, 5, 6   | E-UTRAN Cell 1 and NR Cell 2      |        |  |
| Neighbour cell                                  |      | 1, 2, 3, 4, 5, 6   | NR Cell 3                         |        | Cell to be identified.   |
| RF Channel Number                               |      | 1, 2, 3, 4, 5, 6   | 1: Cell 1<br>2: Cell 2 and Cell 3 |        |  |
| Measurement gap type                            |      | 1, 2, 3, 4, 5, 6   | Per-UE gaps                       |        |  |
| Measurement gap repetition periodicity          | ms   | 1, 2, 3, 4, 5, 6   | 40                                |        |  |
| Measurement gap length                          | ms   | 1, 2, 3, 4, 5, 6   | 6                                 |        |  |
| Measurement gap offset                          | ms   | 1, 2, 3, 4, 5, 6   | 39                                |        |  |
| SSB configuration                               |      | 1, 4               | SSB.1 FR1                         |        |  |
|   |      | 2, 5               | SSB.1 FR1                         |        |  |
|   |      | 3, 6               | SSB.2 FR1                         |        |  |
| SMTTC configuration                             |      | 1, 4               | SMTTC.2                           |        |  |
|   |      | 2, 5               | SMTTC.1                           |        |  |
|   |      | 3, 6               | SMTTC.1                           |        |  |
| CSI-RS parameters                               |      | 1, 4               | CSI-RS.1.2 FDD resource #0        |        |  |
|   |      | 2, 5               | CSI-RS.1.2 TDD resource #0        |        |  |
|   |      | 3, 6               | CSI-RS.2.2 TDD resource #0        |        |  |
| A3-Offset                                       | dB   | 1, 2, 3, 4, 5, 6   | -4.5                              |        |  |
| CP length                                       |      | 1, 2, 3, 4, 5, 6   | Normal                            |        |  |
| Hysteresis                                      | dB   | 1, 2, 3, 4, 5, 6   | 0                                 |        |  |
| Time To Trigger                                 | s    | 1, 2, 3, 4, 5, 6   | 0                                 |        |  |
| Filter coefficient                              |      | 1, 2, 3, 4, 5, 6   | 0                                 |        | L3 filtering is not used   |
| DRX   |      | 1, 2, 3, 4, 5, 6   | DRX.1                             | DRX.7  |  |
| Time offset between PCell and PSCell            |      | 1, 2, 3, 4, 5, 6   | 3 $\mu$ s                         |        | Synchronous EN-DC  |
| Time offset between serving and neighbour cells |      | 1, 4               | 3 ms                              |        | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|   |      | 2, 5               | 3 $\mu$ s                         |        | Synchronous cells  |
|   |      | 3, 6               | 3 $\mu$ s                         |        | Synchronous cells  |
| T1  | s    | 1, 2, 3, 4, 5, 6   | 5                                 |        |  |
| T2  | s    | 1, 2, 3, 4, 5, 6   | 5                                 | 10     |  |

**Table A.4.6.1.4.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX**

| Parameter   | Unit          | Test configuration | Cell 2                 |        | Cell 3                 |        |
|---|---------------|--------------------|------------------------|--------|------------------------|--------|
|   |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |               | 1, 4               | N/A                    |        | N/A                    |        |
|   |               | 2, 5               | TDDConf.1.1            |        | TDDConf.1.1            |        |
|   |               | 3, 6               | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration   |               | 1, 4               | SR.1.1 FDD             |        | N/A                    |        |
|   |               | 2, 5               | SR.1.1 TDD             |        |                        |        |
|   |               | 3, 6               | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration  |               | 1, 4               | CR.1.1 FDD             |        | N/A                    |        |
|   |               | 2, 5               | CR.1.1 TDD             |        | N/A                    |        |
|   |               | 3, 6               | CR.2.1 TDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |               | 1, 4               | CCR.1.2 FDD            |        | N/A                    |        |
|   |               | 2, 5               | CCR.1.2 TDD            |        | N/A                    |        |
|   |               | 3, 6               | CCR.2.1 TDD            |        | N/A                    |        |
| OCNG Patterns   |               | 1, 2, 3, 4, 5, 6   | OP.1                   |        | OP.1                   |        |
| TRS configuration   |               | 1, 4               | TRS.1.1 FDD            |        | N/A                    |        |
|   |               | 2, 5               | TRS.1.1 TDD            |        | N/A                    |        |
|   |               | 3, 6               | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration   |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | DLBWP.1.2              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | ULBWP.1.2              |        | ULBWP.1.1              |        |
| RLM-RS  |               | 1, 2, 3, 4, 5, 6   | CSI-RS                 |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/SCS       | 1, 4               | -98                    |        |                        |        |
|   |               | 2, 5               | -98                    |        |                        |        |
|   |               | 3, 6               | -95                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 KHz    | 1, 4               | -98                    |        |                        |        |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB            | 1, 4               | 4                      | -1.46  | -Infinity              | -1.46  |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1, 4               | 4                      | 4      | -Infinity              | 4      |
|   |               | 2, 5               |                        |        |                        |        |
|   |               | 3, 6               |                        |        |                        |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS KHz   | 1, 4               | -94                    | -94    | -Infinity              | -94    |
|   |               | 2, 5               | -94                    | -94    | -Infinity              | -94    |
|   |               | 3, 6               | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1, 4               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|   | dBm/9.36 MHz  | 2, 5               | -64.60                 | -62.25 | -64.60                 | -62.25 |
|   | dBm/38.16 MHz | 3, 6               | -58.50                 | -56.16 | -58.50                 | -56.16 |
| Propagation Condition   |               | 1, 2, 3, 4, 5, 6   | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

#### A.4.6.1.4.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.1.5 EN-DC event triggered reporting tests without gap under non-DRX with SSB index reading

##### A.4.6.1.5.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

##### A.4.6.1.5.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for FDD PSCell are given in Table A.4.6.1.5.1-1 and A.4.6.1.5.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

**Table A.4.6.1.5.2-1: Supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2       |



**Table A.4.6.1.5.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading**

| Parameter                                       | Unit | Test configuration | Value                             | Comment   |
|---|------|--------------------|-----------------------------------|---|
| Active cell                                     |      | 1, 2               | E-UTRAN Cell 1 and NR Cell 2      |   |
| Neighbour cell                                  |      | 1, 2               | NR Cell 3                         | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2               | 1: Cell 1<br>2: Cell 2 and Cell 3 |   |
| SSB configuration                               |      | 1, 2               | SSB.1 FR1                         |   |
| SMTTC configuration                             |      | 1, 2               | SMTTC.2                           |   |
| A3-Offset                                       | dB   | 1, 2               | -4.5                              |   |
| CP length                                       |      | 1, 2               | Normal                            |   |
| Hysteresis                                      | dB   | 1, 2               | 0                                 |   |
| Time To Trigger                                 | s    | 1, 2               | 0                                 |   |
| Filter coefficient                              |      | 1, 2               | 0                                 | L3 filtering is not used  |
| DRX   |      | 1, 2               | N/A                               | OFF   |
| Time offset between PCell and PSCell            |      | 1, 2               | 3 $\mu$ s                         | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | 1, 2               | 3 ms                              | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1  | s    | 1, 2               | 5                                 |   |
| T2  | s    | 1, 2               | 5                                 |   |

**Table A.4.6.1.5.1-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading**

| Parameter   | Unit         | Test configuration | Cell 2                 |        | Cell 3                 |        |
|---|--------------|--------------------|------------------------|--------|------------------------|--------|
|   |              |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |              | 1, 2               | N/A                    |        | N/A                    |        |
| PDSCH RMC configuration   |              | 1, 2               | SR.1.1 FDD             |        | N/A                    |        |
| RMSI CORESET RMC configuration  |              | 1, 2               | CR.1.1 FDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |              | 1, 2               | CCR.1.1 FDD            |        | N/A                    |        |
| OCNG Patterns   |              | 1, 2               | OP.1                   |        | OP.1                   |        |
| TRS configuration   |              | 1, 2               | TRS.1.1 FDD            |        | N/A                    |        |
| Initial BWP configuration   |              | 1, 2               | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |              | 1, 2               | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |              | 1, 2               | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS  |              | 1, 2               | SSB                    |        | SSB                    |        |
| $N_{oc}$ Note 2   | dBm/SCS      | 1, 2               | -98                    |        |                        |        |
| $N_{oc}$ Note 2   | dBm/15 kHz   | 1, 2               | -98                    |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB           | 1, 2               | 4                      | -1.46  | -Infinity              | -1.46  |
| $\hat{E}_s/N_{oc}$  | dB           | 1, 2               | 4                      | 4      | -Infinity              | 4      |
| SS-RSRP Note 3  | dBm/SCS kHz  | 1, 2               | -94                    | -94    | -Infinity              | -94    |
| $l_o$   | dBm/9.36 MHz | 1, 2               | -64.60                 | -62.25 | -64.60                 | -62.25 |
| Propagation Condition   |              | 1, 2               | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |                    |                        |        |                        |        |

### A.4.6.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.1.6 EN-DC event triggered reporting tests with SSB index reading with per-UE gaps

#### A.4.6.1.6.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.4.6.1.6.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PCell. The test parameters for PCell are given in Table A.4.6.1.6.2-1 A.4.6.1.6.2-2 and A.4.6.1.6.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

**Table A.4.6.1.6.2-1: Supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |
| Note 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2       |   |

**Table A.4.6.1.6.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with gap for PCell in FR1 with SSB index reading**

| Parameter                                       | Unit | Test configuration | Value                             | Comment   |
|---|------|--------------------|-----------------------------------|---|
| Active cell                                     |      | 1, 2               | E-UTRAN Cell 1 and NR Cell 2      |   |
| Neighbour cell                                  |      | 1, 2               | NR Cell 3                         | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2               | 1: Cell 1<br>2: Cell 2 and Cell 3 |   |
| Measurement gap type                            |      | 1, 2               | Per-UE gaps                       |   |
| Measurement gap repetition periodicity          | ms   | 1, 2               | 40                                |   |
| Measurement gap length                          | ms   | 1, 2               | 6                                 |   |
| Measurement gap offset                          | ms   | 1, 2               | 39                                |   |
| SSB configuration                               |      | 1, 2               | SSB.1 FR1                         |   |
| SMTC configuration                              |      | 1, 2               | SMTC.2                            |   |
| CSI-RS parameters                               |      | 1, 2               | CSI-RS.1.2 FDD resource #0        |   |
| A3-Offset                                       | dB   | 1, 2               | -4.5                              |   |
| CP length                                       |      | 1, 2               | Normal                            |   |
| Hysteresis                                      | dB   | 1, 2               | 0                                 |   |
| Time To Trigger                                 | s    | 1, 2               | 0                                 |   |
| Filter coefficient                              |      | 1, 2               | 0                                 | L3 filtering is not used  |
| DRX   |      | 1, 2               | N/A                               | OFF   |
| Time offset between PCell and PCell             |      | 1, 2               | 3 $\mu$ s                         | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | 1, 2               | 3 ms                              | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1  | s    | 1, 2               | 5                                 |   |
| T2  | s    | 1, 2               | 5                                 |   |

**Table A.4.6.1.6.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading**

| Parameter   | Unit         | Test configuration | Cell 2                 |        | Cell 3                 |        |
|---|--------------|--------------------|------------------------|--------|------------------------|--------|
|   |              |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |              | 1, 2               | N/A                    |        | N/A                    |        |
| PDSCH RMC configuration   |              | 1, 2               | SR.1.1 FDD             |        | N/A                    |        |
| RMSI CORESET RMC configuration  |              | 1, 2               | CR.1.1 FDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |              | 1, 2               | CCR.1.2 FDD            |        | N/A                    |        |
| OCNG Patterns   |              | 1, 2               | OP.1                   |        | OP.1                   |        |
| TRS configuration   |              | 1, 2               | TRS.1.1 FDD            |        | N/A                    |        |
| Initial BWP configuration   |              | 1, 2               | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |              | 1, 2               | DLBWP.1.2              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |              | 1, 2               | ULBWP.1.2              |        | ULBWP.1.1              |        |
| RLM-RS  |              | 1, 2               | CSI-RS                 |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/SCS      | 1, 2               | -98                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 kHz   | 1, 2               | -98                    |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB           | 1, 2               | 4                      | -1.46  | -Infinity              | -1.46  |
| $\hat{E}_s/N_{oc}$  | dB           | 1, 2               | 4                      | 4      | -Infinity              | 4      |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz  | 1, 2               | -94                    | -94    | -Infinity              | -94    |
| Io  | dBm/9.36 MHz | 1, 2               | -64.60                 | -62.25 | -64.60                 | -62.25 |
| Propagation Condition   |              | 1, 2               | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |                    |                        |        |                        |        |

### A.4.6.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.4.6.1.7 EN-DC event triggered reporting tests under DRX for UE configured with highSpeedMeasFlag-r16

#### A.4.6.1.7.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasFlag-r16. This test will partly verify the intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.4.6.1.7.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.7.1-1, A.4.6.1.7.1-2, A.4.6.1.7.1-3 and A.4.6.1.7.1-4 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.4.6.1.7.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                     |
| 2             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                     |
| 3             | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                     |
| 4             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                     |
| 5             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                     |
| 6             | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                     |
| Note 1:       | The UE is only required to be tested in one of the supported test configurations. |
| Note 2:       | Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2        |

**Table A.4.6.1.7.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter                                       | Unit | Test configuration | Value                             | Comment   |
|---|------|--------------------|-----------------------------------|---|
| <i>highSpeedMeasFlag-r16</i>                    |      | 1,2,3,4,5,6        | Present                           | To enable high speed measurement enhancements                                       |
| Active cell                                     |      | 1, 2, 3,4,5,6      | E-UTRAN Cell 1 and NR Cell 2      |   |
| Neighbour cell                                  |      | 1, 2, 3,4,5,6      | NR Cell 3                         | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3,4,5,6      | 1: Cell 1<br>2: Cell 2 and Cell 3 |   |
| SSB configuration                               |      | 1,4                | SSB.1 FR1                         |   |
|   |      | 2,5                | SSB.1 FR1                         |   |
|   |      | 3,6                | SSB.2 FR1                         |   |
| SMTC configuration                              |      | 1,4                | SMTC.2                            |   |
|   |      | 2,5                | SMTC.1                            |   |
|   |      | 3,6                | SMTC.1                            |   |
| A3-Offset                                       | dB   | 1, 2, 3,4,5,6      | -4.5                              |   |
| CP length                                       |      | 1, 2, 3,4,5,6      | Normal                            |   |
| Hysteresis                                      | dB   | 1, 2, 3,4,5,6      | 0                                 |   |
| Time To Trigger                                 | s    | 1, 2, 3,4,5,6      | 0                                 |   |
| Filter coefficient                              |      | 1, 2, 3,4,5,6      | 0                                 | L3 filtering is not used  |
| DRX   |      | 1, 2, 3,4,5,6      | DRX.7.                            | 640ms DRX cycle   |
| Time offset between PCell and PSCell            |      | 1, 2, 3,4,5,6      | 3 $\mu$ s                         | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | 1,4                | 3 ms                              | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|   |      | 2,5                | 3 $\mu$ s                         | Synchronous cells   |
|   |      | 3,6                | 3 $\mu$ s                         | Synchronous cells   |
| T1  | s    | 1, 2, 3,4,5,6      | 5                                 |   |
| T2  | s    | 1, 2, 3,4,5,6      | 6                                 |   |

**Table A.4.6.1.7.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter                           | Unit          | Test configuration | Cell 2                 |        | Cell 3                         |        |
|-------------------------------------|---------------|--------------------|------------------------|--------|--------------------------------|--------|
|                                     |               |                    | T1                     | T2     | T1                             | T2     |
| TDD configuration                   |               | 1,4                | N/A                    |        | N/A                            |        |
|                                     |               | 2,5                | TDDConf.1.1            |        | TDDConf.1.1                    |        |
|                                     |               | 3,6                | TDDConf.2.1            |        | TDDConf.2.1                    |        |
| PDSCH RMC configuration             |               | 1,4                | SR.1.1 FDD             |        | N/A                            |        |
|                                     |               | 2,5                | SR.1.1 TDD             |        |                                |        |
|                                     |               | 3,6                | SR.2.1 TDD             |        |                                |        |
| RMSI CORESET RMC configuration      |               | 1,4                | CR.1.1 FDD             |        | CR.1.1 FDD                     |        |
|                                     |               | 2,5                | CR.1.1 TDD             |        | CR.1.1 TDD                     |        |
|                                     |               | 3,6                | CR.2.1 TDD             |        | CR.2.1 TDD                     |        |
| Dedicated CORESET RMC configuration |               | 1,4                | CCR.1.1 FDD            |        | CCR.1.1 FDD                    |        |
|                                     |               | 2,5                | CCR.1.1 TDD            |        | CCR.1.1 TDD                    |        |
|                                     |               | 3,6                | CCR.2.1 TDD            |        | CCR.2.1 TDD                    |        |
| OCNG Patterns                       |               | 1, 2, 3,4,5,6      | OP.1                   |        | OP.1                           |        |
| TRS configuration                   |               | 1,4                | TRS.1.1 FDD            |        | N/A                            |        |
|                                     |               | 2,5                | TRS.1.1 TDD            |        | N/A                            |        |
|                                     |               | 3,6                | TRS.1.2 TDD            |        | N/A                            |        |
| Initial BWP configuration           |               | 1, 2, 3,4,5,6      | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1         |        |
| Active DL BWP configuration         |               | 1, 2, 3,4,5,6      | DLBWP.1.1              |        | DLBWP.1.1                      |        |
| Active UL BWP configuration         |               | 1, 2, 3,4,5,6      | ULBWP.1.1              |        | ULBWP.1.1                      |        |
| RLM-RS                              |               | 1, 2, 3,4,5,6      | SSB                    |        | SSB                            |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/SCS       | 1,4                | -98                    |        |                                |        |
|                                     |               | 2,5                | -98                    |        |                                |        |
|                                     |               | 3,6                | -95                    |        |                                |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/15 kHz    | 1,4                | -98                    |        |                                |        |
|                                     |               | 2,5                |                        |        |                                |        |
|                                     |               | 3,6                |                        |        |                                |        |
| $\hat{E}_s/I_{ot}$                  | dB            | 1,4                | 4                      | -1.46  | -Infinity                      | -1.46  |
|                                     |               | 2,5                |                        |        |                                |        |
|                                     |               | 3,6                |                        |        |                                |        |
| $\hat{E}_s/N_{oc}$                  | dB            | 1,4                | 4                      | 4      | -Infinity                      | 4      |
|                                     |               | 2,5                |                        |        |                                |        |
|                                     |               | 3,6                |                        |        |                                |        |
| SS-RSRP <sup>Note 3</sup>           | dBm/SCS kHz   | 1,4                | -94                    | -94    | -Infinity                      | -94    |
|                                     |               | 2,5                | -94                    | -94    | -Infinity                      | -94    |
|                                     |               | 3,6                | -91                    | -91    | -Infinity                      | -91    |
| I <sub>o</sub>                      | dBm/9.36 MHz  | 1,4                | -64.60                 | -62.25 | -64.60                         | -62.25 |
|                                     | dBm/9.36 MHz  | 2,5                | -64.60                 | -62.25 | -64.60                         | -62.25 |
|                                     | dBm/38.16 MHz | 3,6                | -58.50                 | -56.16 | -58.50                         | -56.16 |
| Propagation Condition               |               | 1, 2,4,5           | AWGN                   |        | AWGN 1944 Hz <sup>Note 4</sup> |        |
|                                     |               | 3,6                | AWGN                   |        | AWGN 3334 Hz <sup>Note 5</sup> |        |



|         |  |
|---------|--|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.   |
| Note 5: | The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.   |

### A.4.6.1.7.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 5120 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.2 Inter-frequency Measurements

### A.4.6.2.1 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used

#### A.4.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.1.1-1, A.4.6.2.1.1-2, and A.4.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.1.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.1.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.1.1-1.

**Table A.4.6.2.1.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3       | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6       | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2         |

**Table A.4.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        | Comment   |
|---|------|--------------------|---|--------|---|
|   |      |                    | Test 1                                    | Test 2 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        | One E-UTRAN carrier frequencies is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   | 9      |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | OFF                                       |        | DRX is not used   |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3 ms                                      |        | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3 $\mu$ s                                 |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 1   | 1      |   |

**Table A.4.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 | Unit       | Test configuration | Cell 2                      |             | Cell 3 |    |
|---|------------|--------------------|-----------------------------|-------------|--------|----|
|   |            |                    | T1                          | T2          | T1     | T2 |
| NR RF Channel Number                      |            | Config 1,2,3,4,5,6 | 1                           |             | 2      |    |
| Duplex mode                               |            | Config 1,4         | FDD                         |             |        |    |
|   |            | Config 2,3,5,6     | TDD                         |             |        |    |
| BW <sub>channel</sub>                     | MHz        | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |             |        |    |
|   |            | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |             |        |    |
|   |            | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |             |        |    |
| BWP BW                                    | MHz        | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |             |        |    |
|   |            | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |             |        |    |
|   |            | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |             |        |    |
| TDD configuration                         |            | Config 2,5         | TDDConf.1.1                 | TDDConf.1.1 |        |    |
|   |            | Config 3,6         | TDDConf.2.1                 | TDDConf.2.1 |        |    |
| Initial DL BWP                            |            | Config 1,2,3,4,5,6 | DLBWP.0.1                   | NA          |        |    |
| Initial UL BWP                            |            | Config 1,2,3,4,5,6 | ULBWP.0.1                   | NA          |        |    |
| Dedicated DL BWP                          |            | Config 1,2,3,4,5,6 | DLBWP.1.1                   | NA          |        |    |
| Dedicated UL BWP                          |            | Config 1,2,3,4,5,6 | ULBWP.1.1                   | NA          |        |    |
| TRS configuration                         |            | Config 1,4         | TRS.1.1 FDD                 | NA          |        |    |
|   |            | Config 2,5         | TRS.1.1 TDD                 | NA          |        |    |
|   |            | Config 3,6         | TRS.1.2 TDD                 | NA          |        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |            | Config 1,2,3,4,5,6 | OP.1                        | OP.1        |        |    |
| PDSCH Reference measurement channel       |            | Config 1,4         | SR.1.1 FDD                  | -           |        |    |
|   |            | Config 2,5         | SR.1.1 TDD                  |             |        |    |
|   |            | Config 3,6         | SR2.1 TDD                   |             |        |    |
| RMSI CORESET Reference Channel            |            | Config 1,4         | CR.1.1 FDD                  | -           |        |    |
|   |            | Config 2,5         | CR.1.1 TDD                  |             |        |    |
|   |            | Config 3,6         | CR2.1 TDD                   |             |        |    |
| Dedicated CORESET Reference Channel       |            | Config 1,4         | CCR.1.1 FDD                 |             |        |    |
|   |            | Config 2,5         | CCR.1.1 TDD                 |             |        |    |
|   |            | Config 3,6         | CCR.2.1 TDD                 |             |        |    |
| SSB parameters                            |            | Config 1,4         | SSB.1 FR1                   | SSB.5 FR1   |        |    |
|   |            | Config 2,5         | SSB.1 FR1                   | SSB.5 FR1   |        |    |
|   |            | Config 3,6         | SSB.2 FR1                   | SSB.6 FR1   |        |    |
| SMTC configuration defined in A.3.11      |            | Config 1,4         | SMTC.2                      | SMTC.5      |        |    |
|   |            | Config 2,3,5,6     | SMTC.1                      | SMTC.4      |        |    |
| PDSCH/PDCCH subcarrier spacing            | kHz        | Config 1,2,4,5     | 15                          |             |        |    |
|   |            | Config 3,6         | 30                          |             |        |    |
| EPRE ratio of PSS to SSS                  |            | Config 1,2,3,4,5,6 | 0                           |             | 0      |    |
| EPRE ratio of PBCH DMRS to SSS            |            |                    |                             |             |        |    |
| EPRE ratio of PBCH to PBCH DMRS           |            |                    |                             |             |        |    |
| EPRE ratio of PDCCH DMRS to SSS           |            |                    |                             |             |        |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |            |                    |                             |             |        |    |
| EPRE ratio of PDSCH DMRS to SSS           |            |                    |                             |             |        |    |
| EPRE ratio of PDSCH to PDSCH              |            |                    |                             |             |        |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |            |                    |                             |             |        |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |            |                    |                             |             |        |    |
| N <sub>oc</sub> <sup>Note2</sup>          | dBm/15k Hz |                    |                             |             |        |    |
| N <sub>oc</sub> <sup>Note2</sup>          |            | Config 1,2,4,5     | -98                         |             | -98    |    |

|  | dBm/SC<br>S      | Config 3,6            | -95    |        | -95       |        |
|--|------------------|-----------------------|--------|--------|-----------|--------|
| SS-RSRP <sup>Note 3</sup>  | dBm/SC<br>S      | Config 1,2,4,5        | -94    | -94    | -Infinity | -91    |
|  |                  | Config 3,6            | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$   | dB               | Config<br>1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$   | dB               | Config<br>1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36<br>MHz  | Config 1,2,4,5        | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38.1<br>6MHz | Config 3,6            | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |                  | Config<br>1,2,3,4,5,6 | AWGN   |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |                  |                       |        |        |           |        |

#### A.4.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.2.2 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used

##### A.4.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.2.1-1, A.4.6.2.2.1-2, and A.4.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.2.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.2.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.2.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.4.6.2.2.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations  
Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2

**Table A.4.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        |        |        | Comment   |
|---|------|--------------------|---|--------|--------|--------|---|
|   |      |                    | Test 1                                    | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        |        |        | One E-UTRAN carrier frequencies is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        |        |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        |        |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        |        |        | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   |        | 4      |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   |        | 9      |        |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |        |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        |        |        | L3 filtering is not used  |
| DRX   | ms   | Config 1,2,3,4,5,6 | DRX .1                                    | DRX .7 | DRX .1 | DRX .7 | As specified in clause A.3.3  |
| Time offset between PCell and PScell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        |        |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3ms                                       |        |        |        | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3 $\mu$ s                                 |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |        |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 1.1                                       | 11     | 1.1    | 11     |   |

**Table A.4.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 | Unit | Test configuration | Cell 2                      |    | Cell 3    |    |
|---|------|--------------------|-----------------------------|----|-----------|----|
|   |      |                    | T1                          | T2 | T1        | T2 |
| NR RF Channel Number                      |      | Config 1,2,3,4,5,6 | 1                           |    | 2         |    |
| Duplex mode                               |      | Config 1,4         | FDD                         |    |           |    |
|   |      | Config 2,3,5,6     | TDD                         |    |           |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP BW                                    | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| TDD configuration                         |      | Config 2,5         | TDDConf.1.1                 |    |           |    |
|   |      | Config 3,6         | TDDConf.2.1                 |    |           |    |
| Initial DL BWP                            |      | Config 1,2,3,4,5,6 | DLBWP.0.1                   |    | NA        |    |
| Initial UL BWP                            |      | Config 1,2,3,4,5,6 | ULBWP.0.1                   |    | NA        |    |
| Dedicated DL BWP                          |      | Config 1,2,3,4,5,6 | DLBWP.1.1                   |    | NA        |    |
| Dedicated UL BWP                          |      | Config 1,2,3,4,5,6 | ULBWP.1.1                   |    | NA        |    |
| TRS configuration                         |      | Config 1,4         | TRS.1.1 FDD                 |    | NA        |    |
|   |      | Config 2,5         | TRS.1.1 TDD                 |    | NA        |    |
|   |      | Config 3,6         | TRS.1.2 TDD                 |    | NA        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |      | Config 1,2,3,4,5,6 | OP.1                        |    | OP.1      |    |
| PDSCH Reference measurement channel       |      | Config 1,4         | SR.1.1 FDD                  |    | -         |    |
|   |      | Config 2,5         | SR.1.1 TDD                  |    |           |    |
|   |      | Config 3,6         | SR2.1 TDD                   |    |           |    |
| RMSI CORESET Reference Channel            |      | Config 1,4         | CR.1.1 FDD                  |    | -         |    |
|   |      | Config 2,5         | CR.1.1 TDD                  |    |           |    |
|   |      | Config 3,6         | CR2.1 TDD                   |    |           |    |
| Dedicated CORESET Reference Channel       |      | Config 1,4         | CCR.1.1 FDD                 |    |           |    |
|   |      | Config 2,5         | CCR.1.1 TDD                 |    |           |    |
|   |      | Config 3,6         | CCR.2.1 TDD                 |    |           |    |
| SSB parameters                            |      | Config 1,4         | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |      | Config 2,5         | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |      | Config 3,6         | SSB.2 FR1                   |    | SSB.6 FR1 |    |
| SMTC configuration defined in A.3.11      |      | Config 1,4         | SMTC.2                      |    | SMTC.5    |    |
|   |      | Config 2,3,5,6     | SMTC.1                      |    | SMTC.4    |    |
| PDSCH/PDCCH subcarrier spacing            | kHz  | Config 1,2,4,5     | 15                          |    |           |    |
|   |      | Config 3,6         | 30                          |    |           |    |
| EPRE ratio of PSS to SSS                  |      | Config 1,2,3,4,5,6 | 0                           |    | 0         |    |
| EPRE ratio of PBCH DMRS to SSS            |      |                    |                             |    |           |    |
| EPRE ratio of PBCH to PBCH DMRS           |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH DMRS to SSS           |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH DMRS to SSS           |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH to PDSCH              |      |                    |                             |    |           |    |

|  |               |                    |        |        |           |        |
|--|---------------|--------------------|--------|--------|-----------|--------|
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |               |                    |        |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |               |                    |        |        |           |        |
| $N_{oc}^{Note2}$   | dBm/15kHz     |                    |        | -98    |           | -98    |
| $N_{oc}^{Note2}$   | dBm/SCS       | Config 1,2,4,5     |        | -98    |           | -98    |
|  |               | Config 3,6         |        | -95    |           | -95    |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS       | Config 1,2,4,5     | -94    | -94    | -Infinity | -91    |
|  |               | Config 3,6         | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$   | dB            | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$   | dB            | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $I_o^{Note3}$  | dBm/9.36 MHz  | Config 1,2,4,5     | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38.16 MHz | Config 3,6         | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |               | Config 1,2,3,4,5,6 | AWGN   |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |               |                    |        |        |           |        |

#### A.4.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.



A.4.6.2.3 Void

A.4.6.2.4 Void

A.4.6.2.5 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used

A.4.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.5.1-1, A.4.6.2.5.1-2, and A.4.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.5.1-1.

**Table A.4.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3       | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6       | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2         |

**Table A.4.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        | Comment   |
|---|------|--------------------|---|--------|---|
|   |      |                    | Test 1                                    | Test 2 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        | One E-UTRAN carrier frequencies is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   | 9      |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | OFF                                       |        | DRX is not used   |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3ms                                       |        | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3 $\mu$ s                                 |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 1.1                                       | 1      |   |

**Table A.4.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 | Unit | Test configuration | Cell 2                      |    | Cell 3    |    |
|---|------|--------------------|-----------------------------|----|-----------|----|
|   |      |                    | T1                          | T2 | T1        | T2 |
| NR RF Channel Number                      |      | Config 1,2,3,4,5,6 | 1                           |    | 2         |    |
| Duplex mode                               |      | Config 1,4         | FDD                         |    |           |    |
|   |      | Config 2,3,5,6     | TDD                         |    |           |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP BW                                    | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| TDD configuration                         |      | Config 2,5         | TDDConf.1.1                 |    |           |    |
|   |      | Config 3,6         | TDDConf.2.1                 |    |           |    |
| Initial DL BWP                            |      | Config 1,2,3,4,5,6 | DLBWP.0.1                   |    | NA        |    |
| Initial UL BWP                            |      | Config 1,2,3,4,5,6 | ULBWP.0.1                   |    | NA        |    |
| Dedicated DL BWP                          |      | Config 1,2,3,4,5,6 | DLBWP.1.1                   |    | NA        |    |
| Dedicated UL BWP                          |      | Config 1,2,3,4,5,6 | ULBWP.1.1                   |    | NA        |    |
| TRS configuration                         |      | Config 1,4         | TRS.1.1 FDD                 |    | NA        |    |
|   |      | Config 2,5         | TRS.1.1 TDD                 |    | NA        |    |
|   |      | Config 3,6         | TRS.1.2 TDD                 |    | NA        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |      | Config 1,2,3,4,5,6 | OP.1                        |    | OP.1      |    |
| PDSCH Reference measurement channel       |      | Config 1,4         | SR.1.1 FDD                  |    |           |    |
|   |      | Config 2,5         | SR.1.1 TDD                  |    |           |    |
|   |      | Config 3,6         | SR2.1 TDD                   |    |           |    |
| RMSI CORESET Reference Channel            |      | Config 1,4         | CR.1.1 FDD                  |    | -         |    |
|   |      | Config 2,5         | CR.1.1 TDD                  |    |           |    |
|   |      | Config 3,6         | CR2.1 TDD                   |    |           |    |
| Dedicated CORESET Reference Channel       |      | Config 1,4         | CCR.1.1 FDD                 |    |           |    |
|   |      | Config 2,5         | CCR.1.1 TDD                 |    |           |    |
|   |      | Config 3,6         | CCR.2.1 TDD                 |    |           |    |
| SSB parameters                            |      | Config 1,4         | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |      | Config 2,5         | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |      | Config 3,6         | SSB.2 FR1                   |    | SSB.6 FR1 |    |
| SMTC configuration defined in A.3.11      |      | Config 1,4         | SMTC.2                      |    | SMTC.5    |    |
|   |      | Config 2,3,5,6     | SMTC.1                      |    | SMTC.4    |    |
| PDSCH/PDCCH subcarrier spacing            | kHz  | Config 1,2,4,5     | 15                          |    |           |    |
|   |      | Config 3,6         | 30                          |    |           |    |
| EPRE ratio of PSS to SSS                  |      | Config 1,2,3,4,5,6 | 0                           |    | 0         |    |
| EPRE ratio of PBCH DMRS to SSS            |      |                    |                             |    |           |    |
| EPRE ratio of PBCH to PBCH DMRS           |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH DMRS to SSS           |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH DMRS to SSS           |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH to PDSCH              |      |                    |                             |    |           |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |      |                    |                             |    |           |    |

|  |              |                    |        |        |           |        |
|--|--------------|--------------------|--------|--------|-----------|--------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |                    |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz   |                    |        | -98    |           | -98    |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2,4,5     |        | -98    |           | -98    |
|  |              | Config 3,6         |        | -95    |           | -95    |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2,4,5     | -94    | -94    | -Infinity | -91    |
|  |              | Config 3,6         | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$   | dB           | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$   | dB           | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2,4,5     | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38.16MHz | Config 3,6         | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3,4,5,6 | AWGN   |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |        |        |           |        |

#### A.4.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.2.6 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used

##### A.4.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.6.1-1, A.4.6.2.6.1-2, and A.4.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.6.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.4.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2       | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3       | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5       | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6       | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2         |

**Table A.4.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        |        |        | Comment   |
|---|------|--------------------|---|--------|--------|--------|---|
|   |      |                    | Test 1                                    | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        |        |        | One E-UTRAN carrier frequencies is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        |        |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        |        |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        |        |        | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 4      |        |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   | 9      |        |        |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |        |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        |        |        | L3 filtering is not used  |
| DRX   | ms   | Config 1,2,3,4,5,6 | DRX .1                                    | DRX .7 | DRX .1 | DRX .7 | As specified in clause A.3.3  |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        |        |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3ms                                       |        |        |        | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3 $\mu$ s                                 |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |        |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 1.3                                       | 13.5   | 1.3    | 13.5   |   |

**Table A.4.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**



| Parameter                                 | Unit | Test configuration | Cell 2                      |    | Cell 3 |    |
|---|------|--------------------|-----------------------------|----|--------|----|
|   |      |                    | T1                          | T2 | T1     | T2 |
| NR RF Channel Number                      |      | Config 1,2,3,4,5,6 | 1                           |    | 2      |    |
| Duplex mode                               |      | Config 1,4         | FDD                         |    |        |    |
|   |      | Config 2,3,5,6     | TDD                         |    |        |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |        |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |        |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    |        |    |
| BWP BW                                    | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |        |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |        |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    |        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |      | Config 1,2,3,4,5,6 | OP.1                        |    | OP.1   |    |
| PDSCH Reference measurement channel       |      | Config 1,4         | SR.1.1 FDD                  |    | -      |    |
|   |      | Config 2,5         | SR.1.1 TDD                  |    |        |    |
|   |      | Config 3,6         | SR2.1 TDD                   |    |        |    |
| RMSI CORESET Reference Channel            |      | Config 1,4         | CR.1.1 FDD                  |    | -      |    |
|   |      | Config 2,5         | CR.1.1 TDD                  |    |        |    |
|   |      | Config 3,6         | CR2.1 TDD                   |    |        |    |
| Dedicated CORESET Reference Channel       |      | Config 1,4         | CCR.1.1 FDD                 |    |        |    |
|   |      | Config 2,5         | CCR.1.1 TDD                 |    |        |    |
|   |      | Config 3,6         | CCR.2.1 TDD                 |    |        |    |
| TDD configuration                         |      | Config 2,5         | TDDConf.1.1                 |    |        |    |
|   |      | Config 3,6         | TDDConf.2.1                 |    |        |    |
| Initial DL BWP                            |      | Config 1,2,3,4,5,6 | DLBWP.0.1                   |    |        |    |
| TRS configuration                         |      | Config 1,4         | TRS.1.1 FDD                 |    | N/A    |    |
|   |      | Config 2,5         | TRS.1.1 TDD                 |    | N/A    |    |
|   |      | Config 3,6         | TRS.1.2 TDD                 |    | N/A    |    |
| Initial UL BWP                            |      | Config 1,2,3,4,5,6 | ULBWP.0.1                   |    |        |    |
| Dedicated DL BWP                          |      | Config 1,2,3,4,5,6 | DLBWP.1.1                   |    |        |    |
| Dedicated UL BWP                          |      | Config 1,2,3,4,5,6 | ULBWP.1.1                   |    |        |    |
| SSB parameters                            |      | Config 1,4         | SSB.1 FR1                   |    |        |    |
|   |      | Config 2,5         | SSB.1 FR1                   |    |        |    |
|   |      | Config 3,6         | SSB.2 FR1                   |    |        |    |
| SMTc configuration defined in A.3.11      |      | Config 1,4         | SMTc.2                      |    |        |    |
|   |      | Config 2,3,5,6     | SMTc.1                      |    |        |    |
| PDSCH/PDCCH subcarrier spacing            | kHz  | Config 1,2,4,5     | 15                          |    |        |    |
|   |      | Config 3,6         | 30                          |    |        |    |
| EPRE ratio of PSS to SSS                  |      | Config 1,2,3,4,5,6 | 0                           |    | 0      |    |
| EPRE ratio of PBCH DMRS to SSS            |      |                    |                             |    |        |    |
| EPRE ratio of PBCH to PBCH DMRS           |      |                    |                             |    |        |    |
| EPRE ratio of PDCCH DMRS to SSS           |      |                    |                             |    |        |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |      |                    |                             |    |        |    |
| EPRE ratio of PDSCH DMRS to SSS           |      |                    |                             |    |        |    |
| EPRE ratio of PDSCH to PDSCH              |      |                    |                             |    |        |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |      |                    |                             |    |        |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                    |                             |    |        |    |

|  |              |                    |        |        |           |        |
|--|--------------|--------------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz   |                    | -98    |        | -98       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2,4,5     | -98    |        | -98       |        |
|  |              | Config 3,6         | -95    |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2,4,5     | -94    | -94    | -Infinity | -91    |
|  |              | Config 3,6         | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2,4,5     | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38.16MHz | Config 3,6         | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3,4,5,6 | AWGN   |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |        |        |           |        |

#### A.4.6.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.4.6.2.7 Void

A.4.6.2.8 Void

A.4.6.3 Void

#### A.4.6.4 L1-RSRP measurement for beam reporting

A.4.6.4.1 SSB based L1-RSRP measurement when DRX is not used

A.4.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.4.1.1-1.

**Table A.4.6.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

A.4.6.4.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.1.2-1 and Table A.4.6.4.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.4.6.4.1.2-1: General test parameters

| Parameter   | Config | Unit | Value                  |
|---|--------|------|------------------------|
| SSB GSCN  | 1~6    |      | freq1                  |
| Duplex mode   | 1,4    |      | FDD                    |
|   | 2,5    |      | TDD                    |
|   | 3,6    |      | TDD                    |
| TDD Configuration   | 1,4    |      | N/A                    |
|   | 2,5    |      | TDDConf.1.1            |
|   | 3,6    |      | TDDConf.2.1            |
| $BW_{\text{channel}}$   | 1,4    | MHz  | 10: $N_{RB,c} = 52$    |
|   | 2,5    |      | 10: $N_{RB,c} = 52$    |
|   | 3,6    |      | 40: $N_{RB,c} = 106$   |
| PDSCH Reference measurement channel   | 1,4    |      | SR.1.1 FDD             |
|   | 2,5    |      | SR.1.1 TDD             |
|   | 3,6    |      | SR.2.1 TDD             |
| RMSI CORESET Reference Channel  | 1,4    |      | CR.1.1 FDD             |
|   | 2,5    |      | CR.1.1 TDD             |
|   | 3,6    |      | CR.2.1 TDD             |
| Dedicated CORESET Reference Channel   | 1,4    |      | CCR.1.1 FDD            |
|   | 2,5    |      | CCR.1.1 TDD            |
|   | 3,6    |      | CCR.2.1 TDD            |
| SSB configuration   | 1,4    |      | SSB.3 FR1              |
|   | 2,5    |      | SSB.3 FR1              |
|   | 3,6    |      | SSB.4 FR1              |
| OCNG Patterns   | 1~6    |      | OP.1                   |
| Initial BWP Configuration   | 1~6    |      | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration   | 1~6    |      | DLBWP.1.1<br>ULBWP.1.1 |
| SMTc configuration  | 1~6    |      | SMTc.1                 |
| TRS Configuration   | 1,4    |      | TRS.1.1 FDD            |
|   | 2,5    |      | TRS.1.1 TDD            |
|   | 3,6    |      | TRS.1.2 TDD            |
| DRX configuration   | 1~6    |      | Off                    |
| reportConfigType  | 1~6    |      | periodic               |
| reportQuantity  | 1~6    |      | ssb-Index-RSRP         |
| Number of reported RS   | 1~6    |      | 2                      |
| L1-RSRP reporting period  | 1~6    | slot | 80                     |
| T1  | 1~6    | s    | 5                      |
| T2  | 1~6    | s    | 1                      |
| EPRE ratio of PSS to SSS  | 1~6    | dB   | 0                      |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                        |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                        |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                        |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                        |
| Propagation condition   | 1~6    |      | AWGN                   |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                        |

Table A.4.6.4.1.2-2: SSB specific test parameters

| Parameter  | Config  | Unit          | SSB#0  |        | SSB#1     |        |
|--|---------|---------------|--------|--------|-----------|--------|
|  |         |               | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~6     | dBm/15kHz     | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65 |        |           |        |
|  | 3,6     |               | -91.65 |        |           |        |
| $\hat{E}_s / I_{ot}$   | 1~6     | dB            | 0      | 0      | -Infinity | 3      |
| SSB RSRP <sup>Note3</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3,6     |               | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2,4,5 | dBm/9.36 MHz  | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3,6     | dBm/38.16 MHz | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s / N_{oc}$   | 1~6     | dB            | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |               |        |        |           |        |

#### A.4.6.4.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.4.2 SSB based L1-RSRP measurement when DRX is used

##### A.4.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.4.2.1-1.

Table A.4.6.4.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

##### A.4.6.4.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.2.2-1 and Table A.4.6.4.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.4.6.4.2.2-1: General test parameters

| Parameter   | Config | Unit | Value                  |
|---|--------|------|------------------------|
| SSB GSCN  | 1~6    |      | freq1                  |
| Duplex mode   | 1,4    |      | FDD                    |
|   | 2,5    |      | TDD                    |
|   | 3,6    |      | TDD                    |
| TDD Configuration   | 1,4    |      | N/A                    |
|   | 2,5    |      | TDDConf.1.1            |
|   | 3,6    |      | TDDConf.2.1            |
| $BW_{\text{channel}}$   | 1,4    | MHz  | 10: $N_{RB,c} = 52$    |
|   | 2,5    |      | 10: $N_{RB,c} = 52$    |
|   | 3,6    |      | 40: $N_{RB,c} = 106$   |
| PDSCH Reference measurement channel   | 1,4    |      | SR.1.1 FDD             |
|   | 2,5    |      | SR.1.1 TDD             |
|   | 3,6    |      | SR.2.1 TDD             |
| RMSI CORESET Reference Channel  | 1,4    |      | CR.1.1 FDD             |
|   | 2,5    |      | CR.1.1 TDD             |
|   | 3,6    |      | CR.2.1 TDD             |
| Dedicated CORESET Reference Channel   | 1,4    |      | CCR.1.1 FDD            |
|   | 2,5    |      | CCR.1.1 TDD            |
|   | 3,6    |      | CCR.2.1 TDD            |
| SSB configuration   | 1,4    |      | SSB.3 FR1              |
|   | 2,5    |      | SSB.3 FR1              |
|   | 3,6    |      | SSB.4 FR1              |
| OCNG Patterns   | 1~6    |      | OP.1                   |
| Initial BWP Configuration   | 1~6    |      | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration   | 1~6    |      | DLBWP.1.1<br>ULBWP.1.1 |
| SMTc configuration  | 1~6    |      | SMTc.1                 |
| TRS Configuration   | 1,4    |      | TRS.1.1 FDD            |
|   | 2,5    |      | TRS.1.1 TDD            |
|   | 3,6    |      | TRS.1.2 TDD            |
| DRX configuration   | 1~6    |      | DRX.3                  |
| reportConfigType  | 1~6    |      | periodic               |
| reportQuantity  | 1~6    |      | ssb-Index-RSRP         |
| Number of reported RS   | 1~6    |      | 2                      |
| L1-RSRP reporting period  | 1~6    | slot | 80                     |
| T1  | 1~6    | s    | 5                      |
| T2  | 1~6    | s    | 1                      |
| EPRE ratio of PSS to SSS  | 1~6    | dB   | 0                      |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                        |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                        |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                        |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                        |
| Propagation condition   | 1~6    |      | AWGN                   |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                        |

Table A.4.6.4.2.2-2: SSB specific test parameters

| Parameter  | Config  | Unit          | SSB#0  |        | SSB#1     |        |
|--|---------|---------------|--------|--------|-----------|--------|
|  |         |               | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~6     | dBm/15kHz     | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65 |        |           |        |
|  | 3,6     |               | -91.65 |        |           |        |
| $\hat{E}_s / I_{ot}$   | 1~6     | dB            | 0      | 0      | -Infinity | 3      |
| SSB RSRP <sup>Note3</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3,6     |               | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2,4,5 | dBm/9.36 MHz  | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3,6     | dBm/38.16 MHz | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s / N_{oc}$   | 1~6     | dB            | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |               |        |        |           |        |

#### A.4.6.4.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.4.6.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.4.6.4.3.1-1.

Table A.4.6.4.3.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |



#### A.4.6.4.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.3.2-1 and Table A.4.6.4.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.4.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.4.6.4.3.2-1: General test parameters

| Parameter   | Config | Unit  | Value                       |
|---|--------|-------|-----------------------------|
| SSB GSCN  | 1~6    |       | freq1                       |
| Duplex mode   | 1,4    |       | FDD                         |
|   | 2,5    |       | TDD                         |
|   | 3,6    |       | TDD                         |
| TDD Configuration   | 1,4    |       | N/A                         |
|   | 2,5    |       | TDDConf.1.1                 |
|   | 3,6    |       | TDDConf.2.1                 |
| BW <sub>channel</sub>   | 1,4    | MHz   | 10: N <sub>RB,c</sub> = 52  |
|   | 2,5    |       | 10: N <sub>RB,c</sub> = 52  |
|   | 3,6    |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1,4    |       | SR.1.1 FDD                  |
|   | 2,5    |       | SR.1.1 TDD                  |
|   | 3,6    |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1,4    |       | CR.1.1 FDD                  |
|   | 2,5    |       | CR.1.1 TDD                  |
|   | 3,6    |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1,4    |       | CCR.1.1 FDD                 |
|   | 2,5    |       | CCR.1.1 TDD                 |
|   | 3,6    |       | CCR.2.1 TDD                 |
| SSB configuration   | 1,4    |       | SSB.3 FR1                   |
|   | 2,5    |       | SSB.3 FR1                   |
|   | 3,6    |       | SSB.4 FR1                   |
| CSI-RS configuration  | 1,4    |       | CSI-RS 1.3 FDD              |
|   | 2,5    |       | CSI-RS 1.3 TDD              |
|   | 3,6    |       | CSI-RS 2.3 TDD              |
| OCNG Patterns   | 1~6    |       | OP.1                        |
| TRS Configuration   | 1,4    |       | TRS.1.1 FDD                 |
|   | 2,5    |       | TRS.1.1 TDD                 |
|   | 3,6    |       | TRS.1.2 TDD                 |
| Initial BWP Configuration   | 1~6    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~6    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration  | 1~6    |       | SMTc.1                      |
| DRX configuration   | 1~6    |       | Off                         |
| reportConfigType  | 1~6    |       | aperiodic                   |
| reportQuantity  | 1~6    |       | cri-RSRP                    |
| Number of reported RS   | 1~6    |       | 2                           |
| qcl-Info  | 1~6    |       | SSB#0 for resource#0        |
|   |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList  | 1~6    | slots | 8                           |
| T1  | 1~6    | s     | 5                           |
| EPRE ratio of PSS to SSS  | 1~6    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |       |                             |
| Propagation condition   | 1~6    |       | AWGN                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

Table A.4.6.4.3.2-2: CSI-RS specific test parameters

| Parameter  | Config  | Unit          | CSI-RS#0 | CSI-RS#1 |
|--|---------|---------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~6     | dBm/15kHz     | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65   |          |
|  | 3,6     |               | -91.65   |          |
| $\hat{E}_s / I_{ot}$   | 1~6     | dB            | 0        | 3        |
| CSI-RS RSRP <sup>Note2</sup>   | 1,2,4,5 | dBm/SSB SCS   | -94.65   | -91.65   |
|  | 3,6     |               | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2,4,5 | dBm/9.36 MHz  | -63.69   | -61.93   |
|  | 3,6     | dBm/38.16 MHz | -57.59   | -55.84   |
| $\hat{E}_s / N_{oc}$   | 1~6     | dB            | 0        | 3        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |               |          |          |

#### A.4.6.4.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.4.4 CSI-RS based L1-RSRP measurement when DRX is used

##### A.4.6.4.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.4.6.4.4.1-1.

Table A.4.6.4.4.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6  | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

##### A.4.6.4.4.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.4.2-1 and Table A.4.6.4.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.4.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.4.6.4.4.2-1: General test parameters

| Parameter   | Config | Unit  | Value                       |
|---|--------|-------|-----------------------------|
| SSB GSCN  | 1-6    |       | freq1                       |
| Duplex mode   | 1,4    |       | FDD                         |
|   | 2,5    |       | TDD                         |
|   | 3,6    |       | TDD                         |
| TDD Configuration   | 1,4    |       | N/A                         |
|   | 2,5    |       | TDDConf.1.1                 |
|   | 3,6    |       | TDDConf.2.1                 |
| BW <sub>channel</sub>   | 1,4    | MHz   | 10: N <sub>RB,c</sub> = 52  |
|   | 2,5    |       | 10: N <sub>RB,c</sub> = 52  |
|   | 3,6    |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1,4    |       | SR.1.1 FDD                  |
|   | 2,5    |       | SR.1.1 TDD                  |
|   | 3,6    |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1,4    |       | CR.1.1 FDD                  |
|   | 2,5    |       | CR.1.1 TDD                  |
|   | 3,6    |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1,4    |       | CCR.1.1 FDD                 |
|   | 2,5    |       | CCR.1.1 TDD                 |
|   | 3,6    |       | CCR.2.1 TDD                 |
| SSB configuration   | 1,4    |       | SSB.3 FR1                   |
|   | 2,5    |       | SSB.3 FR1                   |
|   | 3,6    |       | SSB.4 FR1                   |
| CSI-RS configuration  | 1,4    |       | CSI-RS 1.3 FDD              |
|   | 2,5    |       | CSI-RS 1.3 TDD              |
|   | 3,6    |       | CSI-RS 2.3 TDD              |
| OCNG Patterns   | 1-6    |       | OP.1                        |
| TRS Configuration   | 1,4    |       | TRS.1.1 FDD                 |
|   | 2,5    |       | TRS.1.1 TDD                 |
|   | 3,6    |       | TRS.1.2 TDD                 |
| Initial BWP Configuration   | 1-6    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1-6    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration  | 1-6    |       | SMTC.1                      |
| DRX configuration   | 1-6    |       | DRX.3                       |
| reportConfigType  | 1-6    |       | aperiodic                   |
| reportQuantity  | 1-6    |       | cri-RSRP                    |
| Number of reported RS   | 1-6    |       | 2                           |
| qcl-Info  | 1-6    |       | SSB#0 for resource#0        |
|   |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList  | 1-6    | slots | 8                           |
| T1  | 1-6    | s     | 5                           |
| EPRE ratio of PSS to SSS  | 1-6    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |       |                             |
| Propagation condition   | 1-6    |       | AWGN                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

Table A.4.6.4.4.2-2: CSI-RS specific test parameters

| Parameter  | Config  | Unit          | CSI-RS#0 | CSI-RS#1 |
|--|---------|---------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~6     | dBm/15kHz     | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65   |          |
|  | 3,6     |               | -91.65   |          |
| $\hat{E}_s / I_{ot}$   | 1~6     | dB            | 0        | 3        |
| CSI-RS RSRP <sup>Note2</sup>   | 1,2,4,5 | dBm/SSB SCS   | -94.65   | -91.65   |
|  | 3,6     |               | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2,4,5 | dBm/9.36 MHz  | -63.69   | -61.93   |
|  | 3,6     | dBm/38.16 MHz | -57.59   | -55.84   |
| $\hat{E}_s / N_{oc}$   | 1~6     | dB            | 0        | 3        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |               |          |          |

#### A.4.6.4.4.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.4.5 SSB based L1-RSRP measurement when DRX is used for UE configured with *highSpeedMeasFlag-r16*

##### A.4.6.4.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*. This test will partly verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.4.5.1-1.

Table A.4.6.4.5.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6  | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

#### A.4.6.4.5.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.5.2-1 and Table A.4.6.4.5.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.4.6.4.5.2-1: General test parameters for UE configured with *highSpeedMeasFlag-r16*

| Parameter   | Config | Unit | Value                  |
|---|--------|------|------------------------|
| SSB GSCN  | 1~6    |      | freq1                  |
| Duplex mode   | 1,4    |      | FDD                    |
|   | 2,5    |      | TDD                    |
|   | 3,6    |      | TDD                    |
| TDD Configuration   | 1,4    |      | N/A                    |
|   | 2,5    |      | TDDConf.1.1            |
|   | 3,6    |      | TDDConf.2.1            |
| $BW_{\text{channel}}$   | 1,4    | MHz  | 10: $N_{RB,c} = 52$    |
|   | 2,5    |      | 10: $N_{RB,c} = 52$    |
|   | 3,6    |      | 40: $N_{RB,c} = 106$   |
| PDSCH Reference measurement channel   | 1,4    |      | SR.1.1 FDD             |
|   | 2,5    |      | SR.1.1 TDD             |
|   | 3,6    |      | SR.2.1 TDD             |
| RMSI CORESET Reference Channel  | 1,4    |      | CR.1.1 FDD             |
|   | 2,5    |      | CR.1.1 TDD             |
|   | 3,6    |      | CR.2.1 TDD             |
| Dedicated CORESET Reference Channel   | 1,4    |      | CCR.1.1 FDD            |
|   | 2,5    |      | CCR.1.1 TDD            |
|   | 3,6    |      | CCR.2.1 TDD            |
| SSB configuration   | 1,4    |      | SSB.3 FR1              |
|   | 2,5    |      | SSB.3 FR1              |
|   | 3,6    |      | SSB.4 FR1              |
| OCNG Patterns   | 1~6    |      | OP.1                   |
| Initial BWP Configuration   | 1~6    |      | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration   | 1~6    |      | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration  | 1~6    |      | SMTC.1                 |
| TRS Configuration   | 1,4    |      | TRS.1.1 FDD            |
|   | 2,5    |      | TRS.1.1 TDD            |
|   | 3,6    |      | TRS.1.2 TDD            |
| DRX configuration   | 1~6    |      | DRX.3                  |
| reportConfigType  | 1~6    |      | periodic               |
| reportQuantity  | 1~6    |      | ssb-Index-RSRP         |
| Number of reported RS   | 1~6    |      | 2                      |
| L1-RSRP reporting period  | 1~6    | slot | 80                     |
| T1  | 1~6    | s    | 5                      |
| T2  | 1~6    | s    | 2                      |
| EPRE ratio of PSS to SSS  | 1~6    | dB   | 0                      |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                        |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                        |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                        |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                        |
| Propagation condition   |        |      |                        |
|   | 3,6    |      | AWGN 3334 Hz           |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                        |



**Table A.4.6.4.5.2-2: SSB specific test parameters for UE configured with *highSpeedMeasFlag-r16***

| Parameter  | Config  | Unit         | SSB#0  |        | SSB#1     |        |
|--|---------|--------------|--------|--------|-----------|--------|
|  |         |              | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~6     | dBm/15kHz    | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2,4,5 | dBm/SSB SCS  | -94.65 |        |           |        |
|  | 3,6     |              | -91.65 |        |           |        |
| $\hat{E}_s/I_{ot}$   | 1~6     | dB           | 0      | 0      | -Infinity | 3      |
| SSB RSRP <sup>Note3</sup>  | 1,2,4,5 | dBm/SSB SCS  | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3,6     |              | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3,6     |              | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s/N_{oc}$   | 1~6     | dB           | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |              |        |        |           |        |

#### A.4.6.4.5.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.5 CLI measurements

#### A.4.6.5.1 SRS-RSRP measurement with non-DRX

##### A.4.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 9.7.2.5 with the testing configurations for NR cells in Table A.4.6.5.1.1-1.

**Table A.4.6.5.1.1-1: Applicable NR configurations for FR1 SRS-RSRP test**

| Configuration | Description  |
|---------------|--|
| 1             | NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 2             | NR 30 kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

##### A.4.6.5.1.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR1 PCell (Cell 2). The test parameters for PCell is given in Table A.4.6.5.1.2-1 and A.4.6.5.1.2-2 below and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table A.4.6.5.1.2-4 and the test parameters for the (virtual) neighbour cell UE in Table A.4.6.5.1.2-3. During the test,

the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

**Table A.4.6.5.1.2-1: General test parameters for SRS-RSRP event triggered reporting for PSCell in FR1**

| Parameter   | Unit    | Test configuration | Value                        | Comment                  |
|---|---------|--------------------|------------------------------|--------------------------|
| Active cell   |         | 1, 2               | E-UTRAN Cell 1 and NR Cell 2 |                          |
| RF Channel Number   |         | 1, 2               | 1: Cell 1<br>2: Cell 2       |                          |
| SSB configuration   |         | 1                  | SSB.1 FR1                    |                          |
|   |         | 2                  | SSB.2 FR1                    |                          |
| SMTC configuration  |         | 1                  | SMTC.1                       |                          |
|   |         | 2                  | SMTC.1                       |                          |
| SRS configuration   |         | 1                  | SRSCConf.1                   | Table A.4.6.5.1.2-3      |
|   |         | 2                  | SRSCConf.2                   |                          |
| CP length   |         | 1, 2               | Normal                       |                          |
| i1-Threshold  | dBm     | 1                  | -97                          |                          |
|   |         | 2                  | -95                          |                          |
| Hysteresis  | dB      | 1, 2               | 0                            |                          |
| Time To Trigger   | s       | 1, 2               | 0                            |                          |
| Filter coefficient  |         | 1, 2               | 0                            | L3 filtering is not used |
| DRX   |         | 1, 2               | OFF                          | Non-DRX                  |
| Time offset between DL from serving cell and SRS from test system | $\mu$ s | 1,2                | 17.67                        |                          |
| T1  | s       | 1, 2               | 5                            |                          |
| T2  | s       | 1, 2               | 1                            |                          |

**Table A.4.6.5.1.2-2: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell in FR1**

| Parameter  | Unit       | Test configuration | Cell 2              |    |
|--|------------|--------------------|---------------------|----|
|  |            |                    | T1                  | T2 |
| TDD configuration  |            | 1                  | TDDConf.1.1         |    |
|  |            | 2                  | TDDConf.2.1         |    |
| PDSCH RMC configuration  |            | 1                  | SR.1.1 TDD          |    |
|  |            | 2                  | SR.2.1 TDD          |    |
| RMSI CORESET RMC configuration   |            | 1                  | CR.1.1 TDD          |    |
|  |            | 2                  | CR.2.1 TDD          |    |
| Dedicated CORESET RMC configuration  |            | 1                  | CCR.1.1 TDD         |    |
|  |            | 2                  | CCR.2.1 TDD         |    |
| OCNG Patterns  |            | 1, 2               | OP.1                |    |
| TRS Configuration  |            | 1                  | TRS.1.1 TDD         |    |
|  |            | 2                  | TRS.1.2 TDD         |    |
| Initial BWP configuration  |            | 1, 2               | DLBWP.0.1 ULBWP.0.1 |    |
| Active DL BWP configuration  |            | 1, 2               | DLBWP.1.1           |    |
| Active UL BWP configuration  |            | 1, 2               | ULBWP.1.1           |    |
| $N_{oc}$ Note 2  | dBm/15 kHz | 1                  | -98                 |    |
|  |            | 2                  |                     |    |
| $N_{oc}$ Note 2  | dBm/SCS    | 1                  | -98                 |    |
|  |            | 2                  | -95                 |    |
| Propagation Condition  |            | 1, 2               | AWGN                |    |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |            |                    |                     |    |

**Table A.4.6.5.1.2-3: NR Cell specific test parameters for SRS-RSRP event triggered reporting for neighbour cell UE**

| Parameter  | Unit          | Test configuration | Neighbour cell UE |        |
|--|---------------|--------------------|-------------------|--------|
|  |               |                    | T1                | T2     |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/15 kHz    | 1                  | -98               |        |
|  |               | 2                  |                   |        |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/SCS       | 1                  | -98               |        |
|  |               | 2                  | -95               |        |
| $\hat{E}_s/I_{ot}$   | dB            | 1                  | -infinity         | 4      |
|  |               | 2                  |                   |        |
| $\hat{E}_s/N_{oc}$   | dB            | 1                  | -infinity         | 4      |
|  |               | 2                  |                   |        |
| SRS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1                  | -infinity         | -94    |
|  |               | 2                  | -infinity         | -91    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -70.05            | -64.59 |
|  | dBm/38.16 MHz | 2                  | -63.96            | -58.50 |
| Propagation Condition  |               | 1, 2               | AWGN              |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                   |        |

**Table A.4.6.5.1.2-4: SRS configuration for measurement reporting**

|                 | Field                            | SRSCConf.1 | SRSCConf.2        | Comments |
|-----------------|----------------------------------|------------|-------------------|----------|
| SRS-ResourceSet | srs-ResourceSetId                | 0          | 0                 |          |
|                 | srs-ResourceCidList              | 0          | 0                 |          |
|                 | resourceType                     | Periodic   | Periodic          |          |
|                 | Usage                            | Codebook   | Codebook          |          |
| SRS-Resource    | SRS-ResourceCid                  | 0          | 0                 |          |
|                 | nrofSRS-Ports                    | Port1      | Port1             |          |
|                 | transmissionComb                 | n2         | n2                |          |
|                 | combOffset-n2                    | 0          | 0                 |          |
|                 | cyclicShift-n2                   | 0          | 0                 |          |
|                 | resourceMapping startPosition    | 0          | 0                 |          |
|                 | resourceMapping nrofSymbols      | n1         | n1                |          |
|                 | resourceMapping repetitionFactor | n1         | n1                |          |
|                 | freqDomainPosition               | 0          | 0                 |          |
|                 | freqDomainShift                  | 0          | 0                 |          |
|                 | freqHopping c-SRS                | 12         | 12                |          |
|                 | freqHopping b-SRS                | 0          | 0                 |          |
|                 | freqHopping b-hop                | 0          | 0                 |          |
|                 | groupOrSequenceHopping           | Neither    | Neither           |          |
|                 | resourceType                     | Periodic   | Periodic          |          |
|                 | periodicityAndOffset             | sl20, 9    | sl40, 19          |          |
| sequenceId      | 0                                | 0          | Any 10 bit number |          |

### A.4.6.5.1.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.5.2 CLI-RSSI measurement with non-DRX

#### A.4.6.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of CLI-RSSI measurement. This test will verify the CLI-RSSI measurement requirements in clause 9.7.3.5 with the testing configurations for NR cells in Table A.4.6.5.2.1-1.

**Table A.4.6.5.2.1-1: Applicable NR configurations for FR1 CLI-RSSI test**

| Configuration | Description  |
|---------------|--|
| 1             | NR 15 kHz SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 2             | NR 30 kHz SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

#### A.4.6.5.2.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters for PSCell is given in Table A.4.6.5.2.2-1 and A.4.6.5.2.2-2 below and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI measurement resource and on 1 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.4.6.5.2.2-3.

**Table A.4.6.5.2.2-1: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR1**

| Parameter  | Unit | Test configuration | Value                           | Comment                  |
|--|------|--------------------|---------------------------------|--------------------------|
| Active cell  |      | 1, 2               | E-UTRAN Cell 1<br>and NR Cell 2 |                          |
| RF Channel Number  |      | 1, 2               | 1: Cell 1<br>2: Cell 2          |                          |
| SSB configuration  |      | 1                  | SSB.1 FR1                       |                          |
|  |      | 2                  | SSB.2 FR1                       |                          |
| SMTC configuration   |      | 1                  | SMTC.1                          |                          |
|  |      | 2                  | SMTC.1                          |                          |
| CLI-RSSI configuration   |      | 1                  | CLI-RSSICConf.1                 | Table A.4.6.5.2.2-3      |
|  |      | 2                  | CLI-RSSICConf.2                 |                          |
| CP length  |      | 1, 2               | Normal                          |                          |
| i1-Threshold   | dBm  | 1                  | -93                             |                          |
|  |      | 2                  | -93                             |                          |
| Hysteresis   | dB   | 1, 2               | 0                               |                          |
| Time To Trigger  | s    | 1, 2               | 0                               |                          |
| Filter coefficient   |      | 1, 2               | 0                               | L3 filtering is not used |
| DRX  |      | 1, 2               | OFF                             | Non-DRX                  |
| Time offset between DL from serving cell and OCNG from test system | μs   | 1,2                | 17.67                           |                          |
| T1   | s    | 1, 2               | 5                               |                          |
| T2   | s    | 1, 2               | 1                               |                          |

**Table A.4.6.5.2.2-2: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR1**

| Parameter  | Unit          | Test configuration | Cell 2              |        |
|--|---------------|--------------------|---------------------|--------|
|  |               |                    | T1                  | T2     |
| TDD configuration  |               | 1                  | TDDConf.1.1         |        |
|  |               | 2                  | TDDConf.2.1         |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 TDD          |        |
|  |               | 2                  | SR.2.1 TDD          |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 TDD          |        |
|  |               | 2                  | CR.2.1 TDD          |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 TDD         |        |
|  |               | 2                  | CCR.2.1 TDD         |        |
| OCNG Patterns <sup>Note 3</sup>  |               | 1, 2               | OP.1                |        |
| TRS Configuration  |               | 1                  | TRS.1.1 TDD         |        |
|  |               | 2                  | TRS.1.2 TDD         |        |
| Initial BWP configuration  |               | 1, 2               | DLBWP.0.1 ULBWP.0.1 |        |
| Active DL BWP configuration  |               | 1, 2               | DLBWP.1.1           |        |
| Active UL BWP configuration  |               | 1, 2               | ULBWP.1.1           |        |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>  | dBm/15 kHz    | 1                  | -116                | -108   |
|  |               | 2                  |                     |        |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>  | dBm/SCS       | 1                  | -116                | -108   |
|  |               | 2                  | -113                | -105   |
| Io on CLI-RSSI measurement resource  | dBm/9.36 MHz  | 1                  | -88.05              | -80.05 |
|  | dBm/38.16 MHz | 2                  | -81.96              | -74.00 |
| Io on CLI-RSSI measurement resource  | dBm/1.08 MHz  | 1                  | -97.43              | -89.43 |
|  | dBm/1.08 MHz  | 2                  | -97.44              | -89.44 |
| Propagation Condition  |               | 1, 2               | AWGN                |        |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |               |                    |                     |        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |               |                    |                     |        |
| Note 3: OCNG is not transmitted in the CLI-RSSI measurement resources.   |               |                    |                     |        |

**Table A.4.6.5.2.2-3: CLI-RSSI measurement resource configuration for measurement reporting**

|               | Field                    | CLI-RSSIConf.1 | CLI-RSSIConf.2 |
|---------------|--------------------------|----------------|----------------|
| RSSI-Resource | rss-ResourceId           | 0              | 0              |
|               | rss-SCS                  | 15             | 30             |
|               | startPRB                 | 0              | 0              |
|               | nrofPRBs                 | 52             | 106            |
|               | startPosition            | 3              | 3              |
|               | nrofSymbols              | 11             | 11             |
|               | rss-PeriodicityAndOffset | sl20, 9        | sl40, 19       |

### A.4.6.5.2.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on I<sub>o</sub>.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.6 Measurements with autonomous gaps

### A.4.6.6.1 EN-DC-intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC

#### A.4.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements for intra-frequency identification of a new CGI of NR FR1 cell with autonomous gaps in clause 8.1.2.4.27 and 8.1.2.4.28 in 36.133 [15] for EN-DC.

The test scenario comprises of one E-UTRA carrier and one NR FR1 carrier. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) on E-UTRA RF channel 1, NR FR1 PCell (Cell 2) and NR FR1 neighbour cell (Cell 3) on NR RF channel 1. The supported test configurations are shown in table A.4.6.6.1.1-1 below. The test parameters for NR Cells are given in Table A.4.6.6.1.2-2, A.4.6.6.1.2-3 below. The test parameters and applicability for the E-UTRAN PCell are defined in A.3.7.2.1. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 3. Starting T2, Cell 3 becomes detectable and the UE is expected to detect and send a measurement report.

A RRC message implying SI reading shall be sent to the UE during period T2, after the UE has reported Event A3. The RRC message shall create a measurement report configuration with purpose *reportCGI* which *cellForWhichToReportCGI* set to the physical cell identity of Cell 3. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading of the neighbour cell (Cell 3) using autonomous gap is sent to the UE.

**Table A.4.6.6.1.1-1: intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations  
Note 2: target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2

**Table A.4.6.6.1.1-2: General test parameters for intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**

| Parameter                                       | Unit | Test configuration | Value                                     | Comment   |
|---|------|--------------------|---|---|
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   | One E-UTRAN radio channel is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1   | One NR FR1 radio channel is used.   |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR Cell 2 (PScell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR Cell 3                                 | NR Cell 3 is on NR RF channel number 1.   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -4.5                                      |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | OFF                                       | DRX is not used   |
| Time offset between PCell and PScell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3 ms                                      | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3 $\mu$ s                                 | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |   |
| T2  | s    | Config 1,2,3,4,5,6 | $\leq 10$                                 |   |
| T3  | s    | Config 1,2,3,4,5,6 | 5   |   |

**Table A.4.6.6.1.1-3: Cell specific test parameters for intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**



| Parameter                                 | Unit       | Test configuration | Cell 2                      |     | Cell 3      |     |
|---|------------|--------------------|-----------------------------|-----|-------------|-----|
|   |            |                    | T1                          | T2  | T1          | T2  |
| Duplex mode                               |            | Config 1,4         | FDD                         |     |             |     |
|   |            | Config 2,3,5,6     | TDD                         |     |             |     |
| BW <sub>channel</sub>                     | MHz        | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |     |             |     |
|   |            | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |     |             |     |
|   |            | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |     |             |     |
| BWP BW                                    | MHz        | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |     |             |     |
|   |            | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |     |             |     |
|   |            | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |     |             |     |
| TDD configuration                         |            | Config 1,4         | N/A                         |     | N/A         |     |
|   |            | Config 2,5         | TDDConf.1.1                 |     | TDDConf.1.1 |     |
|   |            | Config 3,6         | TDDConf.2.1                 |     | TDDConf.2.1 |     |
| Initial DL BWP                            |            | Config 1,2,3,4,5,6 | DLBWP.0.1                   |     | NA          |     |
| Initial UL BWP                            |            | Config 1,2,3,4,5,6 | ULBWP.0.1                   |     | NA          |     |
| Dedicated DL BWP                          |            | Config 1,2,3,4,5,6 | DLBWP.1.1                   |     | NA          |     |
| Dedicated UL BWP                          |            | Config 1,2,3,4,5,6 | ULBWP.1.1                   |     | NA          |     |
| TRS configuration                         |            | Config 1,4         | TRS.1.1 FDD                 |     | NA          |     |
|   |            | Config 2,5         | TRS.1.1 TDD                 |     |             |     |
|   |            | Config 3,6         | TRS.1.2 TDD                 |     |             |     |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |            | Config 1,2,3,4,5,6 | OP.1                        |     | OP.1        |     |
| PDSCH Reference measurement channel       |            | Config 1,4         | SR.1.1 FDD                  |     | NA          |     |
|   |            | Config 2,5         | SR.1.1 TDD                  |     |             |     |
|   |            | Config 3,6         | SR2.1 TDD                   |     |             |     |
| RMSI CORESET Reference Channel            |            | Config 1,4         | CR.1.1 FDD                  |     | NA          |     |
|   |            | Config 2,5         | CR.1.1 TDD                  |     | NA          |     |
|   |            | Config 3,6         | CR2.1 TDD                   |     | NA          |     |
| RMC CORESET Reference Channel             |            | 1, 4               | CCR.1.1 FDD                 |     | NA          |     |
|   |            | 2, 5               | CCR.1.1 TDD                 |     | NA          |     |
|   |            | 3, 6               | CCR.2.1 TDD                 |     | NA          |     |
| SSB parameters                            |            | Config 1,2,4,5     | SSB.1 FR1                   |     |             |     |
|   |            | Config 3,6         | SSB.2 FR1                   |     |             |     |
| SMTC configuration defined in A.3.11      |            | Config 1,4         | SMTC.2                      |     |             |     |
|   |            | Config 2,3,5,6     | SMTC.1                      |     |             |     |
| RMSI scheduling periodicity               | ms         | Config 1,2,3,4,5,6 | 20ms                        |     |             |     |
| PDSCH/PDCCH subcarrier spacing            | kHz        | Config 1,2,4,5     | 15                          |     |             |     |
|   |            | Config 3,6         | 30                          |     |             |     |
| RLM-RS                                    |            | Config 1,2,3,4,5,6 | SSB                         |     | SSB         |     |
| EPRE ratio of PSS to SSS                  |            | Config 1,2,3,4,5,6 | 0                           |     | 0           |     |
| EPRE ratio of PBCH DMRS to SSS            |            |                    |                             |     |             |     |
| EPRE ratio of PBCH to PBCH DMRS           |            |                    |                             |     |             |     |
| EPRE ratio of PDCCH DMRS to SSS           |            |                    |                             |     |             |     |
| EPRE ratio of PDCCH to PDCCH DMRS         |            |                    |                             |     |             |     |
| EPRE ratio of PDSCH DMRS to SSS           |            |                    |                             |     |             |     |
| EPRE ratio of PDSCH to PDSCH              |            |                    |                             |     |             |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |            |                    |                             |     |             |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |            |                    |                             |     |             |     |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/15 kHz |                    | -98                         |     | -98         |     |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/S CS   | Config 1,2,4,5     | -98                         |     | -98         |     |
|   |            | Config 3,6         | -95                         |     | -95         |     |
| SS-RSRP <sup>Note 3</sup>                 | dBm/S CS   | Config 1,2,4,5     | -94                         | -94 | -Infinity   | -94 |
|   |            | Config 3,6         | -91                         | -91 | -Infinity   | -91 |

|  |              |                    |        |        |           |        |
|--|--------------|--------------------|--------|--------|-----------|--------|
| $\hat{E}_s / I_{ot}$   | dB           | Config 1,2,3,4,5,6 | 4      | -1.46  | -Infinity | -1.46  |
| $\hat{E}_s / N_{oc}$   | dB           | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 4      |
| $I_o^{Note3}$  | dBm/9.36MHz  | Config 1,2,4,5     | -64.60 | -62.25 | -64.60    | -62.25 |
|  | dBm/38.16MHz | Config 3,6         | -58.50 | -56.16 | -58.50    | -56.16 |
| Propagation Condition  |              | Config 1,2,3,4,5,6 | AWGN   |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |        |        |           |        |

#### A.4.6.6.1.2 Test Requirements

The UE shall transmit a measurement report containing the cell global identifier of Cell 3 within 257 ms from the start of T3.

$$\begin{aligned}
 \text{Test requirement} &= \text{RRC Procedure delay} + T_{\text{identify\_CGL\_NR}} + \text{reporting delay} \\
 &= 15 + 240 + 2 \\
 &= 257 \text{ ms, allow 260ms.}
 \end{aligned}$$

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 257 ms the number of interrupted slots shall not exceed the allowed number specified in 8.2.1.2.16.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.7 L1-SINR measurement for beam reporting

#### A.4.6.7.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR when DRX is not used

##### A.4.6.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement based on CSI-RS CMR without dedicated IMR. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.1, with the testing configurations for NR cells in Table A.4.6.7.1.1-1.

**Table A.4.6.7.1.1-1: Applicable NR configurations for FR1 CSI-RS based L1-SINR test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.4.6.7.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.7.1.2-1 and Table A.4.6.7.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.7.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.4.6.7.1.2-1: General test parameters

| Parameter   | Config | Unit  | Value                       |
|---|--------|-------|-----------------------------|
| SSB GSCN  | 1~6    |       | freq1                       |
| Duplex mode   | 1,4    |       | FDD                         |
|   | 2,5    |       | TDD                         |
|   | 3,6    |       | TDD                         |
| TDD Configuration   | 1,4    |       | N/A                         |
|   | 2,5    |       | TDDConf.1.1                 |
|   | 3,6    |       | TDDConf.2.1                 |
| BW <sub>channel</sub>   | 1,4    | MHz   | 10: N <sub>RB,c</sub> = 52  |
|   | 2,5    |       | 10: N <sub>RB,c</sub> = 52  |
|   | 3,6    |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1,4    |       | SR.1.1 FDD                  |
|   | 2,5    |       | SR.1.1 TDD                  |
|   | 3,6    |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1,4    |       | CR.1.1 FDD                  |
|   | 2,5    |       | CR.1.1 TDD                  |
|   | 3,6    |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1,4    |       | CCR.1.1 FDD                 |
|   | 2,5    |       | CCR.1.1 TDD                 |
|   | 3,6    |       | CCR.2.1 TDD                 |
| SSB configuration   | 1,4    |       | SSB.3 FR1                   |
|   | 2,5    |       | SSB.3 FR1                   |
|   | 3,6    |       | SSB.4 FR1                   |
| CSI-RS configuration  | 1,4    |       | CSI-RS.1.3 FDD              |
|   | 2,5    |       | CSI-RS.1.3 TDD              |
|   | 3,6    |       | CSI-RS.2.3 TDD              |
| OCNG Patterns   | 1~6    |       | OP.1                        |
| TRS Configuration   | 1,4    |       | TRS.1.1 FDD                 |
|   | 2,5    |       | TRS.1.1 TDD                 |
|   | 3,6    |       | TRS.1.2 TDD                 |
| Initial BWP Configuration   | 1~6    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~6    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration  | 1~6    |       | SMTC.1                      |
| DRX configuration   | 1~6    |       | Off                         |
| reportConfigType  | 1~6    |       | aperiodic                   |
| reportQuantity-r16  | 1~6    |       | cri-SINR-r16                |
| Number of reported RS   | 1~6    |       | 2                           |
| qcl-Info  | 1~6    |       | SSB#0 for resource#0        |
|   |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList  | 1~6    | slots | 26                          |
| T1  | 1~6    | s     | 5                           |
| EPRE ratio of PSS to SSS  | 1~6    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |       |                             |
| Propagation condition   | 1~6    |       | AWGN                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

Table A.4.6.7.1.2-2: CSI-RS specific test parameters

| Parameter  | Config  | Unit          | CSI-RS#0 | CSI-RS#1 |
|--|---------|---------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~6     | dBm/15kHz     | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65   |          |
|  | 3,6     |               | -91.65   |          |
| $\hat{E}_s/I_{ot}$   | 1~6     | dB            | 0        | 3        |
| CSI-RS RSRP <sup>Note3</sup>   | 1,2,4,5 | dBm/SSB SCS   | -94.65   | -91.65   |
|  | 3,6     |               | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2,4,5 | dBm/9.36 MHz  | -63.69   | -61.93   |
|  | 3,6     | dBm/38.16 MHz | -57.59   | -55.84   |
| $\hat{E}_s/N_{oc}$   | 1~6     | dB            | 0        | 3        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |               |          |          |

#### A.4.6.7.1.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.27.1.1 and relative accuracy requirement in clause 10.1.27.1.2.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

#### A.4.6.7.2 L1-SINR measurement with SSB based CMR and dedicated IMR when DRX is used

##### A.4.6.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with SSB based CMR and CSI-IM based IMR in clause 9.8.4.2, with the testing configurations for NR cells in Table A.4.6.7.2.1-1.

**Table A.4.6.7.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.4.6.7.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.7.2.2-1 and Table A.4.6.7.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the SSBs and the associated CSI-IM resources, and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD measurements based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR.

Table A.4.6.7.2.2-1: General test parameters

| Parameter   | Config | Unit | Value                       |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1~6    |      | freq1                       |
| Duplex mode   | 1,4    |      | FDD                         |
|   | 2,5    |      | TDD                         |
|   | 3,6    |      | TDD                         |
|   | 1,4    |      | N/A                         |
| TDD Configuration   | 2,5    |      | TDDConf.1.1                 |
|   | 3,6    |      | TDDConf.2.1                 |
|   | 1,4    |      |                             |
| BW <sub>channel</sub>   | 2,5    | MHz  | 10: N <sub>RB,c</sub> = 52  |
|   | 3,6    |      | 10: N <sub>RB,c</sub> = 52  |
|   |        |      | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1,4    |      | SR.1.1 FDD                  |
|   | 2,5    |      | SR.1.1 TDD                  |
|   | 3,6    |      | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1,4    |      | CR.1.1 FDD                  |
|   | 2,5    |      | CR.1.1 TDD                  |
|   | 3,6    |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1,4    |      | CCR.1.1 FDD                 |
|   | 2,5    |      | CCR.1.1 TDD                 |
|   | 3,6    |      | CCR.2.1 TDD                 |
| SSB configuration   | 1,4    |      | SSB.3 FR1                   |
|   | 2,5    |      | SSB.3 FR1                   |
|   | 3,6    |      | SSB.4 FR1                   |
| CSI-IM configuration  | 1,4    |      | CSI-IM.1.1 FDD              |
|   | 2,5    |      | CSI-IM.1.1 TDD              |
|   | 3,6    |      | CSI-IM.2.1 TDD              |
| OCNG Patterns   | 1~6    |      | OP.1                        |
| Initial BWP Configuration   | 1~6    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~6    |      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration  | 1~6    |      | SMTC.1                      |
| TRS Configuration   | 1,4    |      | TRS.1.1 FDD                 |
|   | 2,5    |      | TRS.1.1 TDD                 |
|   | 3,6    |      | TRS.1.2 TDD                 |
| DRX configuration   | 1~6    |      | DRX.3                       |
| reportConfigType  | 1~6    |      | periodic                    |
| reportQuantity-r16  | 1~6    |      | ssb-Index-SINR-r16          |
| Number of reported RS   | 1~6    |      | 2                           |
| L1-SINR reporting period  | 1~6    | slot | 80                          |
| T1  | 1~6    | s    | 5                           |
| T2  | 1~6    | s    | 1                           |
| EPRE ratio of PSS to SSS  | 1~6    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| Propagation condition   |        |      |                             |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |

Table A.4.6.7.2.2-2: SSB specific test parameters

| Parameter  | Config  | Unit          | SSB#0  |        | SSB#1     |        |
|--|---------|---------------|--------|--------|-----------|--------|
|  |         |               | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~6     | dBm/15kHz     | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65 |        |           |        |
|  | 3,6     |               | -91.65 |        |           |        |
| $\hat{E}_s/I_{ot}$   | 1~6     | dB            | 0      | 0      | -Infinity | 3      |
| SS-RSRP <sup>Note3</sup>   | 1,2,4,5 | dBm/SSB SCS   | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3,6     |               | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2,4,5 | dBm/9.36 MHz  | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3,6     | dBm/38.16 MHz | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s/N_{oc}$   | 1~6     | dB            | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |               |        |        |           |        |

### A.4.6.7.2.3 Test Requirements

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 while meeting the accuracy requirement in clause 10.1.27.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.4.6.7.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR configured when DRX is used

#### A.4.6.7.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with CSI-RS based CMR and dedicated IMR configured in clause 9.8.4.3, with the testing configurations for NR cells in Table A.4.6.7.3.1-1.

Table A.4.6.7.3.1-1: Applicable NR configurations for FR1 L1-SINR test with CMR and dedicated IMR

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |



#### A.4.6.7.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.7.3.2-1 and Table A.4.6.7.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the configured CSI-RS as CMR and an associated CSI-RS as IMR, and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources and the associated IMR. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.7.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs, and UE is configured to perform L1-SINR measurement based on the CSI-RS as CMR and the CSI-RS as IMR.

Table A.4.6.7.3.2-1: General test parameters

| Parameter   | Config | Unit  | Value                       |
|---|--------|-------|-----------------------------|
| SSB GSCN  | 1~6    |       | freq1                       |
| Duplex mode   | 1,4    |       | FDD                         |
|   | 2,5    |       | TDD                         |
|   | 3,6    |       | TDD                         |
| TDD Configuration   | 1,4    |       | N/A                         |
|   | 2,5    |       | TDDConf.1.1                 |
|   | 3,6    |       | TDDConf.2.1                 |
| BW <sub>channel</sub>   | 1,4    | MHz   | 10: N <sub>RB,c</sub> = 52  |
|   | 2,5    |       | 10: N <sub>RB,c</sub> = 52  |
|   | 3,6    |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1,4    |       | SR.1.1 FDD                  |
|   | 2,5    |       | SR.1.1 TDD                  |
|   | 3,6    |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1,4    |       | CR.1.1 FDD                  |
|   | 2,5    |       | CR.1.1 TDD                  |
|   | 3,6    |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1,4    |       | CCR.1.1 FDD                 |
|   | 2,5    |       | CCR.1.1 TDD                 |
|   | 3,6    |       | CCR.2.1 TDD                 |
| SSB configuration   | 1,4    |       | SSB.3 FR1                   |
|   | 2,5    |       | SSB.3 FR1                   |
|   | 3,6    |       | SSB.4 FR1                   |
| CSI-RS configuration as CMR   | 1,4    |       | CSI-RS.1.3 FDD              |
|   | 2,5    |       | CSI-RS.1.3 TDD              |
|   | 3,6    |       | CSI-RS.2.3 TDD              |
| CSI-RS configuration as IMR   | 1,4    |       | CSI-RS.1.2A FDD             |
|   | 2,5    |       | CSI-RS.1.2A TDD             |
|   | 3,6    |       | CSI-RS.2.2A TDD             |
| OCNG Patterns   | 1~6    |       | OP.1                        |
| TRS Configuration   | 1,4    |       | TRS.1.1 FDD                 |
|   | 2,5    |       | TRS.1.1 TDD                 |
|   | 3,6    |       | TRS.1.2 TDD                 |
| Initial BWP Configuration   | 1~6    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~6    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration  | 1~6    |       | SMTc.1                      |
| DRX configuration   | 1~6    |       | DRX.3                       |
| reportConfigType  | 1~6    |       | aperiodic                   |
| reportQuantity-r16  | 1~6    |       | cri-SINR-r16                |
| Number of reported RS   | 1~6    |       | 2                           |
| qcl-Info  | 1~6    |       | SSB#0 for resource#0        |
|   |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList  | 1~6    | slots | 26                          |
| T1  | 1~6    | s     | 5                           |
| EPRE ratio of PSS to SSS  | 1~6    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |       |                             |
| Propagation condition   | 1~6    |       | AWGN                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

Table A.4.6.7.3.2-2: CSI-RS specific test parameters

| Parameter  | Config  | Unit          | CSI-RS#0 | CSI-RS#1 |
|--|---------|---------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~6     | dBm/15kHz     | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2,4,5 | dBm/SSB SCS   | -94.65   |          |
|  | 3,6     |               | -91.65   |          |
| $\hat{E}_s / I_{ot}$   | 1~6     | dB            | 0        | 3        |
| $\hat{E}_s / N_{oc}$   | 1~6     | dB            | 0        | 3        |
| CSI-RS RSRP <sup>Note2</sup>   | 1,2,4,5 | dBm/SSB SCS   | -94.65   | -91.65   |
|  | 3,6     |               | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2,4,5 | dBm/9.36 MHz  | -63.69   | -61.93   |
|  | 3,6     | dBm/38.16 MHz | -57.59   | -55.84   |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |         |               |          |          |

### A.4.6.7.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR while meeting the accuracy requirement in clause 10.1.27.3.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

## A.4.6.8 CSI-RS based intra-frequency Measurement

### A.4.6.8.1 EN-DC event triggered reporting tests without gap under DRX

#### A.4.6.8.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the CSI-RS based L3 intra-frequency requirements in clause 9.10.2.

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PCell. The test parameters for PCell are given in Table A.4.6.8.1.1-1, A.4.6.8.1.1-2, A.4.6.8.1.1-3 and A.4.6.8.1.1-4 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used for the CSI-RS based L3 intra-frequency measurements. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.4.6.8.1.1-1: Supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode         |
| 2       | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode         |
| 3       | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode         |
| 4       | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode         |
| 5       | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode         |
| 6       | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode         |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2       |

**Table A.4.6.8.1.1-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX**

| Parameter                                       | Unit | Test configuration | Value                             | Comment  |
|---|------|--------------------|-----------------------------------|--|
|   |      |                    | Test 1                            |  |
| Active cell                                     |      | 1, 2, 3, 4, 5, 6   | E-UTRAN Cell 1 and NR Cell 2      |  |
| Neighbour cell                                  |      | 1, 2, 3, 4, 5, 6   | NR Cell 3                         | Cell to be identified.   |
| RF Channel Number                               |      | 1, 2, 3, 4, 5, 6   | 1: Cell 1<br>2: Cell 2 and Cell 3 |  |
| SMTC configuration                              |      | 1, 4               | SMTC.2                            |  |
|   |      | 2, 5               | SMTC.1                            |  |
|   |      | 3, 6               | SMTC.1                            |  |
| A3-Offset                                       | dB   | 1, 2, 3, 4, 5, 6   | -4.5                              |  |
| CP length                                       |      | 1, 2, 3, 4, 5, 6   | Normal                            |  |
| Hysteresis                                      | dB   | 1, 2, 3, 4, 5, 6   | 0                                 |  |
| Time To Trigger                                 | s    | 1, 2, 3, 4, 5, 6   | 0                                 |  |
| Filter coefficient                              |      | 1, 2, 3, 4, 5, 6   | 0                                 | L3 filtering is not used   |
| DRX   |      | 1, 2, 3, 4, 5, 6   | DRX.5                             |  |
| Time offset between PCell and PSCell            | µs   | 1, 2, 3, 4, 5, 6   | 3                                 | Synchronous EN-DC  |
| Time offset between serving and neighbour cells | µs   | 1, 4               | 4.7                               | Asynchronous cells.<br>The timing of Cell 3 is CP later than the timing of Cell 2. |
|   |      | 2, 5               | 4.7                               | Synchronous cells  |
|   |      | 3, 6               | 2.35                              | Synchronous cells  |
| T1  | s    | 1, 2, 3, 4, 5, 6   | 5                                 |  |
| T2  | s    | 1, 2, 3, 4, 5, 6   | 7                                 |  |

**Table A.4.6.8.1.1-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX**

| Parameter         | Unit | Test configuration | Cell 2      |    | Cell 3      |    |
|-------------------|------|--------------------|-------------|----|-------------|----|
|                   |      |                    | T1          | T2 | T1          | T2 |
| TDD configuration |      | 1, 4               | N/A         |    | N/A         |    |
|                   |      | 2, 5               | TDDConf.1.1 |    | TDDConf.1.1 |    |
|                   |      | 3, 6               | TDDConf.2.1 |    | TDDConf.2.1 |    |

|                                     |               |                  |                        |                        |           |        |
|-------------------------------------|---------------|------------------|------------------------|------------------------|-----------|--------|
| PDSCH RMC configuration             |               | 1, 4             | SR.1.1 FDD             | N/A                    |           |        |
|                                     |               | 2, 5             | SR.1.1 TDD             |                        |           |        |
|                                     |               | 3, 6             | SR.2.1 TDD             |                        |           |        |
| RMSI CORESET RMC configuration      |               | 1, 4             | CR.1.1 FDD             | CR.1.1 FDD             |           |        |
|                                     |               | 2, 5             | CR.1.1 TDD             | CR.1.1 TDD             |           |        |
|                                     |               | 3, 6             | CR.2.1 TDD             | CR.2.1 TDD             |           |        |
| Dedicated CORESET RMC configuration |               | 1, 4             | CCR.1.1 FDD            | CCR.1.1 FDD            |           |        |
|                                     |               | 2, 5             | CCR.1.1 TDD            | CCR.1.1 TDD            |           |        |
|                                     |               | 3, 6             | CCR.2.1 TDD            | CCR.2.1 TDD            |           |        |
| OCNG Patterns                       |               | 1, 2, 3, 4, 5, 6 | OP.1                   | OP.1                   |           |        |
| TRS configuration                   |               | 1, 4             | TRS.1.1 FDD            | N/A                    |           |        |
|                                     |               | 2, 5             | TRS.1.1 TDD            | N/A                    |           |        |
|                                     |               | 3, 6             | TRS.1.2 TDD            | N/A                    |           |        |
| Initial BWP configuration           |               | 1, 2, 3, 4, 5, 6 | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |           |        |
| Active DL BWP configuration         |               | 1, 2, 3, 4, 5, 6 | DLBWP.1.1              | DLBWP.1.1              |           |        |
| Active UL BWP configuration         |               | 1, 2, 3, 4, 5, 6 | ULBWP.1.1              | ULBWP.1.1              |           |        |
| SSB parameters                      |               | 1,4              | SSB.1 FR1              | SSB.5 FR1              |           |        |
|                                     |               | 2,5              | SSB.1 FR1              | SSB.5 FR1              |           |        |
|                                     |               | 3,6              | SSB.2 FR1              | SSB.6 FR1              |           |        |
| CSI-RS configuration for RRM        |               | 1,4              | CSI-RS.RRM.FR1.1 FDD   |                        |           |        |
|                                     |               | 2,5              | CSI-RS.RRM.FR1.1 TDD   |                        |           |        |
|                                     |               | 3,6              | CSI-RS.RRM.FR1.2 TDD   |                        |           |        |
| RLM-RS                              |               | 1, 2, 3, 4, 5, 6 | SSB                    | SSB                    |           |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/SCS       | 1,2,4,5          | -98                    |                        |           |        |
|                                     |               | 3, 6             | -95                    |                        |           |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/15 kHz    | 1, 2, 3, 4, 5, 6 | -98                    |                        |           |        |
| $\hat{E}_s/I_{ot}$ for SSB          | dB            | 1, 2, 3, 4, 5, 6 | 4                      | -1.46                  | -Infinity | -1.46  |
| $\hat{E}_s/I_{ot}$ for CSI-RS       | dB            | 1, 2, 3, 4, 5, 6 | 4                      | -1.46                  | -Infinity | -1.46  |
| $\hat{E}_s/N_{oc}$ for SSB          | dB            | 1, 2, 3, 4, 5, 6 | 4                      | 4                      | -Infinity | 4      |
| $\hat{E}_s/N_{oc}$ for CSI-RS       | dB            | 1, 2, 3, 4, 5, 6 | 4                      | 4                      | -Infinity | 4      |
| SS-RSRP <sup>Note 3</sup>           | dBm/SCS kHz   | 1, 4             | -94                    | -94                    | -Infinity | -94    |
|                                     |               | 2, 5             | -94                    | -94                    | -Infinity | -94    |
|                                     |               | 3, 6             | -91                    | -91                    | -Infinity | -91    |
| CSI-RSRP <sup>Note 3</sup>          | dBm/SCS kHz   | 1, 4             | -94                    | -94                    | -Infinity | -94    |
|                                     |               | 2, 5             | -94                    | -94                    | -Infinity | -94    |
|                                     |               | 3, 6             | -91                    | -91                    | -Infinity | -91    |
| I <sub>o</sub>                      | dBm/9.36 MHz  | 1, 4             | -64.60                 | -62.25                 | -64.60    | -62.25 |
|                                     | dBm/9.36 MHz  | 2, 5             | -64.60                 | -62.25                 | -64.60    | -62.25 |
|                                     | dBm/38.16 MHz | 3                | -58.50                 | -56.16                 | -58.50    | -56.16 |

|                       |  |                  |      |
|-----------------------|--|------------------|------|
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN |
| Note 1:               | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |                  |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |      |
| Note 3:               | SS-RSRP and CSI-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |      |

#### A.4.6.8.1.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 9280 ms from the beginning of time period T2. The UE is not required to read the SSB index indicated by associatedSSB in the neighbour cell in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.9 CSI-RS based inter-frequency Measurement

#### A.4.6.9.1 EN-DC event triggered reporting tests for FR1 cell when non-DRX is used

##### A.4.6.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell measurement requirements in clause 9.10.3.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.9.1.1-1, A.4.6.9.1.1-2, and A.4.6.9.1.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.9.1.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.9.1.1-1.

**Table A.4.6.9.1.1-1: EN-DC event triggered reporting tests with SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode         |
| 2       | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode         |
| 3       | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode         |
| 4       | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode         |
| 5       | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode         |
| 6       | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode         |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2         |

Table A.4.6.9.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting

| Parameter                                       | Unit | Test configuration | Value                                     |        | Comment   |
|---|------|--------------------|---|--------|---|
|   |      |                    | Test 1                                    | Test 2 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        | One E-UTRAN TDD carrier frequencies is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        | Two FR1 NR carrier frequencies are used.  |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   | 9      |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        | L3 filtering is not used  |
| DRX   | ms   | Config 1,2,3,4,5,6 | OFF                                       |        | DRX is not used   |
| Time offset between PCell and PScell            | μs   | Config 1,2,3,4,5,6 | 3   |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells | μs   | Config 1,4         | 4.7                                       |        | Asynchronous cells.<br>The timing of Cell 3 is CP later than the timing of Cell 2.      |
|   |      | Config 2,5         | 4.7                                       |        | Synchronous EN-DC   |
|   |      | Config 3,6         | 2.35                                      |        | Synchronous EN-DC   |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 1.1                                       | 1.1    |   |

Table A.4.6.9.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting

| Parameter             | Unit | Test configuration | Cell 2                      |    | Cell 3 |    |
|-----------------------|------|--------------------|-----------------------------|----|--------|----|
|                       |      |                    | T1                          | T2 | T1     | T2 |
| NR RF Channel Number  |      | Config 1,2,3,4,5,6 | 1                           |    | 2      |    |
| Duplex mode           |      | Config 1,4         | FDD                         |    |        |    |
|                       |      | Config 2,3,5,6     | TDD                         |    |        |    |
| BW <sub>channel</sub> | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |        |    |
|                       |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |        |    |
|                       |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    |        |    |
| BWP BW                | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    |        |    |
|                       |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    |        |    |

|   |           |                    |                      |           |
|---|-----------|--------------------|----------------------|-----------|
|   |           | Config 3,6         | 40: $N_{RB,c} = 106$ |           |
| TDD configuration                         |           | Config 2,5         | TDDConf.1.1          |           |
|   |           | Config 3,6         | TDDConf.2.1          |           |
| Initial DL BWP                            |           | Config 1,2,3,4,5,6 | DLBWP.0.1            | NA        |
| Initial UL BWP                            |           | Config 1,2,3,4,5,6 | ULBWP.0.1            | NA        |
| Dedicated DL BWP                          |           | Config 1,2,3,4,5,6 | DLBWP.1.1            | NA        |
| Dedicated UL BWP                          |           | Config 1,2,3,4,5,6 | ULBWP.1.1            | NA        |
| TRS configuration                         |           | Config 1,4         | TRS.1.1 FDD          | NA        |
|   |           | Config 2,5         | TRS.1.1 TDD          | NA        |
|   |           | Config 3,6         | TRS.1.2 TDD          | NA        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |           | Config 1,2,3,4,5,6 | OP.1                 | OP.1      |
| PDSCH Reference measurement channel       |           | Config 1,4         | SR.1.1 FDD           | -         |
|   |           | Config 2,5         | SR.1.1 TDD           |           |
|   |           | Config 3,6         | SR. 2.1 TDD          |           |
| CORESET Reference Channel                 |           | Config 1,4         | CR.1.1 FDD           | -         |
|   |           | Config 2,5         | CR.1.1 TDD           |           |
|   |           | Config 3,6         | CR.2.1 TDD           |           |
| SSB parameters                            |           | Config 1,4         | SSB.1 FR1            | SSB.5 FR1 |
|   |           | Config 2,5         | SSB.1 FR1            | SSB.5 FR1 |
|   |           | Config 3,6         | SSB.2 FR1            | SSB.6 FR1 |
| SMTc configuration                        |           | Config 1,4         | SMTc.2               |           |
|   |           | Config 2,3,5,6     | SMTc.1               |           |
| CSI-RS configuration for RRM              |           | Config 1,4         | CSI-RS.RRM.FR1.1 FDD |           |
|   |           | Config 2,5         | CSI-RS.RRM.FR1.1 TDD |           |
|   |           | Config 3,6         | CSI-RS.RRM.FR1.2 TDD |           |
| PDSCH/PDCCH subcarrier spacing            | kHz       | Config 1,2,4,5     | 15                   |           |
|   |           | Config 3,6         | 30                   |           |
| EPRE ratio of PSS to SSS                  |           | Config 1,2,3,4,5,6 | 0                    | 0         |
| EPRE ratio of PBCH DMRS to SSS            |           |                    |                      |           |
| EPRE ratio of PBCH to PBCH DMRS           |           |                    |                      |           |
| EPRE ratio of PDCCH DMRS to SSS           |           |                    |                      |           |
| EPRE ratio of PDCCH to PDCCH DMRS         |           |                    |                      |           |
| EPRE ratio of PDSCH DMRS to SSS           |           |                    |                      |           |
| EPRE ratio of PDSCH to PDSCH              |           |                    |                      |           |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |           |                    |                      |           |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |           |                    |                      |           |
| $N_{oc}^{Note2}$                          | dBm/15kHz |                    | -98                  | -98       |
| $N_{oc}^{Note2}$                          | dBm/SCS   | Config 1,2,4,5     | -98                  | -98       |
|   |           | Config 3,6         | -95                  | -95       |



|  |               |                    |        |        |           |        |
|--|---------------|--------------------|--------|--------|-----------|--------|
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS       | Config 1,2,4,5     | -94    | -94    | -Infinity | -91    |
|  |               | Config 3,6         | -91    | -91    | -Infinity | -88    |
| CSI-RSRP <sup>Note 3</sup>   | dBm/SCS       | Config 1,2,4,5     | -94    | -94    | -Infinity | -91    |
|  |               | Config 3,6         | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$   | dB            | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$   | dB            | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36 MHz  | Config 1,2,4,5     | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38.16 MHz | Config 3,6         | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |               | Config 1,2,3,4,5,6 | AWGN   |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP, CSI-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |               |                    |        |        |           |        |

#### A.4.6.9.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTIDCCH$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.7 Measurement Performance requirements

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in Clause 10 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in Clause 10 for at least 90% of the reported cases.
- Measurements are performed in RRC\_CONNECTED state.
- The reference channels assume transmission of PDSCH with a maximum number of 5 HARQ transmissions unless otherwise specified.

## A.4.7.1 SS-RSRP

### A.4.7.1.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.4.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.2.1.1 and 10.1.2.1.2 for intra-frequency measurements.

#### A.4.7.1.1.2 Test parameters

In this set of test cases all NR cells are on the same carrier frequency. Supported test configurations are shown in table A.4.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in A.4.7.1.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1 In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell.

**Table A.4.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations for each supported band

**Table A.4.7.1.1.2-2: SS-RSRP Intra frequency test parameters**

| Parameter                                |                | Unit   | Test 1                      |           | Test 2      |           | Test 3      |           |
|--|----------------|--|-----------------------------|-----------|-------------|-----------|-------------|-----------|
|  |                |  | Cell 2                      | Cell 3    | Cell 2      | Cell 3    | Cell 2      | Cell 3    |
| Physical cell ID                         |                |  | 489                         | 0         | 489         | 0         | 489         | 0         |
| SSB ARFCN                                |                |  | freq1                       |           | freq1       |           | freq1       |           |
| Duplex mode                              | Config 1,4     |  | FDD                         |           |             |           |             |           |
|  | Config 2,3,5,6 |  | TDD                         |           |             |           |             |           |
| TDD configuration                        | Config 1,4     |  | Not Applicable              |           |             |           |             |           |
|  | Config 2,5     |  | TDDConf.1.1                 |           |             |           |             |           |
|  | Config 3,6     |  | TDDConf.2.1                 |           |             |           |             |           |
| BW <sub>channel</sub>                    | Config 1,4     | MHz  | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|  | Config 2,5     |  | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|  | Config 3,6     |  | 40: N <sub>RB,c</sub> = 106 |           |             |           |             |           |
| Downlink initial BWP configuration       |                |  | DLBWP.0.1                   |           |             |           |             |           |
| Downlink dedicated BWP configuration     |                |  | DLBWP.1.1                   |           |             |           |             |           |
| Uplink initial BWP configuration         |                |  | ULBWP.0.1                   |           |             |           |             |           |
| Uplink dedicated BWP configuration       |                |  | ULBWP.1.1                   |           |             |           |             |           |
| TRS configuration                        | Config 1,4     |  | TRS.1.1 FDD                 | NA        | TRS.1.1 FDD | NA        | TRS.1.1 FDD | NA        |
|  | Config 2,5     |  | TRS.1.1 TDD                 | NA        | TRS.1.1 TDD | NA        | TRS.1.1 TDD | NA        |
|  | Config 3,6     |  | TRS.1.2 TDD                 | NA        | TRS.1.2 TDD | NA        | TRS.1.2 TDD | NA        |
| DRX Cycle                                |                | ms   | Not Applicable              |           |             |           |             |           |
| PDSCH Reference measurement channel      | Config 1,4     |  | SR.1.1 FDD                  | -         | SR.1.1 FDD  | -         | SR.1.1 FDD  | -         |
|  | Config 2,5     |  | SR.1.1 TDD                  | -         | SR.1.1 TDD  | -         | SR.1.1 TDD  | -         |
|  | Config 3,6     |  | SR2.1 TDD                   | -         | SR2.1 TDD   | -         | SR2.1 TDD   | -         |
| RMSI CORESET Reference Channel           | Config 1,4     |  | CR.1.1 FDD                  | -         | CR.1.1 FDD  | -         | CR.1.1 FDD  | -         |
|  | Config 2,5     |  | CR.1.1 TDD                  | -         | CR.1.1 TDD  | -         | CR.1.1 TDD  | -         |
|  | Config 3,6     |  | CR2.1 TDD                   | -         | CR2.1 TDD   | -         | CR2.1 TDD   | -         |
| Control Channel RMC                      | Config 1,4     |  | CCR.1.1 FDD                 | -         | CCR.1.1 FDD | -         | CCR.1.1 FDD | -         |
|  | Config 2,5     |  | CCR.1.1 TDD                 | -         | CCR.1.1 TDD | -         | CCR.1.1 TDD | -         |
|  | Config 3,6     |  | CCR2.1 TDD                  | -         | CCR2.1 TDD  | -         | CCR2.1 TDD  | -         |
| SSB configuration                        | Config 1,4     |  | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |
|  | Config 2,5     |  | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |
|  | Config 3,6     |  | SSB.2 FR1                   | SSB.2 FR1 | SSB.2 FR1   | SSB.2 FR1 | SSB.2 FR1   | SSB.2 FR1 |
| Time offset with Cell 2                  | Config 1,4     | ms   | -                           | 3         | -           | 3         | -           | 3         |
|  | Config 2,3,5,6 | µs   | -                           | 3         | -           | 3         | -           | 3         |
| SMTC configuration                       | Config 1,4     |  | SMTC.2                      |           |             |           |             |           |
|  | Config 2,3,5,6 |  | SMTC.1                      |           |             |           |             |           |
| OCNG Patterns                            |                |  | OP.1                        |           |             |           |             |           |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5 | kHz  | 15 kHz                      |           |             |           |             |           |
|  | Config 3,6     |  | 30kHz                       |           |             |           |             |           |
| EPRE ratio of PSS to SSS                 |                | dB   | 0                           | 0         | 0           | 0         | 0           | 0         |
| EPRE ratio of PBCH DMRS to SSS           |                |  |                             |           |             |           |             |           |
| EPRE ratio of PBCH to PBCH DMRS          |                |  |                             |           |             |           |             |           |
| EPRE ratio of PDCCH DMRS to SSS          |                |  |                             |           |             |           |             |           |
| EPRE ratio of PDCCH to PDCCH DMRS        |                |  |                             |           |             |           |             |           |
| EPRE ratio of PDSCH DMRS to SSS          |                |  |                             |           |             |           |             |           |
| EPRE ratio of PDSCH to PDSCH             |                |  |                             |           |             |           |             |           |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                |  |                             |           |             |           |             |           |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                |  |                             |           |             |           |             |           |
| N <sub>oc</sub> <small>Note2</small>     | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A <small>NOTE 6</small> | -106                        |           | -88         |           | -114        |           |
|  |                | NR_FDD_FR1_B                                     | -113.5                      |           |             |           |             |           |
|  |                | NR_TDD_FR1_C                                     | -113                        |           |             |           |             |           |
|  |                | NR_FDD_FR1_D, NR_TDD_FR1_D                       | -112.5                      |           |             |           |             |           |
|  |                | NR_FDD_FR1_E, NR_TDD_FR1_E                       | -112                        |           |             |           |             |           |
|  |                | NR_FDD_FR1_F                                     | -111.5                      |           |             |           |             |           |
|  |                | NR_FDD_FR1_G                                     | -111                        |           |             |           |             |           |

|                               |                               |  |                |  |                 |        |         |  |  |  |     |        |         |
|-------------------------------|-------------------------------|--|----------------|--|-----------------|--------|---------|--|--|--|-----|--------|---------|
|                               | Config 3,6                    | NR_FDD_FR1_H   | dBm/SCS        | Not applicable <sup>Note 5</sup>                       |                 | -94    |         | -110.5   |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 6</small> |                |  |                 |        |         | -114   |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_B   |                |  |                 |        |         | -113.5   |  |  |     |        |         |
|                               |                               | NR_TDD_FR1_C   |                |  |                 |        |         | -113   |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                          |                |  |                 |        |         | -112.5   |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                          |                |  |                 |        |         | -112   |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_F   |                |  |                 |        |         | -111.5   |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_G   |                |  |                 |        |         | -111   |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_H   |                |  |                 |        |         | -110.5   |  |  |     |        |         |
| $N_{oc}$ <sup>Note2</sup>     | Config 1,2,4,5                |  | dBm/SCS        | -106   |                 | -88    |         | Same as<br>Noc/15kHz                                   |  |  |     |        |         |
|                               | Config 3,6                    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 6</small> |                |  |                 |        |         | Not applicable <sup>Note 5</sup>                       |  | -91                                    |     | -111   |         |
|                               |                               | NR_FDD_FR1_B   |                |  |                 |        |         |  |  |  |     | -110.5 |         |
|                               |                               | NR_TDD_FR1_C   |                |  |                 |        |         |  |  |  |     | -110   |         |
|                               |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                          |                |  |                 |        |         |  |  |  |     | -109.5 |         |
|                               |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                          |                |  |                 |        |         |  |  |  |     | -109   |         |
|                               |                               | NR_FDD_FR1_F   |                |  |                 |        |         |  |  |  |     | -108.5 |         |
|                               |                               | NR_FDD_FR1_G   |                |  |                 |        |         |  |  |  |     | -108   |         |
|                               |                               | NR_FDD_FR1_H   |                |  |                 |        |         |  |  |  |     | -107.5 |         |
| $\hat{E}_s/I_{ot}$            |                               |  | dB             | 2.46   | -5.97           | 2.46   | -5.97   | -0.01  | -4.76                                  |  |     |        |         |
| $\hat{E}_s/N_{oc}$            |                               |  | dB             | 6  | 1               | 6      | 1       | 3  | 0                                      |  |     |        |         |
| SS-<br>RSRP <sup>Note3</sup>  | Config 1,2,4,5                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 6</small> | dBm/SCS        | -100   | -105            | -82    | -87     | -111.00 -114.00  |  |  |     |        |         |
|                               |                               | NR_FDD_FR1_B   |                |  |                 |        |         | -110.50  | -113.50                                |  |     |        |         |
|                               |                               | NR_TDD_FR1_C   |                |  |                 |        |         | -110.00  | -113.00                                |  |     |        |         |
|                               |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                          |                |  |                 |        |         | -109.50  | -112.50                                |  |     |        |         |
|                               |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                          |                |  |                 |        |         | -109.00  | -112.00                                |  |     |        |         |
|                               |                               | NR_FDD_FR1_F   |                |  |                 |        |         | -108.50  | -111.50                                |  |     |        |         |
|                               |                               | NR_FDD_FR1_G   |                |  |                 |        |         | -108.00  | -111.00                                |  |     |        |         |
|                               |                               | NR_FDD_FR1_H   |                |  |                 |        |         | -107.50  | -110.50                                |  |     |        |         |
|                               |                               | Config 3,6   |                |  |                 |        |         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 6</small> | - Not applicabl<br>e <sup>Note 5</sup> | - Not applicabl<br>e <sup>Note 5</sup> | -85 | -90    | -108.00 |
|                               | NR_FDD_FR1_B                  |  |                |  |                 |        | -107.50 | -110.50  |  |  |     |        |         |
|                               | NR_TDD_FR1_C                  |  |                |  |                 |        | -107.00 | -110.00  |  |  |     |        |         |
|                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |  |                |  |                 |        | -106.50 | -109.50  |  |  |     |        |         |
|                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |  |                |  |                 |        | -106.00 | -109.00  |  |  |     |        |         |
|                               | NR_FDD_FR1_F                  |  |                |  |                 |        | -105.50 | -108.50  |  |  |     |        |         |
|                               | NR_FDD_FR1_G                  |  |                |  |                 |        | -105.00 | -108.00  |  |  |     |        |         |
|                               | NR_FDD_FR1_H                  |  |                |  |                 |        | -104.50 | -107.50  |  |  |     |        |         |
|                               | $I_o$ <sup>Note3</sup>        |  | Config 1,2,4,5 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 6</small> | dBm/<br>9.36MHz | -70.09 |         | -52.09   |  | -80.03                                 |     |        |         |
|                               |                               | NR_FDD_FR1_B   |                | -79.53   |                 |        |         |  |  |  |     |        |         |
| NR_TDD_FR1_C                  |                               | -79.03   |                |  |                 |        |         |  |  |  |     |        |         |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D |                               | -78.53   |                |  |                 |        |         |  |  |  |     |        |         |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E |                               | -78.03   |                |  |                 |        |         |  |  |  |     |        |         |
| NR_FDD_FR1_F                  |                               | -77.53   |                |  |                 |        |         |  |  |  |     |        |         |
| NR_FDD_FR1_G                  |                               | -77.03   |                |  |                 |        |         |  |  |  |     |        |         |
| NR_FDD_FR1_H                  |                               | -76.53   |                |  |                 |        |         |  |  |  |     |        |         |
| Config 3,6                    |                               | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 6</small> |                | dBm/<br>38.16MHz                                       |                 |        |         |  |  | Not applicable <sup>Note 5</sup>       |     | -51.99 |         |
|                               |                               | NR_FDD_FR1_B   | -73.44         |  |                 |        |         |  |  |  |     |        |         |
|                               |                               | NR_TDD_FR1_C   | -72.94         |  |                 |        |         |  |  |  |     |        |         |

|                       |  |   |      |        |
|-----------------------|--|---|------|--------|
|                       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D  |   |      | -72.44 |
|                       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E  |   |      | -71.94 |
|                       | NR_FDD_FR1_F   |   |      | -71.44 |
|                       | NR_FDD_FR1_G   |   |      | -70.94 |
|                       | NR_FDD_FR1_H   |   |      | -70.44 |
| Propagation condition |  | - | AWGN |        |
| Antenna configuration |  |   | 1x2  |        |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |   |      |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |      |        |
| Note 3:               | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |      |        |
| Note 4:               | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |   |      |        |
| Note 5:               | Subtest 1 is not used when testing with 30kHz SSB SCS  |   |      |        |
| Note 6:               | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |   |      |        |

**A.4.7.1.1.3 Test Requirements**

The SS-RSRP measurement accuracy for cell 2 and cell 3 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.2.1.2.

**A.4.7.1.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell**

**A.4.7.1.2.1 Test Purpose and Environment**

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.4.1.1 and 10.1.4.1.2 for inter-frequency measurements with the testing configurations in Table A.4.7.1.2.1-1.

**Table A.4.7.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode   |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations on each supported band |

**A.4.7.1.2.2 Test parameters**

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.4.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.4.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.4.7.1.2.2-1: SS-RSRP inter-frequency test parameters**

| Parameter   | Config       | Unit   | Test 1                      |        | Test 2                      |        |  |
|---|--------------|--------|-----------------------------|--------|-----------------------------|--------|--|
|   |              |        | Cell 2                      | Cell 3 | Cell 2                      | Cell 3 |  |
| SSB ARFCN   | 1~6          |        | freq1                       | freq2  | freq1                       | freq2  |  |
| BW <sub>channel</sub>                             | 1,4          | MHz    | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |  |
|   | 2,5          |        | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |  |
|   | 3,6          |        | 40: N <sub>RB,c</sub> = 106 |        | 40: N <sub>RB,c</sub> = 106 |        |  |
| Gap pattern ID                                    |              |        | 0                           |        | 0                           |        |  |
| Duplex mode                                       | 1,4          |        | FDD                         |        | FDD                         |        |  |
|   | 2,5          |        | TDD                         |        | TDD                         |        |  |
|   | 3,6          |        | TDD                         |        | TDD                         |        |  |
| TDD configuration                                 | 1,4          |        | N/A                         |        | N/A                         |        |  |
|   | 2,5          |        | TDDConf.1.1                 |        | TDDConf.1.1                 |        |  |
|   | 3,6          |        | TDDConf.2.1                 |        | TDDConf.2.1                 |        |  |
| PDSCH Reference measurement channel               | 1,4          |        | SR.1.1 FDD                  | -      | SR.1.1 FDD                  | -      |  |
|   | 2,5          |        | SR.1.1 TDD                  |        | SR.1.1 TDD                  |        |  |
|   | 3,6          |        | SR.2.1 FDD                  |        | SR.2.1 FDD                  |        |  |
| RMSI CORESET Reference Channel                    | 1,4          |        | CR.1.1 FDD                  | -      | CR.1.1 FDD                  | -      |  |
|   | 2,5          |        | CR.1.1 TDD                  | -      | CR.1.1 TDD                  | -      |  |
|   | 3,6          |        | CR.2.1 FDD                  | -      | CR.2.1 FDD                  | -      |  |
| Dedicated CORESET Reference Channel               | 1,4          |        | CCR.1.1 FDD                 | -      | CCR.1.1 FDD                 | -      |  |
|   | 2,5          |        | CCR.1.1 TDD                 | -      | CCR.1.1 TDD                 | -      |  |
|   | 3,6          |        | CCR.2.1 TDD                 | -      | CCR.2.1 TDD                 | -      |  |
| SSB configuration                                 | 1,4          |        | SSB.1 FR1                   |        | SSB.1 FR1                   |        |  |
|   | 2,5          |        | SSB.1 FR1                   |        | SSB.1 FR1                   |        |  |
|   | 3,6          |        | SSB.2 FR1                   |        | SSB.2 FR1                   |        |  |
| OCNG Patterns                                     | 1~6          |        | OP.1                        |        | OP.1                        |        |  |
| TRS configuration                                 | 1,4          |        | TRS.1.1 FDD                 | -      | TRS.1.1 FDD                 | -      |  |
|   | 2,5          |        | TRS.1.1 TDD                 |        | TRS.1.1 TDD                 |        |  |
|   | 3,6          |        | TRS.1.2 TDD                 |        | TRS.1.2 TDD                 |        |  |
| Initial BWP Configuration                         | 1~6          |        | DLBWP.0.1<br>ULBWP.0.1      |        | DLBWP.0.1<br>ULBWP.0.1      |        |  |
| Dedicated BWP configuration                       | 1~6          |        | DLBWP.1.1<br>ULBWP.1.1      |        | DLBWP.1.1<br>ULBWP.1.1      |        |  |
| Time offset with Cell 2                           | 1,4          | ms     | -                           | 3      | -                           | 3      |  |
|   | 2,3,5,6      | µs     | -                           | 3      | -                           | 3      |  |
| SMTTC configuration                               | 1,4          |        | SMTTC.2                     |        | SMTTC.2                     |        |  |
|   | 2,3,5,6      |        | SMTTC.1                     |        | SMTTC.1                     |        |  |
| EPRE ratio of PSS to SSS                          | 1~6          | dB     | 0                           | 0      | 0                           | 0      |  |
| EPRE ratio of PBCH DMRS to SSS                    |              |        |                             |        |                             |        |  |
| EPRE ratio of PBCH to PBCH DMRS                   |              |        |                             |        |                             |        |  |
| EPRE ratio of PDCCH DMRS to SSS                   |              |        |                             |        |                             |        |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |              |        |                             |        |                             |        |  |
| EPRE ratio of PDSCH DMRS to SSS                   |              |        |                             |        |                             |        |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |              |        |                             |        |                             |        |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |              |        |                             |        |                             |        |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |              |        |                             |        |                             |        |  |
| <sup>Note 2</sup><br>$N_{oc}$                     |              |        |                             |        |                             |        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5</small> |
|   | NR_FDD_FR1_B | -114.5 |                             |        |                             |        |  |
|   | NR_TDD_FR1_C | -114   |                             |        |                             |        |  |



|                              |   |         |                     |        |   |         |                               |         |
|------------------------------|---|---------|---------------------|--------|---|---------|-------------------------------|---------|
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |   | -113.5  |                               |         |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |   | -113    |                               |         |
|                              | NR_FDD_FR1_F  |         |                     |        |   | -112.5  |                               |         |
|                              | NR_FDD_FR1_G  |         |                     |        |   | -112    |                               |         |
|                              | NR_FDD_FR1_H  |         |                     |        |   | -111.5  |                               |         |
| $N_{oc}$ <sup>Note2</sup>    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 1,2,4,5 | dBm/SS<br>B SCS     | -94.65 | $(N_{oc}$ for<br>Cell 3<br>+8dB)              | -115    |                               |         |
|                              | NR_FDD_FR1_B  |         |                     |        |   | -114.5  |                               |         |
|                              | NR_TDD_FR1_C  |         |                     |        |   | -114    |                               |         |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |   | -113.5  |                               |         |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |   | -113    |                               |         |
|                              | NR_FDD_FR1_F  |         |                     |        |   | -112.5  |                               |         |
|                              | NR_FDD_FR1_G  |         |                     |        |   | -112    |                               |         |
|                              | NR_FDD_FR1_H  |         |                     |        |   | -111.5  |                               |         |
|                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 3,6     |                     |        |   | -91.65  | $(N_{oc}$ for<br>C 3 +8dB)    | -112.00 |
|                              | NR_SDL_FR1_A  |         |                     |        |   |         |                               | -111.50 |
|                              | NR_FDD_FR1_B  |         |                     |        |   |         |                               | -111.00 |
|                              | NR_TDD_FR1_C  |         |                     |        |   |         |                               | -110.50 |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |   |         |                               | -110.00 |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |   |         |                               | -109.00 |
|                              | NR_FDD_FR1_F  |         |                     |        |   |         |                               | -108.50 |
|                              | NR_FDD_FR1_G  |         |                     |        |   |         |                               | -112.00 |
| $\hat{E}_s/I_{ot}$           |   | 1~6     | dB                  | 10     | 10  | 13      | -3                            |         |
| SS-<br>RSRP <sup>Note3</sup> | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5</small>  | 1,2,4,5 | dBm/SC<br>S         | -84.65 | (RSRP for<br>Cell 3<br>+25dB)                 | -118.00 |                               |         |
|                              | NR_FDD_FR1_B  |         |                     |        |   | -117.50 |                               |         |
|                              | NR_TDD_FR1_C  |         |                     |        |   | -117.00 |                               |         |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |   | -116.50 |                               |         |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |   | -116.00 |                               |         |
|                              | NR_FDD_FR1_F  |         |                     |        |   | -115.50 |                               |         |
|                              | NR_FDD_FR1_G  |         |                     |        |   | -115.00 |                               |         |
|                              | NR_FDD_FR1_H  |         |                     |        |   | -114.50 |                               |         |
|                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 3,6     |                     |        |   | -81.65  | (RSRP for<br>Cell 3<br>+25dB) | -115.00 |
|                              | NR_FDD_FR1_B  |         |                     |        |   |         |                               | -114.50 |
|                              | NR_TDD_FR1_C  |         |                     |        |   |         |                               | -114.00 |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |   |         |                               | -113.50 |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |   |         |                               | -113.00 |
|                              | NR_FDD_FR1_F  |         |                     |        |   |         |                               | -112.50 |
|                              | NR_FDD_FR1_G  |         |                     |        |   |         |                               | -112.00 |
|                              | NR_FDD_FR1_H  |         |                     |        |   |         |                               | -111.50 |
| $I_o$ <sup>Note3</sup>       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 6,</small> | 1,2,4,5 | dBm/<br>9.36MH<br>z | -56.28 | (I <sub>o</sub> for<br>Channel 3<br>+19.75dB) | -85.28  |                               |         |
|                              | NR_FDD_FR1_B  |         |                     |        |   | -84.78  |                               |         |
|                              | NR_TDD_FR1_C  |         |                     |        |   | -84.28  |                               |         |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |   | -83.78  |                               |         |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |   | -83.28  |                               |         |
|                              | NR_FDD_FR1_F  |         |                     |        |   | -82.78  |                               |         |
|                              | NR_FDD_FR1_G  |         |                     |        |   | -82.28  |                               |         |
|                              | NR_FDD_FR1_H  |         |                     |        |   | -81.78  |                               |         |

|  |        |                      |        |    |   |        |
|--|--------|----------------------|--------|----|---|--------|
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,   | 3,6    | dBm/<br>38.16M<br>Hz | -50.19 |    | (I <sub>o</sub> for<br>Channel 3<br>+19.75dB) | -79.19 |
| NR_FDD_FR1_B   | -78.69 |                      |        |    |   |        |
| NR_TDD_FR1_C   | -78.19 |                      |        |    |   |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D  | -77.69 |                      |        |    |   |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E  | -77.19 |                      |        |    |   |        |
| NR_FDD_FR1_F   | -76.69 |                      |        |    |   |        |
| NR_FDD_FR1_G   | -76.19 |                      |        |    |   |        |
| NR_FDD_FR1_H   | -75.69 |                      |        |    |   |        |
| $\hat{E}_s / N_{oc}$   | 1~6    | dB                   | 10     | 10 | 13  | -3     |
| Propagation condition  | 1~6    | -                    | AWGN   |    | AWGN  |        |
| Antenna configuration  |        |                      | 1x2    |    | 1x2   |        |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |        |                      |        |    |   |        |

A.4.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the Absolute requirement in clause 10.1.4.1.1 and Relative requirement in clause 10.1.4.1.2.

A.4.7.1.3 Void

A.4.7.2 SS-RSRQ

A.4.7.2.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.4.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.1.1.

A.4.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.4.7.2.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

**Table A.4.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations in each supported band

**Table A.4.7.2.1.2-2: SS-RSRQ Intra frequency test parameters**

| Parameter                                |                  | Unit         | Test 1                                  |        | Test 2      |        | Test 3      |        |
|--|------------------|--------------|---|--------|-------------|--------|-------------|--------|
|  |                  |              | Cell 2                                  | Cell 3 | Cell 2      | Cell 3 | Cell 2      | Cell 3 |
| SSB ARFCN                                |                  |              | freq1                                   |        | freq1       |        | freq1       |        |
| Duplex mode                              | Config 1,4       |              | FDD                                     |        |             |        |             |        |
|  | Config 2,3,5,6   |              | TDD                                     |        |             |        |             |        |
| TDD configuration                        | Config 1,4       |              | Not Applicable                          |        |             |        |             |        |
|  | Config 2,5       |              | TDDConf.1.1                             |        |             |        |             |        |
|  | Config 3,6       |              | TDDConf.2.1                             |        |             |        |             |        |
| BW <sub>channel</sub>                    | Config 1,4       | MHz          | 10: N <sub>RB,c</sub> = 52              |        |             |        |             |        |
|  | Config 2,5       |              | 10: N <sub>RB,c</sub> = 52              |        |             |        |             |        |
|  | Config 3,6       |              | 40: N <sub>RB,c</sub> = 106             |        |             |        |             |        |
| BWP configuration                        | Initial DL BWP   |              | DLBWP.0.1                               |        |             |        |             |        |
|  | Dedicated DL BWP |              | DLBWP.1.1                               |        |             |        |             |        |
|  | Initial UL BWP   |              | ULBWP.0.1                               |        |             |        |             |        |
|  | Dedicated UL BWP |              | ULBWP.1.1                               |        |             |        |             |        |
| DRX Cycle                                |                  | ms           | Not Applicable                          |        |             |        |             |        |
| PDSCH Reference measurement channel      | Config 1,4       |              | SR.1.1 FDD                              | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|  | Config 2,5       |              | SR.1.1 TDD                              |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|  | Config 3,6       |              | SR2.1 TDD                               |        | SR2.1 TDD   |        | SR2.1 TDD   |        |
| RMSI CORESET Reference Channel           | Config 1,4       |              | CR.1.1 FDD                              | -      | CR.1.1 FDD  | -      | CR.1.1 FDD  |        |
|  | Config 2,5       |              | CR.1.1 TDD                              |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|  | Config 3,6       |              | CR.2.1 TDD                              |        | CR.2.1 TDD  |        | CR.2.1 TDD  |        |
| Control Channel RMC                      | Config 1,4       |              | CCR.1.1 FDD                             | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|  | Config 2,5       |              | CCR.1.1 TDD                             |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|  | Config 3,6       |              | CCR.2.1 TDD                             |        | CCR.2.1 TDD |        | CCR.2.1 TDD |        |
| TRS configuration                        | Config 1,4       |              | TRS.1.1 FDD                             | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD | -      |
|  | Config 2,5       |              | TRS.1.1 TDD                             |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|  | Config 3,6       |              | TRS.1.2 TDD                             |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns                            |                  |              | OP. 1                                   |        |             |        |             |        |
| SS-RSSI-Measurement                      |                  |              | Not Applicable                          |        |             |        |             |        |
| Time offset with Cell 2                  | Config 1,4       | ms           | -                                       | 3      | -           | 3      | -           | 3      |
|  | Config 2,3,5,6   | µs           | -                                       | 3      | -           | 3      | -           | 3      |
| SMTC configuration                       | Config 1,4       |              | SMTC.2                                  |        |             |        |             |        |
|  | Config 2,3,5,6   |              | SMTC.1                                  |        |             |        |             |        |
| SSB configuration                        | Config 1,2,4,5   |              | SSB.1 FR1                               |        |             |        |             |        |
|  | Config 3,6       |              | SSB.2 FR1                               |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5   | kHz          | 15 kHz                                  |        |             |        |             |        |
|  | Config 3,6       |              | 30kHz                                   |        |             |        |             |        |
| EPRE ratio of PSS to SSS                 |                  | dB           | 0                                       | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS           |                  |              |   |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS          |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS          |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS          |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH             |                  |              |   |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |              |   |        |             |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |              |   |        |             |        |             |        |
| N <sub>oc</sub><br>Note2                 | Config 1,2,4,5   |              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | -85    |             | -101   |             | -114   |
|  |                  | NR_FDD_FR1_B |   |        |             |        | -113.5      |        |
|  |                  | NR_TDD_FR1_C |   |        |             |        | -113        |        |
|  |                  |              |   |        |             |        |             |        |

|                      |                               |   |             |     |       |        |        |   |        |       |   |
|----------------------|-------------------------------|---|-------------|-----|-------|--------|--------|---|--------|-------|---|
|                      |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |             |     |       |        |        | -112.5                                  |        |       |   |
|                      |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |             |     |       |        |        | -112                                    |        |       |   |
|                      |                               | NR_FDD_FR1_F                            |             |     |       |        |        | -111.5                                  |        |       |   |
|                      |                               | NR_FDD_FR1_G                            |             |     |       |        |        | -111                                    |        |       |   |
|                      |                               | NR_FDD_FR1_H                            |             |     |       |        |        | -110.5                                  |        |       |   |
|                      | Config<br>3,6                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 |             | -91 |       | -      |        | -114                                    |        |       |   |
|                      |                               | NR_FDD_FR1_B                            |             |     |       |        |        | -113.5                                  |        |       |   |
|                      |                               | NR_TDD_FR1_C                            |             |     |       |        |        | -113                                    |        |       |   |
|                      |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |             |     |       |        |        | -112.5                                  |        |       |   |
|                      |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |             |     |       |        |        | -112                                    |        |       |   |
|                      |                               | NR_FDD_FR1_F                            |             |     |       |        |        | -111.5                                  |        |       |   |
|                      |                               | NR_FDD_FR1_G                            |             |     |       |        |        | -111                                    |        |       |   |
|                      |                               | NR_FDD_FR1_H                            |             |     |       |        |        | -110.5                                  |        |       |   |
| $N_{oc}$<br>Note2    | Config<br>1,2,4,5             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/SC<br>S | -85 |       | -101   |        | -114                                    |        |       |   |
|                      |                               | NR_FDD_FR1_B                            |             |     |       |        |        | -113.5                                  |        |       |   |
|                      |                               | NR_TDD_FR1_C                            |             |     |       |        |        | -113                                    |        |       |   |
|                      |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |             |     |       |        |        | -112.5                                  |        |       |   |
|                      |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |             |     |       |        |        | -112                                    |        |       |   |
|                      |                               | NR_FDD_FR1_F                            |             |     |       |        |        | -111.5                                  |        |       |   |
|                      |                               | NR_FDD_FR1_G                            |             |     |       |        |        | -111                                    |        |       |   |
|                      |                               | NR_FDD_FR1_H                            |             |     |       |        |        | -110.5                                  |        |       |   |
|                      |                               | Config<br>3,6                           |             |     |       |        |        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | -88    |       | - |
|                      | NR_FDD_FR1_B                  |   |             |     |       |        | -110.5 |   |        |       |   |
|                      | NR_TDD_FR1_C                  |   |             |     |       |        | -110   |   |        |       |   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |   |             |     |       |        | -109.5 |   |        |       |   |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |   |             |     |       |        | -109   |   |        |       |   |
|                      | NR_FDD_FR1_F                  |   |             |     |       |        | -108.5 |   |        |       |   |
|                      | NR_FDD_FR1_G                  |   |             |     |       |        | -108   |   |        |       |   |
|                      | NR_FDD_FR1_H                  |   |             |     |       |        | -107.5 |   |        |       |   |
|                      | $\hat{E}_s/I_{ot}$            |   |             | dB  | -1.76 |        | -4.7   |   | -5.46  | -5.46 |   |
|                      | $\hat{E}_s/N_{oc}$            |   |             | dB  | 3     | 3      | -2.9   | -2.9                                    | -4     | -4    |   |
| SS-<br>RSRP<br>Note3 | Config<br>1,2,4,5             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/SC<br>S | -82 | -82   | -103.9 | -103.9 | -118                                    | -118   |       |   |
|                      |                               | NR_FDD_FR1_B                            |             |     |       |        |        | -117.5                                  | -117.5 |       |   |
|                      |                               | NR_TDD_FR1_C                            |             |     |       |        |        | -117                                    | -117   |       |   |
|                      |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |             |     |       |        |        | -116.5                                  | -116.5 |       |   |
|                      |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |             |     |       |        |        | -116                                    | -116   |       |   |
|                      |                               | NR_FDD_FR1_F                            |             |     |       |        |        | -115.5                                  | -115.5 |       |   |
|                      |                               | NR_FDD_FR1_G                            |             |     |       |        |        | -115                                    | -115   |       |   |
|                      |                               | NR_FDD_FR1_H                            |             |     |       |        |        | -114.5                                  | -114.5 |       |   |
|                      |                               | Config<br>3,6                           |             |     |       |        |        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | -85    | -85   | - |
|                      | NR_FDD_FR1_B                  |   |             |     |       |        | -114.5 | -114.5                                  |        |       |   |
|                      | NR_TDD_FR1_C                  |   |             |     |       |        | -114   | -114                                    |        |       |   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |   |             |     |       |        | -113.5 | -113.5                                  |        |       |   |

|  |               |   |   |                 |        |        |        |        |        |
|--|---------------|---|---|-----------------|--------|--------|--------|--------|--------|
|  |               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                 |        |        |        | -113   | -113   |
|  |               | NR_FDD_FR1_F                            |   |                 |        |        |        | -112.5 | -112.5 |
|  |               | NR_FDD_FR1_G                            |   |                 |        |        |        | -112   | -112   |
|  |               | NR_FDD_FR1_H                            |   |                 |        |        |        | -111.5 | -111.5 |
| SS-RSRQ  | Note3         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dB                                      | -14.77          | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
|  |               | NR_FDD_FR1_B                            |   |                 |        |        |        |        |        |
|  |               | NR_TDD_FR1_C                            |   |                 |        |        |        |        |        |
|  |               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                 |        |        |        |        |        |
|  |               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                 |        |        |        |        |        |
|  |               | NR_FDD_FR1_F                            |   |                 |        |        |        |        |        |
|  |               | NR_FDD_FR1_G                            |   |                 |        |        |        |        |        |
|  |               | NR_FDD_FR1_H                            |   |                 |        |        |        |        |        |
| I <sub>o</sub>   | Note3         | Config<br>1,2,4,5                       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/<br>9.36MHz | -50    | -70    |        | -83.5  |        |
|  |               |   |   |                 |        |        |        | -83    |        |
|  |               |   |   |                 |        |        |        | -82.5  |        |
|  |               |   |   |                 |        |        |        | -82    |        |
|  |               |   |   |                 |        |        |        | -81.5  |        |
|  |               |   |   |                 |        |        |        | -81    |        |
|  |               |   |   |                 |        |        |        | -80.5  |        |
|  | -80           |   |   |                 |        |        |        |        |        |
|  | Config<br>3,6 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/<br>38.16M<br>Hz                    | -50             | -      |        | -77.4  |        |        |
|  |               |   |   |                 |        |        | -76.9  |        |        |
|  |               |   |   |                 |        |        | -76.4  |        |        |
|  |               |   |   |                 |        |        | -75.9  |        |        |
|  |               |   |   |                 |        |        | -75.4  |        |        |
|  |               |   |   |                 |        |        | -74.9  |        |        |
| -74.4  |               |   |   |                 |        |        |        |        |        |
| -73.9  |               |   |   |                 |        |        |        |        |        |
| Propagation condition  |               |   | -                                       | AWGN            | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   |
| Antenna configuration  |               |   |   | 1x2             | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 6: Subtest 2 is not used when testing with 30kHz SSB SCS</p> <p>Note 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |               |   |   |                 |        |        |        |        |        |

### A.4.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.1.1.

## A.4.7.2.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter frequency measurement.

### A.4.7.2.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.4.7.2.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.4.7.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.4.7.2.2-2: SS-RSRQ Inter frequency test parameters**



| Parameter                              |                | Unit | Test 1                      |        | Test 2      |        | Test 3      |        |
|--|----------------|------|-----------------------------|--------|-------------|--------|-------------|--------|
|  |                |      | Cell 2                      | Cell 3 | Cell 2      | Cell 3 | Cell 2      | Cell 3 |
| SSB ARFCN                              |                |      | freq1                       | freq2  | freq1       | freq2  | freq1       | freq2  |
| Duplex mode                            | Config 1,4     |      | FDD                         |        |             |        |             |        |
|  | Config 2,3,5,6 |      | TDD                         |        |             |        |             |        |
| TDD configuration                      | Config 1,4     |      | Not Applicable              |        |             |        |             |        |
|  | Config 2,5     |      | TDDConf.1.1                 |        |             |        |             |        |
|  | Config 3,6     |      | TDDConf.2.1                 |        |             |        |             |        |
| BW <sub>channel</sub>                  | Config 1,4     | MHz  | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 2,5     |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 3,6     |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| BWP BW                                 | Config 1,4     | MHz  | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 2,5     |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 3,6     |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| DRX Cycle                              |                | ms   | Not Applicable              |        |             |        |             |        |
| PDSCH Reference measurement channel    | Config 1,4     |      | SR.1.1 FDD                  | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|  | Config 2,5     |      | SR.1.1 TDD                  |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|  | Config 3,6     |      | SR.2.1 TDD                  |        | SR.2.1 TDD  |        | SR.2.1 TDD  |        |
| RMSI CORESET Reference Channel         | Config 1,4     |      | CR.1.1 FDD                  | -      | CR.1.1 FDD  | -      | CR.1.1 FDD  | -      |
|  | Config 2,5     |      | CR.1.1 TDD                  |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|  | Config 3,6     |      | CR.2.1 TDD                  |        | CR.2.1 TDD  |        | CR.2.1 TDD  |        |
| Dedicated CORESET Reference Channel    | Config 1,4     |      | CCR.1.1 FDD                 | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|  | Config 2,5     |      | CCR.1.1 TDD                 |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|  | Config 3,6     |      | CCR.2.1 TDD                 |        | CCR.2.1 TDD |        | CCR.2.1 TDD |        |
| TRS configuration                      | Config 1,4     |      | TRS.1.1 FDD                 | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD | -      |
|  | Config 2,5     |      | TRS.1.1 TDD                 |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|  | Config 3,6     |      | TRS.1.2 TDD                 |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns                          |                |      | OCNG pattern 1              |        |             |        |             |        |
| Time offset with Cell 2                | Config 1,4     | ms   | -                           | 3      | -           | 3      | -           | 3      |
|  | Config 2,3,5,6 | µs   | -                           | 3      | -           | 3      | -           | 3      |
| SMTC configuration                     | Config 1,4     |      | SMTC pattern 2              |        |             |        |             |        |
|  | Config 2,3,5,6 |      | SMTC pattern 1              |        |             |        |             |        |
| SSB configuration                      | Config 1,2,4,5 |      | SSB pattern 1 in FR1        |        |             |        |             |        |
|  | Config 3,6     |      | SSB pattern 2 in FR1        |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing         | Config 1,2,4,5 | kHz  | 15 kHz                      |        |             |        |             |        |
|  | Config 3,6     |      | 30 kHz                      |        |             |        |             |        |
| EPRE ratio of PSS to SSS               |                | dB   | 0                           | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS         |                |      |                             |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS        |                |      |                             |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS        |                |      |                             |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS      |                |      |                             |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS        |                |      |                             |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH           |                |      |                             |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |                |      |                             |        |             |        |             |        |

| EPRE ratio of OCNB to OCNB DMRS (Note 1) |                |              |           |        |        |         |         |      |        |        |        |
|--|----------------|--------------|-----------|--------|--------|---------|---------|------|--------|--------|--------|
| $N_{oc}^{Note2}$                         | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/15kHz | -80.18 | -80.18 | -106    | -106    | -116 | -116   |        |        |
|  |                | NR_TDD_FR1_A |           |        |        |         |         |      |        |        |        |
|  |                | NR_SDL_FR1_A |           |        |        |         |         |      |        |        |        |
|  |                | NR_FDD_FR1_B |           |        |        |         |         |      |        | -115.5 | -115.5 |
|  |                | NR_TDD_FR1_C |           |        |        |         |         |      |        | -115   | -115   |
|  |                | NR_FDD_FR1_D |           |        |        |         |         |      |        | -114.5 | -114.5 |
|  |                | NR_TDD_FR1_D |           |        |        |         |         |      |        |        |        |
|  | NR_FDD_FR1_E   |              |           |        |        | -114    | -114    |      |        |        |        |
|  | NR_TDD_FR1_E   |              |           |        |        |         |         |      |        |        |        |
|  | NR_FDD_FR1_G   |              |           |        |        | -113    | -113    |      |        |        |        |
|  | NR_FDD_FR1_H   |              |           |        |        | -112.5  | -112.5  |      |        |        |        |
|  | Config 3,6     | NR_FDD_FR1_A | dBm/15kHz | -86.27 | -86.27 | -113    | -113    | -116 | -116   |        |        |
|  |                | NR_TDD_FR1_A |           |        |        |         |         |      |        |        |        |
|  |                | NR_SDL_FR1_A |           |        |        |         |         |      |        |        |        |
| NR_FDD_FR1_B                             |                |              |           |        |        |         |         |      | -115.5 | -115.5 |        |
| NR_TDD_FR1_C                             |                |              |           |        |        |         |         |      | -115   | -115   |        |
| NR_FDD_FR1_D                             |                |              |           |        |        |         |         |      | -114.5 | -114.5 |        |
| NR_TDD_FR1_D                             |                |              |           |        |        |         |         |      |        |        |        |
| NR_FDD_FR1_E                             |                |              |           |        | -114   | -114    |         |      |        |        |        |
| NR_TDD_FR1_E                             |                |              |           |        |        |         |         |      |        |        |        |
| NR_FDD_FR1_G                             |                |              |           |        | -113   | -113    |         |      |        |        |        |
| NR_FDD_FR1_H                             |                |              |           |        | -112.5 | -112.5  |         |      |        |        |        |
| $N_{oc}^{Note2}$                         | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/SCS   | -80.18 | -80.18 | -106    | -106    | -116 | -116   |        |        |
|  |                | NR_TDD_FR1_A |           |        |        |         |         |      |        |        |        |
|  |                | NR_SDL_FR1_A |           |        |        |         |         |      |        |        |        |
|  |                | NR_FDD_FR1_B |           |        |        |         |         |      |        | -115.5 | -115.5 |
|  |                | NR_TDD_FR1_C |           |        |        |         |         |      |        | -115   | -115   |
|  |                | NR_FDD_FR1_D |           |        |        |         |         |      |        | -114.5 | -114.5 |
|  |                | NR_TDD_FR1_D |           |        |        |         |         |      |        |        |        |
|  | NR_FDD_FR1_E   |              |           |        |        | -114    | -114    |      |        |        |        |
|  | NR_TDD_FR1_E   |              |           |        |        |         |         |      |        |        |        |
|  | NR_FDD_FR1_G   |              |           |        |        | -113    | -113    |      |        |        |        |
|  | NR_FDD_FR1_H   |              |           |        |        | -112.5  | -112.5  |      |        |        |        |
|  | Config 3,6     | NR_FDD_FR1_A | dBm/SCS   | -83.27 | -83.27 | -110    | -110    | -113 | -113   |        |        |
|  |                | NR_TDD_FR1_A |           |        |        |         |         |      |        |        |        |
|  |                | NR_SDL_FR1_A |           |        |        |         |         |      |        |        |        |
| NR_FDD_FR1_B                             |                |              |           |        |        |         |         |      | -112.5 | -112.5 |        |
| NR_TDD_FR1_C                             |                |              |           |        |        |         |         |      | -112   | -112   |        |
| NR_FDD_FR1_D                             |                |              |           |        |        |         |         |      | -111.5 | -111.5 |        |
| NR_TDD_FR1_D                             |                |              |           |        |        |         |         |      |        |        |        |
| NR_FDD_FR1_E                             |                |              |           |        | -111   | -111    |         |      |        |        |        |
| NR_TDD_FR1_E                             |                |              |           |        |        |         |         |      |        |        |        |
| NR_FDD_FR1_G                             |                |              |           |        | -110   | -110    |         |      |        |        |        |
| NR_FDD_FR1_H                             |                |              |           |        | -109.5 | -109.5  |         |      |        |        |        |
| $\hat{E}_s / I_{ot}$                     |                |              | dB        | -1.75  | -1.75  | -1.75   | -1.75   | 3    | -1.75  |        |        |
| $\hat{E}_s / N_{oc}$                     |                |              | dB        | -1.75  | -1.75  | -1.75   | -1.75   | 3    | -1.75  |        |        |
| SS-RSRP <sup>Note3</sup>                 | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/SCS   | -81.93 | -81.93 | -107.75 | -107.75 | -113 | -      |        |        |
|  |                | NR_TDD_FR1_A |           |        |        |         |         |      | 117.75 |        |        |
|  |                | NR_SDL_FR1_A |           |        |        |         |         |      |        |        |        |
|  |                | NR_FDD_FR1_B |           |        |        |         |         |      |        | -112.5 | -      |
|  |                | NR_TDD_FR1_C |           |        |        |         |         |      |        | -112   | -      |
|  |                | NR_FDD_FR1_D |           |        |        |         |         |      |        | -111.5 | -      |
|  |                | NR_TDD_FR1_D |           |        |        |         |         |      |        |        |        |
|  | NR_FDD_FR1_E   |              |           |        |        | -111.5  | -       |      |        |        |        |
|  | NR_TDD_FR1_E   |              |           |        |        | -111    | -       |      |        |        |        |
|  | NR_FDD_FR1_G   |              |           |        |        | -110    | -       |      |        |        |        |
|  | NR_TDD_FR1_H   |              |           |        |        | -110    | -       |      |        |        |        |
|  | Config 3,6     | NR_FDD_FR1_A | dBm/SCS   | -85.02 | -85.02 | -111.75 | -111.75 | -110 | -      |        |        |
|  |                | NR_TDD_FR1_A |           |        |        |         |         |      | 114.75 |        |        |
|  |                | NR_SDL_FR1_A |           |        |        |         |         |      |        |        |        |
| NR_FDD_FR1_B                             |                |              |           |        |        |         |         |      | -109.5 | -      |        |
| NR_TDD_FR1_C                             |                |              |           |        |        |         |         |      | -109   | -      |        |
| NR_FDD_FR1_D                             |                |              |           |        |        |         |         |      | -108.5 | -      |        |
| NR_TDD_FR1_D                             |                |              |           |        |        |         |         |      |        |        | 113.25 |
| NR_FDD_FR1_E                             |                |              |           |        | -108   | -       |         |      |        |        |        |
| NR_TDD_FR1_E                             |                |              |           |        | -108   | -       |         |      |        |        |        |
|  |                |              |           |        |        |         | 112.75  |      |        |        |        |

|  |                |              |                  |        |        |        |        |        |        |
|--|----------------|--------------|------------------|--------|--------|--------|--------|--------|--------|
|  |                | NR_FDD_FR1_G |                  |        |        |        |        | -107   | -      |
|  |                | NR_FDD_FR1_H |                  |        |        |        |        | -106.5 | 111.75 |
| SS-RSRQ <sup>Note3</sup>   |                | NR_FDD_FR1_A | dB               | -14.77 | -14.77 | -40.59 | -40.59 | -12.56 | -14.76 |
|  |                | NR_TDD_FR1_A |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_B |                  |        |        |        |        |        |        |
|  |                | NR_TDD_FR1_C |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_D |                  |        |        |        |        |        |        |
|  |                | NR_TDD_FR1_D |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_E |                  |        |        |        |        |        |        |
|  |                | NR_TDD_FR1_E |                  |        |        |        |        |        |        |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/<br>9.36MHz  | -50    | -50    | -75.83 | -75.83 | -83.28 | -85.83 |
|  |                | NR_TDD_FR1_A |                  |        |        |        |        |        |        |
|  |                | NR_SDL_FR1_A |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_B |                  |        |        |        |        |        |        |
|  |                | NR_TDD_FR1_C |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_D |                  |        |        |        |        |        |        |
|  |                | NR_TDD_FR1_D |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_E |                  |        |        |        |        |        |        |
|  | NR_TDD_FR1_E   |              |                  |        |        |        |        |        |        |
|  | Config 3,6     | NR_FDD_FR1_G | dBm/<br>38.16MHz | -50    | -50    | -76.73 | -76.73 | -77.19 | -79.73 |
|  |                | NR_FDD_FR1_H |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_A |                  |        |        |        |        |        |        |
|  |                | NR_TDD_FR1_A |                  |        |        |        |        |        |        |
|  |                | NR_SDL_FR1_A |                  |        |        |        |        |        |        |
|  |                | NR_FDD_FR1_B |                  |        |        |        |        |        |        |
|  |                | NR_TDD_FR1_C |                  |        |        |        |        |        |        |
| NR_FDD_FR1_D   |                |              |                  |        |        |        |        |        |        |
| NR_TDD_FR1_D   |                |              |                  |        |        |        |        |        |        |
| Propagation condition  |                |              |                  | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> |                |              |                  |        |        |        |        |        |        |

### A.4.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.1.1 and 10.1.9.1.2.

## A.4.7.3 SS-SINR

### A.4.7.3.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.4.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

#### A.4.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table

A.4.7.3.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

**Table A.4.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| <b>Config</b> | <b>Description</b>   |
|---------------|--|
| 1             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3             | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6             | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

**Table A.4.7.3.1.2-2: SS-SINR Intra frequency test parameters**

| Parameter                                |   | Unit           | Test 1         |        | Test 2         |        |
|--|---|----------------|----------------|--------|----------------|--------|
|  |   |                | Cell 2         | Cell 3 | Cell 2         | Cell 3 |
| SSB ARFCN                                |   |                | freq1          |        | freq1          |        |
| Duplex mode                              | Config 1,4                              |                | FDD            |        |                |        |
|  | Config 2,3,5,6                          |                | TDD            |        |                |        |
| TDD configuration                        | Config 1,4                              |                | Not Applicable |        |                |        |
|  | Config 2,5                              |                | TDDConf.1.1    |        |                |        |
|  | Config 3,6                              |                | TDDConf.2.1    |        |                |        |
| Downlink initial BWP configuration       |   |                | DLBWP.0.1      |        |                |        |
| Downlink dedicated BWP configuration     |   |                | DLBWP.1.1      |        |                |        |
| Uplink initial BWP configuration         |   |                | ULBWP.0.1      |        |                |        |
| Uplink dedicated BWP configuration       |   |                | ULBWP.1.1      |        |                |        |
| DRX Cycle configuration                  |   | ms             | Not Applicable |        |                |        |
| TRS Configuration                        | Config 1,4                              |                | TRS.1.1<br>FDD | -      | TRS.1.1<br>FDD | -      |
|  | Config 2,5                              |                | TRS.1.1<br>TDD |        | TRS.1.1<br>TDD |        |
|  | Config 3,6                              |                | TRS.1.2<br>TDD |        | TRS.1.2<br>TDD |        |
| PDSCH Reference measurement channel      | Config 1,4                              |                | SR.1.1<br>FDD  | -      | SR.1.1<br>FDD  | -      |
|  | Config 2,5                              |                | SR.1.1<br>TDD  |        | SR.1.1<br>TDD  |        |
|  | Config 3,6                              |                | SR.2.1<br>TDD  |        | SR.2.1<br>TDD  |        |
| RMSI CORESET Reference Channel           | Config 1,4                              |                | CR.1.1<br>FDD  | -      | CR.1.1<br>FDD  |        |
|  | Config 2,5                              |                | CR.1.1<br>TDD  |        | CR.1.1<br>TDD  |        |
|  | Config 3,6                              |                | CR.2.1<br>TDD  |        | CR.2.1<br>TDD  |        |
| Dedicated CORESET Reference Channel      | Config 1,4                              |                | CCR.1.1<br>FDD | -      | CCR.1.1<br>FDD | -      |
|  | Config 2,5                              |                | CCR.1.1<br>TDD |        | CCR.1.1<br>TDD |        |
|  | Config 3,6                              |                | CCR.2.1<br>TDD |        | CCR.2.1<br>TDD |        |
| OCNG Patterns                            |   |                | OP.1           |        |                |        |
| SS-RSSI-Measurement                      |   |                | Not Applicable |        |                |        |
| Time offset with Cell 2                  | Config 1,4                              | ms             | -              | 3      | -              | 3      |
|  | Config 2,3,5,6                          | µs             | -              | 3      | -              | 3      |
| SMTC configuration                       | Config 1,4                              |                | SMTC.2         |        |                |        |
|  | Config 2,3,5,6                          |                | SMTC.1         |        |                |        |
| SSB configuration                        | Config 1,2,4,5                          |                | SSB.1 FR1      |        |                |        |
|  | Config 3,6                              |                | SSB.2 FR1      |        |                |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5                          | kHz            | 15             |        |                |        |
|  | Config 3,6                              |                | 30             |        |                |        |
| EPRE ratio of PSS to SSS                 |   | dB             | 0              | 0      | 0              | 0      |
| EPRE ratio of PBCH DMRS to SSS           |   |                |                |        |                |        |
| EPRE ratio of PBCH to PBCH DMRS          |   |                |                |        |                |        |
| EPRE ratio of PDCCH DMRS to SSS          |   |                |                |        |                |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |   |                |                |        |                |        |
| EPRE ratio of PDSCH DMRS to SSS          |   |                |                |        |                |        |
| EPRE ratio of PDSCH to PDSCH             |   |                |                |        |                |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |   |                |                |        |                |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |   |                |                |        |                |        |
| $N_{oc}$ <sup>Note2</sup>                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz<br>z | -93            |        | -116           |        |
|  | NR_FDD_FR1_B                            |                |                |        |                |        |
|  | NR_TDD_FR1_C                            |                |                |        | -115           |        |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                |                |        | -114.5         |        |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                |                |        | -114           |        |
|  | NR_FDD_FR1_F                            |                |                |        | -113.5         |        |

|                           |                               |   |                 |   |                            |   |        |        |
|---------------------------|-------------------------------|---|-----------------|---|----------------------------|---|--------|--------|
|                           |                               | NR_FDD_FR1_G                            |                 |   |                            | -113                                    |        |        |
|                           |                               | NR_FDD_FR1_H                            |                 |   |                            | -112.5                                  |        |        |
| $N_{oc}$<br>Note2         | Config 1,2,4,5                |   | dBm/SCS         | -93                                     | Same as $N_{oc}$ for 15kHz |   |        |        |
|                           |                               |   |                 |   |                            |   |        |        |
|                           | Config 3,6                    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                 |   | -90                        | -113                                    |        |        |
|                           |                               | NR_FDD_FR1_B                            |                 |   |                            | -112.5                                  |        |        |
|                           |                               | NR_TDD_FR1_C                            |                 |   |                            | -112                                    |        |        |
|                           |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                 |   |                            | -111.5                                  |        |        |
|                           |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                 |   |                            | -111                                    |        |        |
|                           |                               | NR_FDD_FR1_F                            |                 |   |                            | -110.5                                  |        |        |
|                           |                               | NR_FDD_FR1_G                            |                 |   |                            | -110                                    |        |        |
| NR_FDD_FR1_H              | -109.5                        |   |                 |   |                            |   |        |        |
| $\hat{E}_s / I_{ot}$      |                               |   | dB              | 0                                       | -3.19                      | -5.46                                   | -5.46  |        |
| $\hat{E}_s / N_{oc}$      |                               |   | dB              | 4.54                                    | 2.66                       | -4                                      | -4     |        |
| SS-RSRP <sup>Not e3</sup> | Config 1,2,4,5                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A           | dBm/SCS         | -88.46                                  | -90.34                     | -120                                    | -120   |        |
|                           |                               | NR_FDD_FR1_B                            |                 |   |                            | -119.5                                  | -119.5 |        |
|                           |                               | NR_TDD_FR1_C                            |                 |   |                            | -119                                    | -119   |        |
|                           |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                 |   |                            | -118.5                                  | -118.5 |        |
|                           |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                 |   |                            | -118                                    | -118   |        |
|                           |                               | NR_FDD_FR1_F                            |                 |   |                            | -117.5                                  | -117.5 |        |
|                           |                               | NR_FDD_FR1_G                            |                 |   |                            | -117                                    | -117   |        |
|                           |                               | NR_FDD_FR1_H                            |                 |   |                            | -116.5                                  | -116.5 |        |
|                           |                               | Config 3,6                              |                 |   |                            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | -85.46 | -87.34 |
|                           | NR_FDD_FR1_B                  |   |                 |   |                            | -116.5                                  | -116.5 |        |
|                           | NR_TDD_FR1_C                  |   |                 |   |                            | -116                                    | -116   |        |
|                           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |   |                 |   |                            | -115.5                                  | -115.5 |        |
|                           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |   |                 |   |                            | -115                                    | -115   |        |
|                           | NR_FDD_FR1_F                  |   |                 |   |                            | -114.5                                  | -114.5 |        |
|                           | NR_FDD_FR1_G                  |   |                 |   |                            | -114                                    | -114   |        |
|                           | NR_FDD_FR1_H                  |   |                 |   |                            | -113.5                                  | -113.5 |        |
|                           | SS-SINR <sup>Note3</sup>      |   |                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dB                         | 0                                       | -3.19  | -5.46  |
|                           |                               | NR_FDD_FR1_B                            |                 |   |                            |   |        |        |
|                           |                               | NR_TDD_FR1_C                            |                 |   |                            |   |        |        |
|                           |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                 |   |                            |   |        |        |
|                           |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                 |   |                            |   |        |        |
|                           |                               | NR_FDD_FR1_F                            |                 |   |                            |   |        |        |
|                           |                               | NR_FDD_FR1_G                            |                 |   |                            |   |        |        |
|                           |                               | NR_FDD_FR1_H                            |                 |   |                            |   |        |        |
| $I_o$ <sup>Note3</sup>    | Config 1,2,4,5                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz | -57.5                                   | -85.51                     |   |        |        |
|                           |                               | NR_FDD_FR1_B                            |                 |   | -85.01                     |   |        |        |
|                           |                               | NR_TDD_FR1_C                            |                 |   | -84.51                     |   |        |        |
|                           |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                 |   | -84.01                     |   |        |        |
|                           |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                 |   | -83.51                     |   |        |        |
|                           |                               | NR_FDD_FR1_F                            |                 |   | -83.01                     |   |        |        |
|                           |                               | NR_FDD_FR1_G                            |                 |   | -82.51                     |   |        |        |

|  |   |                  |        |        |
|--|---|------------------|--------|--------|
| Config 3,6   | NR_FDD_FR1_H                            | dBm/<br>38.16MHz | -51.41 | -82.01 |
|  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                  |        | -79.41 |
|  | NR_FDD_FR1_B                            |                  |        | -78.91 |
|  | NR_TDD_FR1_C                            |                  |        | -78.41 |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        | -77.91 |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        | -77.41 |
|  | NR_FDD_FR1_F                            |                  |        | -76.91 |
|  | NR_FDD_FR1_G                            |                  |        | -76.41 |
|  | NR_FDD_FR1_H                            |                  |        | -75.91 |
| Propagation condition  |   | -                | AWGN   |        |
| Antenna configuration  |   | -                | 1x2    |        |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and <math>I_{o}</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |   |                  |        |        |

A.4.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.1.1.

A.4.7.3.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.4.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.14.1.1 and 10.1.14.1.2 for interfrequency measurement.

A.4.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.4.7.3.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell of which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.4.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |



**Table A.4.7.3.2.2-2: SS-SINR Inter frequency test parameters**

| Parameter                                |                | Unit         | Test 1          |        | Test 2          |        | Test 3          |        |
|--|----------------|--------------|-----------------|--------|-----------------|--------|-----------------|--------|
|  |                |              | Cell 2          | Cell 3 | Cell 2          | Cell 3 | Cell 2          | Cell 3 |
| SSB ARFCN                                |                |              | freq1           | freq2  | freq1           | freq2  | freq1           | freq2  |
| Duplex mode                              | Config 1,4     |              | FDD             |        |                 |        |                 |        |
|  | Config 2,3,5,6 |              | TDD             |        |                 |        |                 |        |
| TDD configuration                        | Config 1,4     |              | Not Applicable  |        |                 |        |                 |        |
|  | Config 2,5     |              | TDDConf.1.1     |        |                 |        |                 |        |
|  | Config 3,6     |              | TDDConf.2.1     |        |                 |        |                 |        |
| Downlink initial BWP configuration       |                |              | DLBWP.0.1       |        |                 |        |                 |        |
| Downlink dedicated BWP configuration     |                |              | DLBWP.1.1       |        |                 |        |                 |        |
| Uplink initial BWP configuration         |                |              | ULBWP.0.1       |        |                 |        |                 |        |
| Uplink dedicated BWP configuration       |                |              | ULBWP.1.1       |        |                 |        |                 |        |
| DRX Cycle configuration                  |                | ms           | Not Applicable  |        |                 |        |                 |        |
| Gap pattern ID                           |                |              | 0               | -      | 0               | -      | 0               | -      |
| TRS configuration                        | Config 1,4     |              | TRS.1.1<br>FDD  | -      | TRS.1.1<br>FDD  | -      | TRS.1.1<br>FDD  | -      |
|  | Config 2,5     |              | TRS.1.1<br>TDD  |        | TRS.1.1<br>TDD  |        | TRS.1.1<br>TDD  |        |
|  | Config 3,6     |              | TRS.1.2<br>TDD  |        | TRS.1.2<br>TDD  |        | TRS.1.2<br>TDD  |        |
| PDSCH Reference measurement channel      | Config 1,4     |              | SR.1.1<br>FDD   | -      | SR.1.1<br>FDD   | -      | SR.1.1<br>FDD   | -      |
|  | Config 2,5     |              | SR.1.1<br>TDD   |        | SR.1.1<br>TDD   |        | SR.1.1<br>TDD   |        |
|  | Config 3,6     |              | SR.2.1<br>TDD   |        | SR.2.1<br>TDD   |        | SR.2.1<br>TDD   |        |
| RMSI CORESET Reference Channel           | Config 1,4     |              | CR.1.1<br>FDD   | -      | CR.1.1<br>FDD   | -      | CR.1.1<br>FDD   | -      |
|  | Config 2,5     |              | CR.1.1<br>TDD   |        | CR.1.1<br>TDD   |        | CR.1.1<br>TDD   |        |
|  | Config 3,6     |              | CR.2.1<br>TDD   |        | CR.2.1<br>TDD   |        | CR.2.1<br>TDD   |        |
| Dedicated CORESET Reference Channel      | Config 1,4     |              | CCR.1.<br>1 FDD | -      | CCR.1.<br>1 FDD | -      | CCR.1.<br>1 FDD | -      |
|  | Config 2,5     |              | CCR.1.<br>1 TDD |        | CCR.1.<br>1 TDD |        | CCR.1.<br>1 TDD |        |
|  | Config 3,6     |              | CCR.2.<br>1 TDD |        | CCR.2.<br>1 TDD |        | CCR.2.<br>1 TDD |        |
| OCNG Patterns                            |                |              | OP.1            |        |                 |        |                 |        |
| SS-RSSI-Measurement                      |                |              | Not Applicable  |        |                 |        |                 |        |
| Time offset with Cell 2                  | Config 1,4     | ms           | -               | 3      | -               | 3      | -               | 3      |
|  | Config 2,3,5,6 | µs           | -               | 3      | -               | 3      | -               | 3      |
| SMTC configuration                       | Config 1,4     |              | SMTC.2          |        |                 |        |                 |        |
|  | Config 2,3,5,6 |              | SMTC.1          |        |                 |        |                 |        |
| SSB configuration                        | Config 1,2,4,5 |              | SSB.1 FR1       |        |                 |        |                 |        |
|  | Config 3,6     |              | SSB.2 FR1       |        |                 |        |                 |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5 | kHz          | 15              |        |                 |        |                 |        |
|  | Config 3,6     |              | 30              |        |                 |        |                 |        |
| EPRE ratio of PSS to SSS                 |                | dB           | 0               | 0      | 0               | 0      | 0               | 0      |
| EPRE ratio of PBCH DMRS to SSS           |                |              |                 |        |                 |        |                 |        |
| EPRE ratio of PBCH to PBCH DMRS          |                |              |                 |        |                 |        |                 |        |
| EPRE ratio of PDCCH DMRS to SSS          |                |              |                 |        |                 |        |                 |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                |              |                 |        |                 |        |                 |        |
| EPRE ratio of PDSCH DMRS to SSS          |                |              |                 |        |                 |        |                 |        |
| EPRE ratio of PDSCH to PDSCH             |                |              |                 |        |                 |        |                 |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                |              |                 |        |                 |        |                 |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                |              |                 |        |                 |        |                 |        |
| $N_{oc}$<br>Note2                        | Config 1,2,4,5 | NR_FDD_FR1_A | -88             |        | -108.5          |        | -119.5          |        |
|  |                | NR_TDD_FR1_A |                 |        |                 |        |                 |        |
|  |                | NR_FDD_FR1_B |                 |        |                 |        |                 |        |
|  |                | NR_TDD_FR1_C |                 |        |                 |        | -118.5          |        |

|                                |                |                        |                 |        |        |                          |  |  |      |
|--------------------------------|----------------|------------------------|-----------------|--------|--------|--------------------------|--|--|------|
|                                |                | NR_FDD_FR1_D           |                 |        |        | -118                     |  |  |      |
|                                |                | NR_TDD_FR1_D           |                 |        |        | -117.5                   |  |  |      |
|                                |                | NR_FDD_FR1_E           |                 |        |        | -117                     |  |  |      |
|                                |                | NR_TDD_FR1_E           |                 |        |        | -116.5                   |  |  |      |
|                                |                | NR_FDD_FR1_F           |                 |        |        | -116                     |  |  |      |
|                                |                | NR_TDD_FR1_G           |                 |        |        | -116                     |  |  |      |
|                                |                | NR_FDD_FR1_H           |                 |        |        | -116                     |  |  |      |
| $N_{oc}$<br>Note2              | Config 1,2,4,5 |                        | dBm/SC<br>S     | -88    | -108.5 | Same as Noc for<br>15kHz |  |  |      |
|                                | Config 3,6     | NR_FDD_FR1_A           |                 | -85    | -105.5 | -116.5                   |  |  |      |
|                                |                | NR_TDD_FR1_A<br>NOTE 6 |                 |        |        | -116                     |  |  |      |
|                                |                | NR_FDD_FR1_B           |                 |        |        | -115.5                   |  |  |      |
|                                |                | NR_TDD_FR1_C           |                 |        |        | -115                     |  |  |      |
|                                |                | NR_FDD_FR1_D           |                 |        |        | -114.5                   |  |  |      |
|                                |                | NR_TDD_FR1_D           |                 |        |        | -114                     |  |  |      |
|                                |                | NR_FDD_FR1_E           |                 |        |        | -114.5                   |  |  |      |
|                                |                | NR_TDD_FR1_E           |                 |        |        | -113                     |  |  |      |
|                                |                | NR_FDD_FR1_F           |                 |        |        | -113                     |  |  |      |
| NR_TDD_FR1_G                   |                | -113                   |                 |        |        |                          |  |  |      |
|                                |                | NR_FDD_FR1_H           |                 |        |        | -113                     |  |  |      |
| $\hat{E}_s / I_{ot}$           |                |                        | dB              | -1.75  | 20     | -4.0                     |  |  |      |
| $\hat{E}_s / N_{oc}$           |                |                        | dB              | -1.75  | 20     | -4.0                     |  |  |      |
| SS-RSRP <sup>Note3</sup><br>e3 | Config 1,2,4,5 | NR_FDD_FR1_A           | dBm/SC<br>S     | -89.75 | -88.5  | -123.5                   |  |  |      |
|                                |                | NR_TDD_FR1_A<br>NOTE 6 |                 |        |        | -123                     |  |  |      |
|                                |                | NR_FDD_FR1_B           |                 |        |        | -122.5                   |  |  |      |
|                                |                | NR_TDD_FR1_C           |                 |        |        | -122                     |  |  |      |
|                                |                | NR_FDD_FR1_D           |                 |        |        | -121.5                   |  |  |      |
|                                |                | NR_TDD_FR1_D           |                 |        |        | -121                     |  |  |      |
|                                |                | NR_FDD_FR1_E           |                 |        |        | -120.5                   |  |  |      |
|                                |                | NR_TDD_FR1_E           |                 |        |        | -120                     |  |  |      |
|                                |                | NR_FDD_FR1_F           |                 |        |        | -120                     |  |  |      |
|                                |                | NR_TDD_FR1_G           |                 |        |        | -120                     |  |  |      |
|                                | NR_FDD_FR1_H   | -120                   |                 |        |        |                          |  |  |      |
|                                | Config 3,6     | NR_FDD_FR1_A           |                 | -86.75 | -85.5  | -120.5                   |  |  |      |
|                                |                | NR_TDD_FR1_A<br>NOTE 6 |                 |        |        | -120                     |  |  |      |
|                                |                | NR_FDD_FR1_B           |                 |        |        | -119.5                   |  |  |      |
|                                |                | NR_TDD_FR1_C           |                 |        |        | -119                     |  |  |      |
|                                |                | NR_FDD_FR1_D           |                 |        |        | -118.5                   |  |  |      |
|                                |                | NR_TDD_FR1_D           |                 |        |        | -118                     |  |  |      |
|                                |                | NR_FDD_FR1_E           |                 |        |        | -117.5                   |  |  |      |
| NR_TDD_FR1_E                   |                | -117                   |                 |        |        |                          |  |  |      |
|                                |                | NR_FDD_FR1_F           |                 |        |        | -117                     |  |  |      |
|                                |                | NR_TDD_FR1_G           |                 |        |        | -117                     |  |  |      |
|                                |                | NR_FDD_FR1_H           |                 |        |        | -117                     |  |  |      |
| SS-SINR <sup>Note3</sup>       |                | NR_FDD_FR1_A           | dB              | -1.75  | 20     | -4.0                     |  |  |      |
|                                |                | NR_TDD_FR1_A<br>NOTE 6 |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_FDD_FR1_B           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_TDD_FR1_C           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_FDD_FR1_D           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_TDD_FR1_D           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_FDD_FR1_E           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_TDD_FR1_E           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_FDD_FR1_F           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_TDD_FR1_G           |                 |        |        |                          |  |  | -4.0 |
|                                |                | NR_FDD_FR1_H           |                 |        |        | -4.0                     |  |  |      |
| $I_o$ <sup>Note3</sup>         | Config 1,2,4,5 | NR_FDD_FR1_A           | dBm/<br>9.36MHz | -57.83 | -60.5  | -90.09                   |  |  |      |
|                                |                | NR_TDD_FR1_A<br>NOTE 6 |                 |        |        | -89.59                   |  |  |      |
|                                |                | NR_FDD_FR1_B           |                 |        |        | -89.09                   |  |  |      |
|                                |                | NR_TDD_FR1_C           |                 |        |        | -89.09                   |  |  |      |

|  |            |              |                      |        |        |        |      |  |       |
|--|------------|--------------|----------------------|--------|--------|--------|------|--|-------|
|  |            | NR_FDD_FR1_D |                      |        |        | -88.59 |      |  |       |
|  |            | NR_TDD_FR1_D |                      |        |        | -88.09 |      |  |       |
|  |            | NR_FDD_FR1_E |                      |        |        | -87.59 |      |  |       |
|  |            | NR_TDD_FR1_E |                      |        |        | -87.09 |      |  |       |
|  |            | NR_FDD_FR1_F |                      |        |        | -86.59 |      |  |       |
|  |            | NR_FDD_FR1_G |                      |        |        | -86.59 |      |  |       |
|  |            | NR_FDD_FR1_H |                      |        |        | -86.59 |      |  |       |
|  | Config 3,6 | NR_FDD_FR1_A | dBm/<br>38.16MH<br>z | -51.73 | -54.41 | -84    |      |  |       |
|  |            | NR_TDD_FR1_A |                      |        |        |        |      |  | -83.5 |
|  |            | NOTE 6       |                      |        |        |        |      |  | -83   |
|  |            | NR_FDD_FR1_B |                      |        |        |        |      |  | -82.5 |
|  |            | NR_TDD_FR1_C |                      |        |        |        |      |  | -82   |
|  |            | NR_FDD_FR1_D |                      |        |        |        |      |  | -81.5 |
|  |            | NR_TDD_FR1_D |                      |        |        |        |      |  | -81   |
|  |            | NR_FDD_FR1_E |                      |        |        |        |      |  | -80.5 |
|  |            | NR_TDD_FR1_E |                      |        |        |        |      |  |       |
|  |            | NR_FDD_FR1_F |                      |        |        |        |      |  |       |
|  |            | NR_FDD_FR1_G |                      |        |        |        |      |  |       |
|  |            | NR_FDD_FR1_H |                      |        |        |        |      |  |       |
| Propagation condition  |            |              |                      |        |        | -      | AWGN |  |       |
| Antenna configuration  |            |              | -                    | 1x2    |        |        |      |  |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |            |              |                      |        |        |        |      |  |       |

A.4.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.1.1 and 10.1.14.1.2.

A.4.7.4 L1-RSRP measurement for beam reporting

A.4.7.4.1 SSB based L1-RSRP measurement

A.4.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.4.7.4.1.1-1.

**Table A.4.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3      | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode   |
| 6      | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

A.4.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table

A.4.7.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

**Table A.4.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|-----------|--------|------|--------|--------|
|-----------|--------|------|--------|--------|

|   |   |        |     |                             |                             |
|---|---|--------|-----|-----------------------------|-----------------------------|
| SSB GSCN  |   | 1~6    |     | freq1                       | freq1                       |
| Duplex mode                                       |   | 1,4    |     | FDD                         | FDD                         |
|   |   | 2,5    |     | TDD                         | TDD                         |
|   |   | 3,6    |     | TDD                         | TDD                         |
| TDD Configuration                                 |   | 1,4    |     | N/A                         | N/A                         |
|   |   | 2,5    |     | TDDConf.1.1                 | TDDConf.1.1                 |
|   |   | 3,6    |     | TDDConf.2.1                 | TDDConf.2.1                 |
| BW <sub>channel</sub>                             |   | 1,4    | MHz | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |
|   |   | 2,5    |     | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |
|   |   | 3,6    |     | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel               |   | 1,4    |     | SR.1.1 FDD                  | SR.1.1 FDD                  |
|   |   | 2,5    |     | SR.1.1 TDD                  | SR.1.1 TDD                  |
|   |   | 3,6    |     | SR.2.1 TDD                  | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel                    |   | 1,4    |     | CR.1.1 FDD                  | CR.1.1 FDD                  |
|   |   | 2,5    |     | CR.1.1 TDD                  | CR.1.1 TDD                  |
|   |   | 3,6    |     | CR.2.1 TDD                  | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel               |   | 1,4    |     | CCR.1.1 FDD                 | CCR.1.1 FDD                 |
|   |   | 2,5    |     | CCR.1.1 TDD                 | CCR.1.1 TDD                 |
|   |   | 3,6    |     | CCR.2.1 TDD                 | CCR.2.1 TDD                 |
| SSB configuration                                 |   | 1,4    |     | SSB.3 FR1                   | SSB.3 FR1                   |
|   |   | 2,5    |     | SSB.3 FR1                   | SSB.3 FR1                   |
|   |   | 3,6    |     | SSB.4 FR1                   | SSB.4 FR1                   |
| OCNG Patterns                                     |   | 1~6    |     | OP.1                        | OP.1                        |
| TRS configuration                                 |   | 1,4    |     | TRS.1.1 FDD                 | TRS.1.1 FDD                 |
|   |   | 2,5    |     | TRS.1.1 TDD                 | TRS.1.1 TDD                 |
|   |   | 3,6    |     | TRS.1.2 TDD                 | TRS.1.2 TDD                 |
| Initial BWP Configuration                         |   | 1~6    |     | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration                       |   | 1~6    |     | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration                                |   | 1~6    |     | SMTC.1                      | SMTC.1                      |
| reportConfigType                                  |   | 1~6    |     | periodic                    | periodic                    |
| reportQuantity                                    |   | 1~6    |     | ssb-Index-RSRP              | ssb-Index-RSRP              |
| Number of reported RS                             |   | 1~6    |     | 2                           | 2                           |
| L1-RSRP reporting period                          |   | 1~6    |     | slot80                      | slot80                      |
| EPRE ratio of PSS to SSS                          |   | 1~6    | dB  | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS                    |   |        |     |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS                   |   |        |     |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS                   |   |        |     |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |        |     |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS                   |   |        |     |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |        |     |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |        |     |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |        |     |                             |                             |
| N <sub>oc</sub><br>Note2                          | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |        |     |                             |                             |
|   | NR_FDD_FR1_B                            | -116.5 |     |                             |                             |
|   | NR_TDD_FR1_C                            | -116   |     |                             |                             |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           | -115.5 |     |                             |                             |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           | -115   |     |                             |                             |
|   | NR_FDD_FR1_F                            | -114.5 |     |                             |                             |
|   | NR_FDD_FR1_G                            | -114   |     |                             |                             |
|   | NR_FDD_FR1_H                            | -113.5 |     |                             |                             |

|                      |   |         |                  |        |        |
|----------------------|---|---------|------------------|--------|--------|
| $N_{oc}$<br>Note2    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/SSB<br>SCS   | -94.65 | -117   |
|                      | NR_FDD_FR1_B                            |         |                  |        | -116.5 |
|                      | NR_TDD_FR1_C                            |         |                  |        | -116   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                  |        | -115.5 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                  |        | -115   |
|                      | NR_FDD_FR1_F                            |         |                  |        | -114.5 |
|                      | NR_FDD_FR1_G                            |         |                  |        | -114   |
|                      | NR_FDD_FR1_H                            |         |                  |        | -113.5 |
|                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     | -91.65           | -114   |        |
|                      | NR_FDD_FR1_B                            |         |                  | -113.5 |        |
|                      | NR_TDD_FR1_C                            |         |                  | -114   |        |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                  | -112.5 |        |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                  | -112   |        |
|                      | NR_FDD_FR1_F                            |         |                  | -111.5 |        |
|                      | NR_FDD_FR1_G                            |         |                  | -111   |        |
|                      | NR_FDD_FR1_H                            |         |                  | -110.5 |        |
| $\hat{E}_s/I_{ot}$   | 1~6                                     | dB      | 10               | -3     |        |
| SSB<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/SSB<br>SCS   | -84.65 | -120   |
|                      | NR_FDD_FR1_B                            |         |                  |        | -119.5 |
|                      | NR_TDD_FR1_C                            |         |                  |        | -119   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                  |        | -118.5 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                  |        | -118   |
|                      | NR_FDD_FR1_F                            |         |                  |        | -117.5 |
|                      | NR_FDD_FR1_G                            |         |                  |        | -117   |
|                      | NR_FDD_FR1_H                            |         |                  |        | -116.5 |
|                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     | -81.65           | -117   |        |
|                      | NR_FDD_FR1_B                            |         |                  | -116.5 |        |
|                      | NR_TDD_FR1_C                            |         |                  | -116   |        |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                  | -115.5 |        |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                  | -115   |        |
|                      | NR_FDD_FR1_F                            |         |                  | -114.5 |        |
|                      | NR_FDD_FR1_G                            |         |                  | -114   |        |
|                      | NR_FDD_FR1_H                            |         |                  | -113.5 |        |
| $I_o$ Note3          | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/9.36<br>MHz  | -56.28 | -87.28 |
|                      | NR_FDD_FR1_B                            |         |                  |        | -86.78 |
|                      | NR_TDD_FR1_C                            |         |                  |        | -86.28 |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                  |        | -85.78 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                  |        | -85.28 |
|                      | NR_FDD_FR1_F                            |         |                  |        | -84.78 |
|                      | NR_FDD_FR1_G                            |         |                  |        | -84.28 |
|                      | NR_FDD_FR1_H                            |         |                  |        | -83.78 |
|                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     | dBm/38.16<br>MHz | -50.19 | -81.19 |
|                      | NR_FDD_FR1_B                            |         |                  |        | -80.69 |
|                      | NR_TDD_FR1_C                            |         |                  |        | -80.19 |
|                      |   |         |                  |        |        |

|   |                               |     |    |      |        |
|---|-------------------------------|-----|----|------|--------|
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |     |    |      | -79.69 |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |     |    |      | -79.19 |
|   | NR_FDD_FR1_F                  |     |    |      | -78.69 |
|   | NR_FDD_FR1_G                  |     |    |      | -78.19 |
|   | NR_FDD_FR1_H                  |     |    |      | -77.69 |
|   | $\hat{E}_s / N_{oc}$          | 1~6 | dB | 10   | -3     |
|   | Propagation condition         | 1~6 |    | AWGN | AWGN   |
|   | Antenna configuration         | 1~6 |    | 1x2  | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |                               |     |    |      |        |

A.4.7.4.1.3 Test Requirements

The L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.19.1.

A.4.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

A.4.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.4.7.4.2.1-1.

**Table A.4.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations in each supported band

A.4.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

**Table A.4.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|-----------|--------|------|--------|--------|
|-----------|--------|------|--------|--------|



|   |                               |        |                             |                             |   |
|---|-------------------------------|--------|-----------------------------|-----------------------------|---|
| SSB GSCN  | 1-6                           |        | freq1                       | freq1                       |   |
| Duplex mode                                       | 1,4                           |        | FDD                         | FDD                         |   |
|   | 2,5                           |        | TDD                         | TDD                         |   |
|   | 3,6                           |        | TDD                         | TDD                         |   |
| TDD Configuration                                 | 1,4                           |        | N/A                         | N/A                         |   |
|   | 2,5                           |        | TDDConf.1.1                 | TDDConf.1.1                 |   |
|   | 3,6                           |        | TDDConf.2.1                 | TDDConf.2.1                 |   |
| BW <sub>channel</sub>                             | 1,4                           | MHz    | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |   |
|   | 2,5                           |        | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |   |
|   | 3,6                           |        | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |   |
| PDSCH Reference measurement channel               | 1,4                           |        | SR.1.1 FDD                  | SR.1.1 FDD                  |   |
|   | 2,5                           |        | SR.1.1 TDD                  | SR.1.1 TDD                  |   |
|   | 3,6                           |        | SR.2.1 TDD                  | SR.2.1 TDD                  |   |
| RMSI CORESET Reference Channel                    | 1,4                           |        | CR.1.1 FDD                  | CR.1.1 FDD                  |   |
|   | 2,5                           |        | CR.1.1 TDD                  | CR.1.1 TDD                  |   |
|   | 3,6                           |        | CR.2.1 TDD                  | CR.2.1 TDD                  |   |
| Dedicated CORESET Reference Channel               | 1,4                           |        | CCR.1.1 FDD                 | CCR.1.1 FDD                 |   |
|   | 2,5                           |        | CCR.1.1 TDD                 | CCR.1.1 TDD                 |   |
|   | 3,6                           |        | CCR.2.1 TDD                 | CCR.2.1 TDD                 |   |
| SSB configuration                                 | 1,4                           |        | SSB.3 FR1                   | SSB.3 FR1                   |   |
|   | 2,5                           |        | SSB.3 FR1                   | SSB.3 FR1                   |   |
|   | 3,6                           |        | SSB.4 FR1                   | SSB.4 FR1                   |   |
| OCNG Patterns                                     | 1-6                           |        | OP.1                        | OP.1                        |   |
| TRS configuration                                 | 1,4                           |        | TRS.1.1 FDD                 | TRS.1.1 FDD                 |   |
|   | 2,5                           |        | TRS.1.1 TDD                 | TRS.1.1 TDD                 |   |
|   | 3,6                           |        | TRS.1.2 TDD                 | TRS.1.2 TDD                 |   |
| Initial BWP Configuration                         | 1-6                           |        | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |   |
| Dedicated BWP configuration                       | 1-6                           |        | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |   |
| SMTc configuration                                | 1-6                           |        | SMTc.1                      | SMTc.1                      |   |
| CSI-RS  | 1,4                           |        | CSI-RS 1.2 FDD              | CSI-RS 1.2 FDD              |   |
|   | 2,5                           |        | CSI-RS 1.2 TDD              | CSI-RS 1.2 TDD              |   |
|   | 3,6                           |        | CSI-RS 2.2 TDD              | CSI-RS 2.2 FDD              |   |
| reportConfigType                                  | 1-6                           |        | periodic                    | periodic                    |   |
| reportQuantity                                    | 1-6                           |        | cri-RSRP                    | cri-RSRP                    |   |
| Number of reported RS                             | 1-6                           |        | 2                           | 2                           |   |
| L1-RSRP reporting period                          | 1-6                           |        | slot80                      | slot80                      |   |
| EPRE ratio of PSS to SSS                          | 1-6                           | dB     | 0                           | 0                           |   |
| EPRE ratio of PBCH DMRS to SSS                    |                               |        |                             |                             |   |
| EPRE ratio of PBCH to PBCH DMRS                   |                               |        |                             |                             |   |
| EPRE ratio of PDCCH DMRS to SSS                   |                               |        |                             |                             |   |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                               |        |                             |                             |   |
| EPRE ratio of PDSCH DMRS to SSS                   |                               |        |                             |                             |   |
| EPRE ratio of PDSCH to PDSCH DMRS                 |                               |        |                             |                             |   |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                               |        |                             |                             |   |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |                               |        |                             |                             |   |
| N <sub>oc</sub><br>Note2                          |                               |        |                             |                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |
|   | NR_FDD_FR1_B                  | -116.5 |                             |                             |   |
|   | NR_TDD_FR1_C                  | -116   |                             |                             |   |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D | -115.5 |                             |                             |   |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E | -115   |                             |                             |   |

|                         |   |         |                   |        |        |
|-------------------------|---|---------|-------------------|--------|--------|
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -113.5 |
| $N_{oc}$<br>Note2       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/CSI-RS<br>SCS | -94.65 | -117   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -113.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                   | -91.65 | -114   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -113.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -112.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -112   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -111.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -111   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -110.5 |
| $\hat{E}_s/I_{ot}$      |   | 1~6     | dB                | 10     | 10     |
| CSI-RS<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/CSI-RS<br>SCS | -84.65 | -120   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -119.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -119   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -118.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -118   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -117.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -117   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -116.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                   | -81.65 | -117   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -113.5 |
| $I_o$ Note3             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/9.36<br>MHz   | -56.28 | -87.28 |
|                         | NR_FDD_FR1_B                            |         |                   |        | -86.78 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -86.28 |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -85.78 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -85.28 |
|                         | NR_FDD_FR1_F                            |         |                   |        | -84.78 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -84.28 |
|                         | NR_FDD_FR1_H                            |         |                   |        | -83.78 |

|   |   |     |                  |        |        |
|---|---|-----|------------------|--------|--------|
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6 | dBm/38.16<br>MHz | -50.19 | -81.19 |
|   | NR_FDD_FR1_B                            |     |                  |        | -80.69 |
|   | NR_TDD_FR1_C                            |     |                  |        | -80.19 |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                  |        | -79.69 |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                  |        | -79.19 |
|   | NR_FDD_FR1_F                            |     |                  |        | -78.69 |
|   | NR_FDD_FR1_G                            |     |                  |        | -78.19 |
|   | NR_FDD_FR1_H                            |     |                  |        | -77.69 |
| $\hat{E}_s / N_{oc}$  | 1~6                                     | dB  | 10               | -3     |        |
| Propagation condition   | 1~6                                     |     | AWGN             | AWGN   |        |
| Antenna configuration   | 1~6                                     |     | 1x2              | 1x2    |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |   |     |                  |        |        |

#### A.4.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.19.2.

### A.4.7.5 SFTD accuracy

#### A.4.7.5.1 SFTD accuracy

##### A.4.7.5.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for EN-DC SFTD measurements.

##### A.4.7.5.1.2 Test Parameters

Supported test configurations are shown in Table A.4.7.5.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is NR FR1 PSCell. The test parameters of cell 1 are given in clause A.3.7.2.1. The test parameters of cell 2 are given in Table A.4.7.5.1.2-2. The SFTD between PCell and PSCell shall be set by the test equipment to one of the time differences in Table A.4.7.5.1.2-3.

**Table A.4.7.5.1.2-1: Supported test configurations for SFTD accuracy**

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

**Table A.4.7.5.1.2-2: Test parameters for SFTD accuracy**

| Parameter   | Config  | Unit    | Test 1                      |   |
|---|---|---------|-----------------------------|---|
| SSB GSCN  | 1~6   |         | freq1                       |   |
| Duplex mode                                       | 1,4   |         | FDD                         |   |
|   | 2,5   |         | TDD                         |   |
|   | 3,6   |         | TDD                         |   |
| TDD Configuration                                 | 1,4   |         | N/A                         |   |
|   | 2,5   |         | TDDConf.1.1                 |   |
|   | 3,6   |         | TDDConf.2.1                 |   |
| BW <sub>channel</sub>                             | 1,4   | MHz     | 10: N <sub>RB,c</sub> = 52  |   |
|   | 2,5   |         | 10: N <sub>RB,c</sub> = 52  |   |
|   | 3,6   |         | 40: N <sub>RB,c</sub> = 106 |   |
| PDSCH Reference measurement channel               | 1,4   |         | SR.1.1 FDD                  |   |
|   | 2,5   |         | SR.1.1 TDD                  |   |
|   | 3,6   |         | SR.2.1 TDD                  |   |
| RMSI CORESET Reference Channel                    | 1,4   |         | CR.1.1 FDD                  |   |
|   | 2,5   |         | CR.1.1 TDD                  |   |
|   | 3,6   |         | CR.2.1 TDD                  |   |
| RMC CORESET Reference Channel                     | 1,4   |         | CCR.1.1 FDD                 |   |
|   | 2,5   |         | CCR.1.1 TDD                 |   |
|   | 3,6   |         | CCR.2.1 TDD                 |   |
| SSB configuration                                 | 1,4   |         | SSB.1 FR1                   |   |
|   | 2,5   |         | SSB.1 FR1                   |   |
|   | 3,6   |         | SSB.2 FR1                   |   |
| SMTC configuration                                | 1~6   |         | SMTC.1                      |   |
| DL BWP configuration                              | 1~6   |         | DLBWP.1.1                   |   |
| UL BWP configuration                              | 1~6   |         | ULBWP.1.1                   |   |
| CSI-RS for tracking                               | 1,4   |         | TRS.1.1 FDD                 |   |
|   | 2,5   |         | TRS.1.1 TDD                 |   |
|   | 3,6   |         | TRS.1.2 TDD                 |   |
| OCNG Patterns                                     | 1~6   |         | OP.1                        |   |
| EPRE ratio of PSS to SSS                          | 1~6   | dB      | 0                           |   |
| EPRE ratio of PBCH DMRS to SSS                    |   |         |                             |   |
| EPRE ratio of PBCH to PBCH DMRS                   |   |         |                             |   |
| EPRE ratio of PDCCH DMRS to SSS                   |   |         |                             |   |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |         |                             |   |
| EPRE ratio of PDSCH DMRS to SSS                   |   |         |                             |   |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |         |                             |   |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |         |                             |   |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |         |                             |   |
| $N_{oc}$ <sup>Note2</sup>                         |   |         |                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> |
|   | NR_FDD_FR1_B                                    |         |                             |   |
|   | NR_TDD_FR1_C                                    |         |                             |   |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |                             |   |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |                             |   |
|   | NR_FDD_FR1_F                                    |         |                             |   |
|   | NR_FDD_FR1_G                                    |         |                             |   |
|   | NR_FDD_FR1_H                                    |         |                             |   |
| $N_{oc}$ <sup>Note2</sup>                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 1,2,4,5 | dBm/SSB SCS                 | -104  |
|   | NR_FDD_FR1_B                                    |         |                             |   |
|   | NR_TDD_FR1_C                                    |         |                             |   |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |                             |   |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |                             |   |
|   | NR_FDD_FR1_F                                    |         |                             |   |
|   | NR_FDD_FR1_G                                    |         |                             |   |
|   | NR_FDD_FR1_H                                    |         |                             |   |

|                                 |   |         |               |        |
|---------------------------------|---|---------|---------------|--------|
|                                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 3,6     |               | -101   |
|                                 | NR_FDD_FR1_B                                    |         |               |        |
|                                 | NR_TDD_FR1_C                                    |         |               |        |
|                                 | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |               |        |
|                                 | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |               |        |
|                                 | NR_FDD_FR1_F                                    |         |               |        |
|                                 | NR_FDD_FR1_G                                    |         |               |        |
|                                 | NR_FDD_FR1_H                                    |         |               |        |
|                                 | $\hat{E}_s/I_{ot}$                              | 1~6     | dB            | -3     |
|                                 | $\hat{E}_s/N_{oc}$                              | 1~6     | dB            | -3     |
| SS-RSRP<br><sup>Note3</sup>     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 1,2,4,5 | dBm/SCS       | -107   |
|                                 | NR_FDD_FR1_B                                    |         |               |        |
|                                 | NR_TDD_FR1_C                                    |         |               |        |
|                                 | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |               |        |
|                                 | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |               |        |
|                                 | NR_FDD_FR1_F                                    |         |               |        |
|                                 | NR_FDD_FR1_G                                    |         |               |        |
|                                 | NR_FDD_FR1_H                                    |         |               |        |
|                                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 3,6     |               | -104   |
|                                 | NR_FDD_FR1_B                                    |         |               |        |
|                                 | NR_TDD_FR1_C                                    |         |               |        |
|                                 | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |               |        |
|                                 | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |               |        |
|                                 | NR_FDD_FR1_F                                    |         |               |        |
|                                 | NR_FDD_FR1_G                                    |         |               |        |
|                                 | NR_FDD_FR1_H                                    |         |               |        |
| I <sub>o</sub> <sup>Note3</sup> | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 1,2,4,5 | dBm/9.36 MHz  | -74.28 |
|                                 | NR_FDD_FR1_B                                    |         |               |        |
|                                 | NR_TDD_FR1_C                                    |         |               |        |
|                                 | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |               |        |
|                                 | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |               |        |
|                                 | NR_FDD_FR1_F                                    |         |               |        |
|                                 | NR_FDD_FR1_G                                    |         |               |        |
|                                 | NR_FDD_FR1_H                                    |         |               |        |
|                                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 3,6     | dBm/38.16 MHz | -68.18 |
|                                 | NR_FDD_FR1_B                                    |         |               |        |
|                                 | NR_TDD_FR1_C                                    |         |               |        |
|                                 | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |               |        |
|                                 | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |               |        |
|                                 | NR_FDD_FR1_F                                    |         |               |        |
|                                 | NR_FDD_FR1_G                                    |         |               |        |
|                                 | NR_FDD_FR1_H                                    |         |               |        |
| Propagation condition           |   | 1~6     |               | AWGN   |
| Antenna configuration           |   | 1~6     |               | 1x2    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |

**Table A.4.7.5.1.2-3: Timing offsets for SFTD accuracy test**

| Condition | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
|-----------|-------------------------------------|---|
| 1         | 100                                 | -122000   |
| 2         | 300                                 | -60540  |
| 3         | 500                                 | 1000  |
| 4         | 700                                 | 62540   |
| 5         | 900                                 | 124000  |

#### A.4.7.5.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and PSCell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

#### A.4.7.5.2 Void

#### A.4.7.5.3 Void

### A.4.7.6 CLI measurements

#### A.4.7.6.1 EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

##### A.4.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.1.1 with the testing configurations for NR cells in Table A.4.7.6.1.1-1.

**Table A.4.7.6.1.1-1: Applicable NR configurations for FR1 SRS-RSRP accuracy test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 2      | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode  |
| 3      | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations in each supported band

##### A.4.7.6.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.6.1.2-1 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table A.4.7.6.1.2-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table A.4.7.6.1.2-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

**Table A.4.7.6.1.2-1: FR1 test parameters for SRS-RSRP accuracy for PSCell**



| Parameter   |                               | Config | Unit           | Test 1                          | Test 2                      | Test 3                      |
|---|-------------------------------|--------|----------------|---------------------------------|-----------------------------|-----------------------------|
| SSB GSCN  |                               | 1~4    |                | freq1                           | freq1                       | freq1                       |
| Duplex mode   |                               | 1~4    |                | TDD                             | TDD                         | TDD                         |
| TDD configuration   |                               | 1,3    |                | TDDConf.1.1                     | TDDConf.1.1                 | TDDConf.1.1                 |
|   |                               | 2,4    |                | TDDConf.2.1                     | TDDConf.2.1                 | TDDConf.2.1                 |
| BW <sub>channel</sub>   |                               | 1,3    | MHz            | 10: N <sub>RB,c</sub> = 52      | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |
|   |                               | 2,4    |                | 40: N <sub>RB,c</sub> = 106     | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel                               |                               | 1,3    |                | SR.1.1 TDD                      | SR.1.1 TDD                  | SR.1.1 TDD                  |
|   |                               | 2,4    |                | SR.2.1 TDD                      | SR.2.1 TDD                  | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel                                    |                               | 1,3    |                | CR.1.1 TDD                      | CR.1.1 TDD                  | CR.1.1 TDD                  |
|   |                               | 2,4    |                | CR.2.1 TDD                      | CR.2.1 TDD                  | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel                               |                               | 1,3    |                | CCR.1.1 TDD                     | CCR.1.1 TDD                 | CCR.1.1 TDD                 |
|   |                               | 2,4    |                | CCR.2.1 TDD                     | CCR.2.1 TDD                 | CCR.2.1 TDD                 |
| SSB configuration   |                               | 1,3    |                | SSB.1 FR1                       | SSB.1 FR1                   | SSB.1 FR1                   |
|   |                               | 2,4    |                | SSB.2 FR1                       | SSB.2 FR1                   | SSB.2 FR1                   |
| OCNG Patterns   |                               | 1~4    |                | OP.1                            | OP.1                        | OP.1                        |
| TRS configuration   |                               | 1,3    |                | TRS.1.1 TDD                     | TRS.1.1 TDD                 | TRS.1.1 TDD                 |
|   |                               | 2,4    |                | TRS.1.2 TDD                     | TRS.1.2 TDD                 | TRS.1.2 TDD                 |
| Initial BWP Configuration   |                               | 1~4    |                | DLBWP.0.1<br>ULBWP.0.1          | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration                                       |                               | 1~4    |                | DLBWP.1.1<br>ULBWP.1.1          | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration  |                               | 1~4    |                | SMTC.1                          | SMTC.1                      | SMTC.1                      |
| Time offset between DL from serving cell and SRS from test system |                               | 1~4    | µs             | 17.67                           | 17.67                       | 17.67                       |
| EPRE ratio of PSS to SSS  |                               | 1~4    | dB             | 0                               | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS                                    |                               |        |                |                                 |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS                                   |                               |        |                |                                 |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS                                   |                               |        |                |                                 |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                                 |                               |        |                |                                 |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS                                   |                               |        |                |                                 |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                                 |                               |        |                |                                 |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>                  |                               |        |                |                                 |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>                 |                               |        |                |                                 |                             |                             |
| N <sub>oc</sub><br>Note2  | NR_TDD_FR1_A <sup>Note3</sup> | 1,3    | dBm/15kHz      | -106                            | -88                         | -114                        |
|   | NR_TDD_FR1_C                  |        |                |                                 |                             | -113                        |
|   | NR_TDD_FR1_D                  |        |                |                                 |                             | -112.5                      |
|   | NR_TDD_FR1_E                  |        |                | -112                            |                             |                             |
|   | NR_TDD_FR1_A <sup>Note3</sup> | 2,4    |                | Not applicable <sup>Note4</sup> | -91                         | -114                        |
|   | NR_TDD_FR1_C                  |        |                |                                 |                             | -113                        |
|   | NR_TDD_FR1_D                  |        |                |                                 |                             | -112.5                      |
| NR_TDD_FR1_E  | -112                          |        |                |                                 |                             |                             |
| N <sub>oc</sub><br>Note2  | NR_TDD_FR1_A <sup>Note3</sup> | 1,3    | dBm/SRS<br>SCS | -106                            | -88                         | -114                        |
|   | NR_TDD_FR1_C                  |        |                |                                 |                             | -113                        |
|   | NR_TDD_FR1_D                  |        |                |                                 |                             | -112.5                      |
|   | NR_TDD_FR1_E                  |        |                | -112                            |                             |                             |
|   | NR_TDD_FR1_A <sup>Note3</sup> | 2,4    |                | Not applicable <sup>Note4</sup> | -88                         | -111                        |
|   | NR_TDD_FR1_C                  |        |                |                                 |                             | -110                        |
|   | NR_TDD_FR1_D                  |        |                |                                 |                             | -109.5                      |
| NR_TDD_FR1_E  | -109                          |        |                |                                 |                             |                             |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.

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

Note 3: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

Note 4: Test 1 is not used when testing with 30kHz SSB SCS

**Table A.4.7.6.1.2-2: FR1 test parameters for SRS-RSRP accuracy for neighbour cell UE**

| Parameter                   |                        | Config | Unit            | Test 1                           | Test 2     | Test 3     |
|-----------------------------|------------------------|--------|-----------------|----------------------------------|------------|------------|
| $N_{oc}$<br>Note2           | NR_TDD_FR1_A<br>NOTE 3 | 1,3    | dBm/15kHz       | -106                             | -88        | -114       |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -113       |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -112.5     |
|                             | NR_TDD_FR1_E           |        |                 |                                  |            | -112       |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2,4    |                 | Not applicable <sup>Note 6</sup> | -91        | -114       |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -113       |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -112.5     |
|                             | NR_TDD_FR1_E           |        | -112            |                                  |            |            |
| $N_{oc}$<br>Note2           | NR_TDD_FR1_A<br>NOTE 5 | 1,3    | dBm/SRS<br>SCS  | -106                             | -88        | -114       |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -113       |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -112.5     |
|                             | NR_TDD_FR1_E           |        |                 |                                  |            | -112       |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2,4    |                 | Not applicable <sup>Note 6</sup> | -88        | -111       |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -110       |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -109.5     |
|                             | NR_TDD_FR1_E           |        | -109            |                                  |            |            |
| $\hat{E}_s / I_{ot}$ on SRS |                        | 1~4    | dB              | 1                                | 1          | 1          |
| SRS<br>RSRP<br>Note3        | NR_TDD_FR1_A<br>NOTE 5 | 1,3    | dBm/SRS<br>SCS  | -105                             | -87        | -113       |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -112       |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -111.5     |
|                             | NR_TDD_FR1_E           |        |                 |                                  |            | -111       |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2,4    |                 | Not applicable <sup>Note 6</sup> | -87        | -110       |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -109       |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -108.5     |
|                             | NR_TDD_FR1_E           |        | -108            |                                  |            |            |
| $I_o$ Note3                 | NR_TDD_FR1_A<br>NOTE 5 | 1,3    | dBm/9.36<br>MHz | -74.51                           | -56.51     | -82.51     |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -81.51     |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -81.01     |
|                             | NR_TDD_FR1_E           |        |                 |                                  |            | -79.51     |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2,4    |                 | Not applicable <sup>Note 6</sup> | -53.42     | -76.42     |
|                             | NR_TDD_FR1_C           |        |                 |                                  |            | -75.42     |
|                             | NR_TDD_FR1_D           |        |                 |                                  |            | -74.92     |
|                             | NR_TDD_FR1_E           |        | -74.42          |                                  |            |            |
| $\hat{E}_s / N_{oc}$ on SRS |                        | 1~4    | dB              | 1                                | 1          | 1          |
| Propagation condition       |                        | 1~4    |                 | AWGN                             | AWGN       | AWGN       |
| Antenna configuration       |                        | 1~4    |                 | 1x2                              | 1x2        | 1x2        |
| SRS configuration           |                        | 1,3    |                 | SRSCConf.1                       | SRSCConf.1 | SRSCConf.1 |
|                             |                        | 2,4    |                 | SRSCConf.2                       | SRSCConf.2 | SRSCConf.2 |

|         |  |
|---------|--|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of the test.   |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |
| Note 6: | Test 1 is not used when testing with 30kHz SSB SCS   |

**Table A.4.7.6.1.2-3: SRS configuration parameters for FR1 SRS-RSRP accuracy**

|                 | Field                            | SRSCnf.1 | SRSCnf.2 |
|-----------------|----------------------------------|----------|----------|
| SRS-ResourceSet | srs-ResourceSetId                | 0        | 0        |
|                 | srs-ResourceIdList               | 0        | 0        |
|                 | resourceType                     | Periodic | Periodic |
|                 | Usage                            | Codebook | Codebook |
| SRS-Resource    | SRS-ResourceId                   | 0        | 0        |
|                 | nrofSRS-Ports                    | Port1    | Port1    |
|                 | transmissionComb                 | n2       | n2       |
|                 | combOffset-n2                    | 0        | 0        |
|                 | cyclicShift-n2                   | 0        | 0        |
|                 | resourceMapping startPosition    | 0        | 0        |
|                 | resourceMapping nrofSymbols      | n1       | n1       |
|                 | resourceMapping repetitionFactor | n1       | n1       |
|                 | freqDomainPosition               | 0        | 0        |
|                 | freqDomainShift                  | 0        | 0        |
|                 | freqHopping c-SRS                | 12       | 12       |
|                 | freqHopping b-SRS                | 0        | 0        |
|                 | freqHopping b-hop                | 0        | 0        |
|                 | groupOrSequenceHopping           | Neither  | Neither  |
|                 | resourceType                     | Periodic | Periodic |
|                 | periodicityAndOffset-p           | sl20, 9  | sl40, 19 |
|                 | sequencId                        | 0        | 0        |

### A.4.7.6.1.3 Test Requirements

The SRS-RSRP measurement accuracy shall fulfil the requirements in clauses 10.1.22.1.1.

### A.4.7.6.2 EN-DC CLI-RSSI measurement accuracy with FR1 serving cell

#### A.4.7.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.2.1 with the testing configurations for NR cells in Table A.4.7.6.2.1-1.

**Table A.4.7.6.2.1-1: Applicable NR configurations for FR1 CLI-RSSI accuracy test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode   |
| 2      | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode  |
| 3      | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode   |
| 4      | LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.4.7.6.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.6.2.2-1 below.

Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 1 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.4.7.6.2.2-2.

**Table A.4.7.6.2.2-1: FR1 test parameters for CLI-RSSI accuracy**

| Parameter  | Config | Unit          | Value                  |
|--|--------|---------------|------------------------|
| SSB GSCN   | 1~4    |               | freq1                  |
| Duplex mode  | 1~4    |               | TDD                    |
| TDD configuration  | 1,3    |               | TDDConf.1.1            |
|  | 2,4    |               | TDDConf.2.1            |
| $BW_{\text{channel}}$  | 1,3    | MHz           | 10: $N_{RB,c} = 52$    |
|  | 2,4    |               | 40: $N_{RB,c} = 106$   |
| PDSCH Reference measurement channel                                | 1,3    |               | SR.1.1 TDD             |
|  | 2,4    |               | SR.2.1 TDD             |
| RMSI CORESET Reference Channel                                     | 1,3    |               | CR.1.1 TDD             |
|  | 2,4    |               | CR.2.1 TDD             |
| Dedicated CORESET Reference Channel                                | 1,3    |               | CCR.1.1 TDD            |
|  | 2,4    |               | CCR.2.1 TDD            |
| SSB configuration  | 1,3    |               | SSB.1 FR1              |
|  | 2,4    |               | SSB.2 FR1              |
| OCNG Patterns <sup>Note6</sup>                                     | 1~4    |               | OP.1                   |
| TRS configuration  | 1,3    |               | TRS.1.1 TDD            |
|  | 2,4    |               | TRS.1.2 TDD            |
| Initial BWP Configuration  | 1~4    |               | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration  | 1~4    |               | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration   | 1~4    |               | SMTC.1                 |
| Time offset between DL from serving cell and OCNG from test system | 1~4    | $\mu\text{s}$ | 17.67                  |
| EPRE ratio of PSS to SSS   | 1~4    | dB            | 0                      |
| EPRE ratio of PBCH DMRS to SSS                                     |        |               |                        |
| EPRE ratio of PBCH to PBCH DMRS                                    |        |               |                        |
| EPRE ratio of PDCCH DMRS to SSS                                    |        |               |                        |
| EPRE ratio of PDCCH to PDCCH DMRS                                  |        |               |                        |
| EPRE ratio of PDSCH DMRS to SSS                                    |        |               |                        |
| EPRE ratio of PDSCH to PDSCH DMRS                                  |        |               |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>                   |        |               |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>                  |        |               |                        |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note2</sup>         | 1,3    | dBm/15kHz     | -106                   |
|  | 2,4    |               | -106                   |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note2</sup>         | 1,3    | dBm/ BWP SCS  | -106                   |
|  | 2,4    |               | -103                   |
| $\hat{E}_s/I_{ot}$ on CLI-RSSI measurement resource                | 1~4    | dB            | -Infinity              |
| RSRP on CLI-RSSI measurement resource <sup>Note3</sup>             | 1~4    | dBm/ BWP SCS  | -Infinity              |
| Io on CLI-RSSI measurement resource <sup>Note3</sup>               | 1,3    | dBm/9.36 MHz  | -78.05                 |
|  | 2,4    | dBm/38.16 MHz | -71.96                 |
| Io on CLI-RSSI measurement resource <sup>Note3</sup>               | 1,3    | dBm/1.08 MHz  | -87.43                 |
|  | 2,4    |               | -87.44                 |

|   |  |    |           |
|---|--|----|-----------|
| $\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource | 1~4  | dB | -Infinity |
| Propagation condition                                 | 1~4  |    | AWGN      |
| Antenna configuration                                 | 1~4  |    | 1x2       |
| Note 1:   | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.   |    |           |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |    |           |
| Note 3:   | RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |    |           |
| Note 4:   | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |    |           |
| Note 5:   | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |    |           |
| Note 6:   | OCNG is not transmitted in the CLI-RSSI measurement resources.   |    |           |

**Table A.4.7.6.2.2-2: CLI-RSSI measurement resource configuration for FR1 CLI-RSSI accuracy**

|                               | Field                     | Config | SRSSConf.1 |
|-------------------------------|---------------------------|--------|------------|
| CLI-RSSI measurement resource | rssi-ResourceId           | 1~4    | 0          |
|                               | rssi-SCS                  | 1,3    | 15kHz      |
|                               |                           | 2,4    | 30kHz      |
|                               | startPRB                  | 1~4    | 0          |
|                               | nrofPRBs                  | 1,3    | 52         |
|                               |                           | 2,4    | 106        |
|                               | startPosition             | 1~4    | 3          |
|                               | nrofSymbols               | 1~4    | 11         |
|                               | rssi-PeriodicityAndOffset | 1,3    | sl20, 9    |
|                               |                           | 2,4    | sl40, 19   |

#### A.4.7.6.2.3 Test Requirements

The CLI-RSSI measurement accuracy shall fulfil the requirements in clauses 10.1.22.2.1.

### A.4.7.7 L1-SINR measurement for beam reporting

#### A.4.7.7.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

##### A.4.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.8.4.1 and clause 10.1.27.1 for FR1 L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.4.7.7.1.1-1, which configures the measurement resources for the CSI-RS based CMR and no dedicated IMR.

**Table A.4.7.7.1.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2      | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode  |
| 3      | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode   |
| 4      | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode  |
| 5      | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode  |
| 6      | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.4.7.7.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.7.1.2-1 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.4.7.7.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.



**Table A.4.7.7.1.2-1: FR1 CSI-RS based L1-SINR test parameters**

| Parameter   | Config   | Unit | Test 1                      | Test 2                      |        |
|---|--|------|-----------------------------|-----------------------------|--------|
| SSB GSCN  | 1~6  |      | freq1                       | freq1                       |        |
| Duplex mode                                       | 1,4  |      | FDD                         | FDD                         |        |
|   | 2,5  |      | TDD                         | TDD                         |        |
|   | 3,6  |      | TDD                         | TDD                         |        |
| TDD Configuration                                 | 1,4  |      | N/A                         | N/A                         |        |
|   | 2,5  |      | TDDConf.1.1                 | TDDConf.1.1                 |        |
|   | 3,6  |      | TDDConf.2.1                 | TDDConf.2.1                 |        |
| BW <sub>channel</sub>                             | 1,4  | MHz  | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |        |
|   | 2,5  |      | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |        |
|   | 3,6  |      | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |        |
| PDSCH Reference measurement channel               | 1,4  |      | SR.1.1 FDD                  | SR.1.1 FDD                  |        |
|   | 2,5  |      | SR.1.1 TDD                  | SR.1.1 TDD                  |        |
|   | 3,6  |      | SR.2.1 TDD                  | SR.2.1 TDD                  |        |
| RMSI CORESET Reference Channel                    | 1,4  |      | CR.1.1 FDD                  | CR.1.1 FDD                  |        |
|   | 2,5  |      | CR.1.1 TDD                  | CR.1.1 TDD                  |        |
|   | 3,6  |      | CR.2.1 TDD                  | CR.2.1 TDD                  |        |
| Dedicated CORESET Reference Channel               | 1,4  |      | CCR.1.1 FDD                 | CCR.1.1 FDD                 |        |
|   | 2,5  |      | CCR.1.1 TDD                 | CCR.1.1 TDD                 |        |
|   | 3,6  |      | CCR.2.1 TDD                 | CCR.2.1 TDD                 |        |
| SSB configuration                                 | 1,4  |      | SSB.1 FR1                   | SSB.1 FR1                   |        |
|   | 2,5  |      | SSB.1 FR1                   | SSB.1 FR1                   |        |
|   | 3,6  |      | SSB.2 FR1                   | SSB.2 FR1                   |        |
| OCNG Patterns                                     | 1~6  |      | OP.1                        | OP.1                        |        |
| TRS configuration                                 | 1,4  |      | TRS.1.1 FDD                 | TRS.1.1 FDD                 |        |
|   | 2,5  |      | TRS.1.1 TDD                 | TRS.1.1 TDD                 |        |
|   | 3,6  |      | TRS.1.2 TDD                 | TRS.1.2 TDD                 |        |
| Initial BWP Configuration                         | 1~6  |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |        |
| Dedicated BWP configuration                       | 1~6  |      | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |        |
| SMTTC configuration                               | 1~6  |      | SMTTC.1                     | SMTTC.1                     |        |
| CSI-RS  | 1,4  |      | CSI-RS 1.2 FDD              | CSI-RS 1.2 FDD              |        |
|   | 2,5  |      | CSI-RS 1.2 TDD              | CSI-RS 1.2 TDD              |        |
|   | 3,6  |      | CSI-RS 2.2 TDD              | CSI-RS 2.2 FDD              |        |
| reportConfigType                                  | 1~6  |      | periodic                    | periodic                    |        |
| reportQuantity-r16                                | 1~6  |      | cri-SINR-r16                | cri-SINR-r16                |        |
| nrofReportedRS                                    | 1~6  |      | 2                           | 2                           |        |
| L1-RSRP reporting period                          | 1~6  |      | slot80                      | slot80                      |        |
| EPRE ratio of PSS to SSS                          | 1~6  | dB   | 0                           | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS                    |  |      |                             |                             |        |
| EPRE ratio of PBCH to PBCH DMRS                   |  |      |                             |                             |        |
| EPRE ratio of PDCCH DMRS to SSS                   |  |      |                             |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |  |      |                             |                             |        |
| EPRE ratio of PDSCH DMRS to SSS                   |  |      |                             |                             |        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |      |                             |                             |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |      |                             |                             |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |      |                             |                             |        |
| N <sub>oc</sub><br><sup>Note2</sup>               | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><sup>NOTE 5</sup> | 1~6  | dBm/15kHz                   | -94.65                      | -117   |
|   | NR_FDD_FR1_B                                       |      |                             |                             | -116.5 |
|   | NR_TDD_FR1_C                                       |      |                             |                             | -116   |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                      |      |                             |                             | -115.5 |

|                         |   |         |                   |        |        |
|-------------------------|---|---------|-------------------|--------|--------|
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -113.5 |
| $N_{oc}$<br>Note2       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/CSI-RS<br>SCS | -94.65 | -117   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            | -114    |                   |        |        |
|                         | NR_FDD_FR1_H                            | -113.5  |                   |        |        |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                   | -91.65 | -114   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -113.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -112.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -112   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -111.5 |
|                         | NR_FDD_FR1_G                            | -111    |                   |        |        |
|                         | NR_FDD_FR1_H                            | -110.5  |                   |        |        |
| $\hat{E}_s/I_{ot}$      |   | 1~6     | dB                | 10     | -3     |
| CSI-RS<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/CSI-RS<br>SCS | -84.65 | -120   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -119.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -119   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -118.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -118   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -117.5 |
|                         | NR_FDD_FR1_G                            | -117    |                   |        |        |
|                         | NR_FDD_FR1_H                            | -116.5  |                   |        |        |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                   | -81.65 | -117   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            | -114    |                   |        |        |
|                         | NR_FDD_FR1_H                            | -113.5  |                   |        |        |
| $I_o$ Note3             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/9.36<br>MHz   | -56.28 | -87.28 |
|                         | NR_FDD_FR1_B                            |         |                   |        | -86.78 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -86.28 |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -85.78 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -85.28 |
|                         | NR_FDD_FR1_F                            |         |                   |        | -84.78 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -84.28 |
|                         | NR_FDD_FR1_H                            |         |                   |        | -83.78 |

|   |   |     |                  |        |        |
|---|---|-----|------------------|--------|--------|
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6 | dBm/38.16<br>MHz | -50.19 | -81.19 |
|   | NR_FDD_FR1_B                            |     |                  |        | -80.69 |
|   | NR_TDD_FR1_C                            |     |                  |        | -80.19 |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                  |        | -79.69 |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                  |        | -79.19 |
|   | NR_FDD_FR1_F                            |     |                  |        | -78.69 |
|   | NR_FDD_FR1_G                            |     |                  |        | -78.19 |
|   | NR_FDD_FR1_H                            |     |                  |        | -77.69 |
| $\hat{E}_s / N_{oc}$  |   | 1~6 | dB               | 10     | -3     |
| Propagation condition   |   | 1~6 |                  | AWGN   | AWGN   |
| Antenna configuration   |   | 1~6 |                  | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |   |     |                  |        |        |

A.4.7.7.1.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.27.1.

A.4.7.7.2 L1-SINR measurement with SSB based CMR and dedicated IMR

A.4.7.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.2 and clause 10.1.27.2 for L1-SINR measurements with SSB based CMR and CSI-IM based IMR, with the testing configurations for NR cells in Table A.4.7.7.2.1-1.

**Table A.4.7.7.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations in each supported band

A.4.7.7.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.7.2.2-1 below. The absolute accuracy of L1-SINR measurements are tested by using the parameters in Table A.4.7.7.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR.

**Table A.4.7.7.2.2-1: FR1 L1-SINR measurement test parameters with SSB based CMR and CSI-IM based IMR**

| Parameter   | Config | Unit      | Test 1                      | Test 2   |        |
|---|--------|-----------|-----------------------------|--|--------|
| SSB GSCN  | 1~6    |           | freq1                       | freq1  |        |
| Duplex mode                                       | 1,4    |           | FDD                         | FDD  |        |
|   | 2,5    |           | TDD                         | TDD  |        |
|   | 3,6    |           | TDD                         | TDD  |        |
| TDD Configuration                                 | 1,4    |           | N/A                         | N/A  |        |
|   | 2,5    |           | TDDConf.1.1                 | TDDConf.1.1  |        |
|   | 3,6    |           | TDDConf.2.1                 | TDDConf.2.1  |        |
| BW <sub>channel</sub>                             | 1,4    | MHz       | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52                         |        |
|   | 2,5    |           | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52                         |        |
|   | 3,6    |           | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106                        |        |
| PDSCH Reference measurement channel               | 1,4    |           | SR.1.1 FDD                  | SR.1.1 FDD   |        |
|   | 2,5    |           | SR.1.1 TDD                  | SR.1.1 TDD   |        |
|   | 3,6    |           | SR.2.1 TDD                  | SR.2.1 TDD   |        |
| RMSI CORESET Reference Channel                    | 1,4    |           | CR.1.1 FDD                  | CR.1.1 FDD   |        |
|   | 2,5    |           | CR.1.1 TDD                  | CR.1.1 TDD   |        |
|   | 3,6    |           | CR.2.1 TDD                  | CR.2.1 TDD   |        |
| Dedicated CORESET Reference Channel               | 1,4    |           | CCR.1.1 FDD                 | CCR.1.1 FDD  |        |
|   | 2,5    |           | CCR.1.1 TDD                 | CCR.1.1 TDD  |        |
|   | 3,6    |           | CCR.2.1 TDD                 | CCR.2.1 TDD  |        |
| SSB configuration                                 | 1,4    |           | SSB.3 FR1                   | SSB.3 FR1  |        |
|   | 2,5    |           | SSB.3 FR1                   | SSB.3 FR1  |        |
|   | 3,6    |           | SSB.4 FR1                   | SSB.4 FR1  |        |
| CSI-IM configuration                              | 1,4    |           | CSI-IM 1.1 FDD              | CSI-IM 1.1 FDD                                     |        |
|   | 2,5    |           | CSI-IM 1.1 TDD              | CSI-IM 1.1 TDD                                     |        |
|   | 3,6    |           | CSI-IM 2.1 TDD              | CSI-IM 2.1 TDD                                     |        |
| OCNG Patterns                                     | 1~6    |           | OP.1                        | OP.1   |        |
| TRS configuration                                 | 1,4    |           | TRS.1.1 FDD                 | TRS.1.1 FDD  |        |
|   | 2,5    |           | TRS.1.1 TDD                 | TRS.1.1 TDD  |        |
|   | 3,6    |           | TRS.1.2 TDD                 | TRS.1.2 TDD  |        |
| Initial BWP Configuration                         | 1~6    |           | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1                             |        |
| Dedicated BWP configuration                       | 1~6    |           | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1                             |        |
| SMTc configuration                                | 1~6    |           | SMTc.1                      | SMTc.1   |        |
| reportConfigType                                  | 1~6    |           | periodic                    | periodic   |        |
| reportQuantity-r16                                | 1~6    |           | ssb-Index-SINR-r16          | ssb-Index-SINR-r16                                 |        |
| Number of reported RS                             | 1~6    |           | 2                           | 2  |        |
| L1-SINR reporting period                          | 1~6    |           | slot80                      | slot80   |        |
| EPRE ratio of PSS to SSS                          | 1~6    | dB        | 0                           | 0  |        |
| EPRE ratio of PBCH DMRS to SSS                    |        |           |                             |  |        |
| EPRE ratio of PBCH to PBCH DMRS                   |        |           |                             |  |        |
| EPRE ratio of PDCCH DMRS to SSS                   |        |           |                             |  |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |        |           |                             |  |        |
| EPRE ratio of PDSCH DMRS to SSS                   |        |           |                             |  |        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |        |           |                             |  |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |           |                             |  |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |        |           |                             |  |        |
| N <sub>oc</sub><br><sup>Note2</sup>               | 1~6    | dBm/15kHz | -94.65                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><sup>NOTE 5</sup> | -117   |
|   |        |           |                             | NR_FDD_FR1_B                                       | -116.5 |
|   |        |           |                             | NR_TDD_FR1_C                                       | -116   |
|   |        |           |                             | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                      | -115.5 |

|                      |   |         |                 |        |        |
|----------------------|---|---------|-----------------|--------|--------|
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                 |        | -115   |
|                      | NR_FDD_FR1_F                            |         |                 |        | -114.5 |
|                      | NR_FDD_FR1_G                            |         |                 |        | -114   |
|                      | NR_FDD_FR1_H                            |         |                 |        | -113.5 |
| $N_{oc}$<br>Note2    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/SSB<br>SCS  | -94.65 | -117   |
|                      | NR_FDD_FR1_B                            |         |                 |        | -116.5 |
|                      | NR_TDD_FR1_C                            |         |                 |        | -116   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                 |        | -115.5 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                 |        | -115   |
|                      | NR_FDD_FR1_F                            |         |                 |        | -114.5 |
|                      | NR_FDD_FR1_G                            |         |                 |        | -114   |
|                      | NR_FDD_FR1_H                            |         |                 |        | -113.5 |
|                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                 | -91.65 | -114   |
|                      | NR_FDD_FR1_B                            |         |                 |        | -113.5 |
|                      | NR_TDD_FR1_C                            |         |                 |        | -114   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                 |        | -112.5 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                 |        | -112   |
|                      | NR_FDD_FR1_F                            |         |                 |        | -111.5 |
|                      | NR_FDD_FR1_G                            |         |                 |        | -111   |
|                      | NR_FDD_FR1_H                            |         |                 |        | -110.5 |
| $\hat{E}_s/I_{ot}$   | 1~6                                     | dB      | 10              | -3     |        |
| SSB<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/SSB<br>SCS  | -84.65 | -120   |
|                      | NR_FDD_FR1_B                            |         |                 |        | -119.5 |
|                      | NR_TDD_FR1_C                            |         |                 |        | -119   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                 |        | -118.5 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                 |        | -118   |
|                      | NR_FDD_FR1_F                            |         |                 |        | -117.5 |
|                      | NR_FDD_FR1_G                            |         |                 |        | -117   |
|                      | NR_FDD_FR1_H                            |         |                 |        | -116.5 |
|                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                 | -81.65 | -117   |
|                      | NR_FDD_FR1_B                            |         |                 |        | -116.5 |
|                      | NR_TDD_FR1_C                            |         |                 |        | -116   |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                 |        | -115.5 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                 |        | -115   |
|                      | NR_FDD_FR1_F                            |         |                 |        | -114.5 |
|                      | NR_FDD_FR1_G                            |         |                 |        | -114   |
|                      | NR_FDD_FR1_H                            |         |                 |        | -113.5 |
| $I_o$ Note3          | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/9.36<br>MHz | -56.28 | -87.28 |
|                      | NR_FDD_FR1_B                            |         |                 |        | -86.78 |
|                      | NR_TDD_FR1_C                            |         |                 |        | -86.28 |
|                      | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                 |        | -85.78 |
|                      | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                 |        | -85.28 |
|                      | NR_FDD_FR1_F                            |         |                 |        | -84.78 |
|                      | NR_FDD_FR1_G                            |         |                 |        | -84.28 |
|                      | NR_FDD_FR1_H                            |         |                 |        | -83.78 |



|   |   |     |                  |        |        |
|---|---|-----|------------------|--------|--------|
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6 | dBm/38.16<br>MHz | -50.19 | -81.19 |
|   | NR_FDD_FR1_B                            |     |                  |        | -80.69 |
|   | NR_TDD_FR1_C                            |     |                  |        | -80.19 |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                  |        | -79.69 |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                  |        | -79.19 |
|   | NR_FDD_FR1_F                            |     |                  |        | -78.69 |
|   | NR_FDD_FR1_G                            |     |                  |        | -78.19 |
|   | NR_FDD_FR1_H                            |     |                  |        | -77.69 |
| $\hat{E}_s / N_{oc}$  | 1~6                                     | dB  | 10               | -3     |        |
| Propagation condition   | 1~6                                     |     | AWGN             | AWGN   |        |
| Antenna configuration   | 1~6                                     |     | 1x2              | 1x2    |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |   |     |                  |        |        |

#### A.4.7.7.2.3 Test Requirements

The L1-SINR measurement accuracy for SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 of Cell 2 shall fulfil the requirements in clauses 10.1.27.2.

### A.4.7.7.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

#### A.4.7.7.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8.4.3 and clause 10.1.27.3 for L1-SINR measurements based on CSI-RS as both CMR and IMR with the testing configurations for NR cells in Table A.4.7.7.3.1-1.

**Table A.4.7.7.3.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based both CMR based IMR**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations in each supported band.

#### A.4.7.7.3.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.7.3.2-1 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.4.7.7.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR.

**Table A.4.7.7.3.2-1: FR1 L1-SINR measurement test with CSI-RS based both CMR and IMR**

| Parameter | Config | Unit | Test 1 | Test 2 |
|-----------|--------|------|--------|--------|
|-----------|--------|------|--------|--------|

|   |   |     |                             |                             |
|---|---|-----|-----------------------------|-----------------------------|
| SSB GSCN  | 1~6                                     |     | freq1                       | freq1                       |
| Duplex mode                                       | 1,4                                     |     | FDD                         | FDD                         |
|   | 2,5                                     |     | TDD                         | TDD                         |
|   | 3,6                                     |     | TDD                         | TDD                         |
| TDD Configuration                                 | 1,4                                     |     | N/A                         | N/A                         |
|   | 2,5                                     |     | TDDConf.1.1                 | TDDConf.1.1                 |
|   | 3,6                                     |     | TDDConf.2.1                 | TDDConf.2.1                 |
| BW <sub>channel</sub>                             | 1,4                                     | MHz | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |
|   | 2,5                                     |     | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |
|   | 3,6                                     |     | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel               | 1,4                                     |     | SR.1.1 FDD                  | SR.1.1 FDD                  |
|   | 2,5                                     |     | SR.1.1 TDD                  | SR.1.1 TDD                  |
|   | 3,6                                     |     | SR.2.1 TDD                  | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel                    | 1,4                                     |     | CR.1.1 FDD                  | CR.1.1 FDD                  |
|   | 2,5                                     |     | CR.1.1 TDD                  | CR.1.1 TDD                  |
|   | 3,6                                     |     | CR.2.1 TDD                  | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel               | 1,4                                     |     | CCR.1.1 FDD                 | CCR.1.1 FDD                 |
|   | 2,5                                     |     | CCR.1.1 TDD                 | CCR.1.1 TDD                 |
|   | 3,6                                     |     | CCR.2.1 TDD                 | CCR.2.1 TDD                 |
| SSB configuration                                 | 1,4                                     |     | SSB.1 FR1                   | SSB.1 FR1                   |
|   | 2,5                                     |     | SSB.1 FR1                   | SSB.1 FR1                   |
|   | 3,6                                     |     | SSB.2 FR1                   | SSB.2 FR1                   |
| OCNG Patterns                                     | 1~6                                     |     | OP.1                        | OP.1                        |
| TRS configuration                                 | 1,4                                     |     | TRS.1.1 FDD                 | TRS.1.1 FDD                 |
|   | 2,5                                     |     | TRS.1.1 TDD                 | TRS.1.1 TDD                 |
|   | 3,6                                     |     | TRS.1.2 TDD                 | TRS.1.2 TDD                 |
| Initial BWP Configuration                         | 1~6                                     |     | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration                       | 1~6                                     |     | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration                                | 1~6                                     |     | SMTc.1                      | SMTc.1                      |
| CSI-RS configuration as CMR                       | 1,4                                     |     | CSI-RS 1.2 FDD              | CSI-RS 1.2 FDD              |
|   | 2,5                                     |     | CSI-RS 1.2 TDD              | CSI-RS 1.2 TDD              |
|   | 3,6                                     |     | CSI-RS 2.2 TDD              | CSI-RS 2.2 FDD              |
| CSI-RS configuration as IMR                       | 1,4                                     |     | CSI-RS 1.3A FDD             | CSI-RS 1.3A FDD             |
|   | 2,5                                     |     | CSI-RS 1.3A TDD             | CSI-RS 1.3A TDD             |
|   | 3,6                                     |     | CSI-RS 2.3A TDD             | CSI-RS 2.3A TDD             |
| reportConfigType                                  | 1~6                                     |     | periodic                    | periodic                    |
| reportQuantity-r16                                | 1~6                                     |     | cri-SINR-r16                | cri-SINR-r16                |
| nrofReportedRS                                    | 1~6                                     |     | 2                           | 2                           |
| L1-RSRP reporting period                          | 1~6                                     |     | slot80                      | slot80                      |
| EPRE ratio of PSS to SSS                          | 1~6                                     | dB  | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS                    |   |     |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS                   |   |     |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS                   |   |     |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |     |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS                   |   |     |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |     |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |     |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |     |                             |                             |
| $N_{oc}$<br>Note2                                 |   |     |                             |                             |
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |     |                             |                             |
|   | NR_FDD_FR1_B<br>NR_TDD_FR1_C            |     |                             |                             |
|   |   |     |                             | -116.5                      |
|   |   |     |                             | -116                        |

|                         |   |         |                   |        |        |
|-------------------------|---|---------|-------------------|--------|--------|
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -113.5 |
| $N_{oc}$<br>Note2       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/CSI-RS<br>SCS | -94.65 | -117   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -113.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                   | -91.65 | -114   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -113.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -112.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -112   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -111.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -111   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -110.5 |
| $\hat{E}_s/I_{ot}$      |   | 1-6     | dB                | 10     | 0      |
| CSI-RS<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/CSI-RS<br>SCS | -84.65 | -117   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -113.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3,6     |                   | -81.65 | -114   |
|                         | NR_FDD_FR1_B                            |         |                   |        | -113.5 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -114   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -112.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -112   |
|                         | NR_FDD_FR1_F                            |         |                   |        | -111.5 |
|                         | NR_FDD_FR1_G                            |         |                   |        | -111   |
|                         | NR_FDD_FR1_H                            |         |                   |        | -110.5 |
| $I_o$ Note3             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5 | dBm/9.36<br>MHz   | -56.28 | -87.28 |
|                         | NR_FDD_FR1_B                            |         |                   |        | -86.78 |
|                         | NR_TDD_FR1_C                            |         |                   |        | -86.28 |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |                   |        | -85.78 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |                   |        | -85.28 |
|                         | NR_FDD_FR1_F                            |         |                   |        | -84.78 |

|   |     |                  |        |        |
|---|-----|------------------|--------|--------|
| NR_FDD_FR1_G  |     |                  |        | -84.28 |
| NR_FDD_FR1_H  |     |                  |        | -83.78 |
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5   | 3,6 | dBm/38.16<br>MHz | -50.19 | -81.19 |
| NR_FDD_FR1_B  |     |                  |        | -80.69 |
| NR_TDD_FR1_C  |     |                  |        | -80.19 |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D   |     |                  |        | -79.69 |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E   |     |                  |        | -79.19 |
| NR_FDD_FR1_F  |     |                  |        | -78.69 |
| NR_FDD_FR1_G  |     |                  |        | -78.19 |
| NR_FDD_FR1_H  |     |                  |        | -77.69 |
| $\hat{E}_s / N_{oc}$  | 1~6 | dB               | 10     | 0      |
| Propagation condition   | 1~6 |                  | AWGN   | AWGN   |
| Antenna configuration   | 1~6 |                  | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_0</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |     |                  |        |        |

#### A.4.7.7.3.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0+CSI-RS#2 and CSI-RS#1+CSI-RS#3 of Cell 2 shall fulfil the requirements in clauses 10.1.27.3.

### A.4.7.8 CSI-RSRP

#### A.4.7.8.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.2.3.1 and 10.1.2.3.2 for intra-frequency CSI-RS based L3 measurements.

##### A.4.7.8.1.2 Test parameters

In this set of test cases all NR cells are on the same carrier frequency. Supported test configurations are shown in table A.4.7.8.1.2-1. Both absolute and relative accuracy of CSI-RSRP intra-frequency measurements are tested by using the parameters in A.4.7.8.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PCell and Cell 3 is the target cell.

Table A.4.7.8.1.2-1: CSI-RSRP Intra frequency CSI-RSRP supported test configurations

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations for each supported band

Table A.4.7.8.1.2-2: CSI-RSRP Intra frequency test parameters

| Parameter                            |                | Unit | Test 1                      |           | Test 2      |           | Test 3      |           |
|--------------------------------------|----------------|------|-----------------------------|-----------|-------------|-----------|-------------|-----------|
|                                      |                |      | Cell 2                      | Cell 3    | Cell 2      | Cell 3    | Cell 2      | Cell 3    |
| Physical cell ID                     |                |      | 489                         | 0         | 489         | 0         | 489         | 0         |
| SSB ARFCN                            |                |      | freq1                       |           | freq1       |           | freq1       |           |
| Duplex mode                          | Config 1,4     |      | FDD                         |           |             |           |             |           |
|                                      | Config 2,3,5,6 |      | TDD                         |           |             |           |             |           |
| TDD configuration                    | Config 1,4     |      | Not Applicable              |           |             |           |             |           |
|                                      | Config 2,5     |      | TDDConf.1.1                 |           |             |           |             |           |
|                                      | Config 3,6     |      | TDDConf.2.1                 |           |             |           |             |           |
| BW <sub>channel</sub>                | Config 1,4     | MHz  | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 2,5     |      | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 3,6     |      | 40: N <sub>RB,c</sub> = 106 |           |             |           |             |           |
| Downlink initial BWP configuration   |                |      | DLBWP.0.1                   |           |             |           |             |           |
| Downlink dedicated BWP configuration |                |      | DLBWP.1.1                   |           |             |           |             |           |
| Uplink initial BWP configuration     |                |      | ULBWP.0.1                   |           |             |           |             |           |
| Uplink dedicated BWP configuration   |                |      | ULBWP.1.1                   |           |             |           |             |           |
| TRS configuration                    | Config 1,4     |      | TRS.1.1 FDD                 | NA        | TRS.1.1 FDD | NA        | TRS.1.1 FDD | NA        |
|                                      | Config 2,5     |      | TRS.1.1 TDD                 | NA        | TRS.1.1 TDD | NA        | TRS.1.1 TDD | NA        |
|                                      | Config 3,6     |      | TRS.1.2 TDD                 | NA        | TRS.1.2 TDD | NA        | TRS.1.2 TDD | NA        |
| DRX Cycle                            |                | ms   | Not Applicable              |           |             |           |             |           |
| PDSCH Reference measurement channel  | Config 1,4     |      | SR.1.1 FDD                  | -         | SR.1.1 FDD  | -         | SR.1.1 FDD  | -         |
|                                      | Config 2,5     |      | SR.1.1 TDD                  | -         | SR.1.1 TDD  | -         | SR.1.1 TDD  | -         |
|                                      | Config 3,6     |      | SR2.1 TDD                   | -         | SR2.1 TDD   | -         | SR2.1 TDD   | -         |
| RMSI CORESET Reference Channel       | Config 1,4     |      | CR.1.1 FDD                  | -         | CR.1.1 FDD  | -         | CR.1.1 FDD  | -         |
|                                      | Config 2,5     |      | CR.1.1 TDD                  | -         | CR.1.1 TDD  | -         | CR.1.1 TDD  | -         |
|                                      | Config 3,6     |      | CR2.1 TDD                   | -         | CR2.1 TDD   | -         | CR2.1 TDD   | -         |
| Control Channel RMC                  | Config 1,4     |      | CCR.1.1 FDD                 | -         | CCR.1.1 FDD | -         | CCR.1.1 FDD | -         |
|                                      | Config 2,5     |      | CCR.1.1 TDD                 | -         | CCR.1.1 TDD | -         | CCR.1.1 TDD | -         |
|                                      | Config 3,6     |      | CCR2.1 TDD                  | -         | CCR2.1 TDD  | -         | CCR2.1 TDD  | -         |
| SSB configuration                    | Config 1,4     |      | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |
|                                      | Config 2,5     |      | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |

|  |                               |   |   |                      |              |              |              |              |              |                      |                                  |
|--|-------------------------------|---|---|----------------------|--------------|--------------|--------------|--------------|--------------|----------------------|----------------------------------|
|  |                               | Config 3,6                              |   | SSB.2<br>FR1         | SSB.2<br>FR1 | SSB.2<br>FR1 | SSB.2<br>FR1 | SSB.2<br>FR1 | SSB.2<br>FR1 |                      |                                  |
| CSI-RS configuration<br>for RRM          |                               | Config 1,4                              |   | CSI-RS.RRM.FR1.1 FDD |              |              |              |              |              |                      |                                  |
|  |                               | Config 2,5                              |   | CSI-RS.RRM.FR1.1 TDD |              |              |              |              |              |                      |                                  |
|  |                               | Config 3,6                              |   | CSI-RS.RRM.FR1.2 TDD |              |              |              |              |              |                      |                                  |
| Time offset with Cell 2                  |                               | Config 1,2,4,5                          | µs                                      | -                    | 4.7          | -            | 4.7          | -            | 4.7          |                      |                                  |
|  |                               | Config 3,6                              | µs                                      | -                    | 2.35         | -            | 2.35         | -            | 2.35         |                      |                                  |
| SMTC configuration                       |                               | Config 1,4                              |   | SMTC.2               |              |              |              |              |              |                      |                                  |
|  |                               | Config 2,3,5,6                          |   | SMTC.1               |              |              |              |              |              |                      |                                  |
| OCNG Patterns                            |                               |   |   | OP.1                 |              |              |              |              |              |                      |                                  |
| PDSCH/PDCCH<br>subcarrier spacing        |                               | Config 1,2,4,5                          | kHz                                     | 15 kHz               |              |              |              |              |              |                      |                                  |
|  |                               | Config 3,6                              |   | 30kHz                |              |              |              |              |              |                      |                                  |
| EPRE ratio of PSS to SSS                 |                               |   | dB                                      | 0                    | 0            | 0            | 0            | 0            | 0            |                      |                                  |
| EPRE ratio of PBCH DMRS to SSS           |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| EPRE ratio of PBCH to PBCH DMRS          |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| EPRE ratio of PDCCH DMRS to SSS          |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| EPRE ratio of PDCCH to PDCCH DMRS        |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| EPRE ratio of PDSCH DMRS to SSS          |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| EPRE ratio of PDSCH to PDSCH             |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                               |   |   |                      |              |              |              |              |              |                      |                                  |
| $N_{oc}$<br>Note2                        | Config 1,2,4,5                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |   | dBm/15Kh<br>Z        | -106         |              | -88          |              | -114         |                      |                                  |
|  |                               | NR_FDD_FR1_B                            | -113.5                                  |                      |              |              |              |              |              |                      |                                  |
|  |                               | NR_TDD_FR1_C                            | -113                                    |                      |              |              |              |              |              |                      |                                  |
|  |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           | -112.5                                  |                      |              |              |              |              |              |                      |                                  |
|  |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           | -112                                    |                      |              |              |              |              |              |                      |                                  |
|  |                               | NR_FDD_FR1_F                            | -111.5                                  |                      |              |              |              |              |              |                      |                                  |
|  |                               | NR_FDD_FR1_G                            | -111                                    |                      |              |              |              |              |              |                      |                                  |
|  |                               | NR_FDD_FR1_H                            | -110.5                                  |                      |              |              |              |              |              |                      |                                  |
|  |                               | Config 3,6                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                      |              |              |              |              |              |                      | Not applicable <sup>Note 5</sup> |
|  | NR_FDD_FR1_B                  |   | -113.5                                  |                      |              |              |              |              |              |                      |                                  |
|  | NR_TDD_FR1_C                  |   | -113                                    |                      |              |              |              |              |              |                      |                                  |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |   | -112.5                                  |                      |              |              |              |              |              |                      |                                  |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |   | -112                                    |                      |              |              |              |              |              |                      |                                  |
|  | NR_FDD_FR1_F                  |   | -111.5                                  |                      |              |              |              |              |              |                      |                                  |
|  | NR_FDD_FR1_G                  |   | -111                                    |                      |              |              |              |              |              |                      |                                  |
|  | NR_FDD_FR1_H                  |   | -110.5                                  |                      |              |              |              |              |              |                      |                                  |
|  | $N_{oc}$<br>Note2             |   | Config 1,2,4,5                          |                      | dBm/SCS      | -106         |              | -88          |              | Same as<br>Noc/15kHz |                                  |
|  |                               | Config 3,6                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                      |              |              |              |              |              |                      |                                  |
| NR_FDD_FR1_B                             |                               |   | -110.5                                  |                      |              |              |              |              |              |                      |                                  |
| NR_TDD_FR1_C                             |                               |   | -110                                    |                      |              |              |              |              |              |                      |                                  |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D            |                               |   | -109.5                                  |                      |              |              |              |              |              |                      |                                  |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E            |                               |   | -109                                    |                      |              |              |              |              |              |                      |                                  |
| NR_FDD_FR1_F                             |                               |   | -108.5                                  |                      |              |              |              |              |              |                      |                                  |
| NR_FDD_FR1_G                             |                               |   | -108                                    |                      |              |              |              |              |              |                      |                                  |
| NR_FDD_FR1_H                             |                               |   | -107.5                                  |                      |              |              |              |              |              |                      |                                  |

|                            |                |                                      |                                    |                                  |       |        |       |        |        |
|----------------------------|----------------|--------------------------------------|------------------------------------|----------------------------------|-------|--------|-------|--------|--------|
| $\hat{E}_s/I_{ot}$         |                |                                      | dB                                 | 2.46                             | -5.97 | 2.46   | -5.97 | -0.01  | -4.76  |
| $\hat{E}_s/N_{oc}$         |                |                                      | dB                                 | 6                                | 1     | 6      | 1     | 3      | 0      |
| CSI-RSRP <sup>Not e3</sup> | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS                            | -100                             | -105  | -82    | -87   | -      | -      |
|                            |                | NR_FDD_FR1_B                         |                                    |                                  |       |        |       | 111.00 | 114.00 |
|                            |                | NR_TDD_FR1_C                         |                                    |                                  |       |        |       | -      | -      |
|                            |                | NR_FDD_FR1_D, NR_TDD_FR1_D           |                                    |                                  |       |        |       | 110.50 | 113.50 |
|                            |                | NR_FDD_FR1_E, NR_TDD_FR1_E           |                                    |                                  |       |        |       | -      | -      |
|                            |                | NR_FDD_FR1_F                         |                                    |                                  |       |        |       | 110.00 | 113.00 |
|                            |                | NR_FDD_FR1_G                         |                                    |                                  |       |        |       | -      | -      |
|                            |                | NR_FDD_FR1_H                         |                                    |                                  |       |        |       | 109.50 | 112.50 |
|                            | Config 3,6     | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | - Not applicable <sup>Note 5</sup> | Not applicable <sup>Note 5</sup> | -85   | -90    | -     | -      |        |
|                            |                | NR_FDD_FR1_B                         | 108.00                             | 111.00                           |       |        |       |        |        |
|                            |                | NR_TDD_FR1_C                         | -                                  | -                                |       |        |       |        |        |
|                            |                | NR_FDD_FR1_D, NR_TDD_FR1_D           | 107.50                             | 110.50                           |       |        |       |        |        |
|                            |                | NR_FDD_FR1_E, NR_TDD_FR1_E           | -                                  | -                                |       |        |       |        |        |
|                            |                | NR_FDD_FR1_F                         | 107.00                             | 110.00                           |       |        |       |        |        |
|                            |                | NR_FDD_FR1_G                         | -                                  | -                                |       |        |       |        |        |
|                            |                | NR_FDD_FR1_H                         | 106.50                             | 109.50                           |       |        |       |        |        |
| $I_o$ <sup>Note3</sup>     | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz                    | -70.09                           |       | -52.09 |       | -80.03 |        |
|                            |                | NR_FDD_FR1_B                         |                                    |                                  |       |        |       | -79.53 |        |
|                            |                | NR_TDD_FR1_C                         |                                    |                                  |       |        |       | -79.03 |        |
|                            |                | NR_FDD_FR1_D, NR_TDD_FR1_D           |                                    |                                  |       |        |       | -78.53 |        |
|                            |                | NR_FDD_FR1_E, NR_TDD_FR1_E           |                                    |                                  |       |        |       | -78.03 |        |
|                            |                | NR_FDD_FR1_F                         |                                    |                                  |       |        |       | -77.53 |        |
|                            |                | NR_FDD_FR1_G                         |                                    |                                  |       |        |       | -77.03 |        |
|                            |                | NR_FDD_FR1_H                         |                                    |                                  |       |        |       | -76.53 |        |
|                            | Config 3,6     | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MHz                   | Not applicable <sup>Note 5</sup> |       | -51.99 |       | -73.94 |        |
|                            |                | NR_FDD_FR1_B                         |                                    |                                  |       |        |       | -73.44 |        |
|                            |                | NR_TDD_FR1_C                         |                                    |                                  |       |        |       | -72.94 |        |
|                            |                | NR_FDD_FR1_D, NR_TDD_FR1_D           |                                    |                                  |       |        |       | -72.44 |        |
|                            |                | NR_FDD_FR1_E, NR_TDD_FR1_E           |                                    |                                  |       |        |       | -71.94 |        |
|                            |                | NR_FDD_FR1_F                         |                                    |                                  |       |        |       | -71.44 |        |
|                            |                | NR_FDD_FR1_G                         |                                    |                                  |       |        |       | -70.94 |        |
|                            |                | NR_FDD_FR1_H                         |                                    |                                  |       |        |       | -70.44 |        |



|                       |  |      |
|-----------------------|--|------|
| Propagation condition | -  | AWGN |
| Antenna configuration |  | 1x2  |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |
| Note 3:               | CSI-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |
| Note 4:               | CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |      |
| Note 5:               | Subtest 1 is not used when testing with 30kHz SSB SCS  |      |
| Note 6:               | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |      |

#### A.4.7.8.1.3 Test Requirements

The CSI-RSRP measurement accuracy for cell 2 and cell 3 shall fulfill absolute requirement in clause 10.1.2.3.1 and relative requirement in clause 10.1.2.3.2.

#### A.4.7.8.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.4.3.1 and 10.1.4.3.2 for inter-frequency measurements with the testing configurations in Table A.4.7.8.2.1-1.

**Table A.4.7.8.2.1-1: Applicable NR configurations for FR1 inter-frequency CSI-RSRP accuracy test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode                                |
| 2      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode                                |
| 3      | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode                                |
| 4      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode                                |
| 5      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode                                |
| 6      | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode                                |
| Note:  | The UE is only required to be tested in one of the supported test configurations on each supported band |

##### A.4.7.8.2.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.4.7.8.2.2-1 below. Both absolute and relative accuracy of CSI-RSRP inter-frequency measurements are tested by using the parameters in Table A.4.7.8.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.4.7.8.2.2-1: CSI-RSRP inter-frequency test parameters**

| Parameter      | Config | Unit | Test 1               |        | Test 2               |        |
|----------------|--------|------|----------------------|--------|----------------------|--------|
|                |        |      | Cell 2               | Cell 3 | Cell 2               | Cell 3 |
| SSB ARFCN      | 1~6    |      | freq1                | freq2  | freq1                | freq2  |
| $BW_{channel}$ | 1,4    | MHz  | 10: $N_{RB,c} = 52$  |        | 10: $N_{RB,c} = 52$  |        |
|                | 2,5    |      | 10: $N_{RB,c} = 52$  |        | 10: $N_{RB,c} = 52$  |        |
|                | 3,6    |      | 40: $N_{RB,c} = 106$ |        | 40: $N_{RB,c} = 106$ |        |
| Gap pattern ID |        |      | 0                    |        | 0                    |        |
| Duplex mode    | 1,4    |      | FDD                  |        | FDD                  |        |
|                | 2,5    |      | TDD                  |        | TDD                  |        |
|                | 3,6    |      | TDD                  |        | TDD                  |        |

|                                     |     |  |                      |   |             |   |
|-------------------------------------|-----|--|----------------------|---|-------------|---|
| TDD configuration                   | 1,4 |  | N/A                  |   | N/A         |   |
|                                     | 2,5 |  | TDDConf.1.1          |   | TDDConf.1.1 |   |
|                                     | 3,6 |  | TDDConf.2.1          |   | TDDConf.2.1 |   |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD           | - | SR.1.1 FDD  | - |
|                                     | 2,5 |  | SR.1.1 TDD           |   | SR.1.1 TDD  |   |
|                                     | 3,6 |  | SR.2.1 FDD           |   | SR.2.1 FDD  |   |
| RMSI CORESET Reference Channel      | 1,4 |  | CR.1.1 FDD           | - | CR.1.1 FDD  | - |
|                                     | 2,5 |  | CR.1.1 TDD           | - | CR.1.1 TDD  | - |
|                                     | 3,6 |  | CR.2.1 FDD           | - | CR.2.1 FDD  | - |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD          | - | CCR.1.1 FDD | - |
|                                     | 2,5 |  | CCR.1.1 TDD          | - | CCR.1.1 TDD | - |
|                                     | 3,6 |  | CCR.2.1 TDD          | - | CCR.2.1 TDD | - |
| SSB configuration                   | 1,4 |  | SSB.1 FR1            |   | SSB.1 FR1   |   |
|                                     | 2,5 |  | SSB.1 FR1            |   | SSB.1 FR1   |   |
|                                     | 3,6 |  | SSB.2 FR1            |   | SSB.2 FR1   |   |
| CSI-RS configuration for RRM        | 1,4 |  | CSI-RS.RRM.FR1.1 FDD |   |             |   |
|                                     | 2,5 |  | CSI-RS.RRM.FR1.1 TDD |   |             |   |
|                                     | 3,6 |  | CSI-RS.RRM.FR1.2 TDD |   |             |   |
| OCNG Patterns                       | 1~6 |  | OP.1                 |   | OP.1        |   |
| TRS configuration                   | 1,4 |  | TRS.1.1 FDD          | - | TRS.1.1 FDD | - |
|                                     | 2,5 |  | TRS.1.1 TDD          |   | TRS.1.1 TDD |   |
|                                     | 3,6 |  | TRS.1.2 TDD          |   | TRS.1.2 TDD |   |

|   |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
|---|-----------------------------------|---|------------------------|------------------------|--------|----------------------------------|---|----------------------------|---------------|--------|----------------------------------|
| Initial BWP Configuration                   | 1~6                               |   | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |        |                                  |   |                            |               |        |                                  |
| Dedicated BWP configuration                 | 1~6                               |   | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |        |                                  |   |                            |               |        |                                  |
| Time offset with Cell 2                     | 1,2,4,5                           | $\mu$ s                                     | -                      | 4.7                    | -      | 4.7                              |   |                            |               |        |                                  |
|   | 3,6                               | $\mu$ s                                     | -                      | 2.35                   | -      | 2.35                             |   |                            |               |        |                                  |
| SMTC configuration                          | 1,4                               |   | SMTC.2                 |                        | SMTC.2 |                                  |   |                            |               |        |                                  |
|   | 2,3,5,6                           |   | SMTC.1                 |                        | SMTC.1 |                                  |   |                            |               |        |                                  |
| EPRE ratio of PSS to SSS                    | 1~6                               | dB  | 0                      | 0                      | 0      | 0                                |   |                            |               |        |                                  |
| EPRE ratio of PBCH DMRS to SSS              |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| EPRE ratio of PBCH to PBCH DMRS             |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| EPRE ratio of PDCCH DMRS to SSS             |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| EPRE ratio of PDCCH to PDCCH DMRS           |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| EPRE ratio of PDSCH DMRS to SSS             |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| EPRE ratio of PDSCH to PDSCH DMRS           |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| EPRE ratio of OCNG DMRS to SSS>Note 1       |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| EPRE ratio of OCNG to OCNG DMRS Note 1      |                                   |   |                        |                        |        |                                  |   |                            |               |        |                                  |
| $N_{oc}$ <sup>Note2</sup>                   |                                   |   |                        |                        |        |                                  | NR_FDD_FR1_A<br>,<br>NR_TDD_FR1_A<br>NOTE 5 | 1~6                        | dBm/15<br>kHz | -94.65 | $(N_{oc}$ for<br>Cell 3<br>+8dB) |
|   | NR_FDD_FR1_B                      | -114.5                                      |                        |                        |        |                                  |   |                            |               |        |                                  |
|   | NR_TDD_FR1_C                      | -114  |                        |                        |        |                                  |   |                            |               |        |                                  |
|   | NR_FDD_FR1_D<br>,<br>NR_TDD_FR1_D | -113.5                                      |                        |                        |        |                                  |   |                            |               |        |                                  |
|   | NR_FDD_FR1_E<br>,<br>NR_TDD_FR1_E | -113  |                        |                        |        |                                  |   |                            |               |        |                                  |
|   | NR_FDD_FR1_F                      | -112.5                                      |                        |                        |        |                                  |   |                            |               |        |                                  |
|   | NR_FDD_FR1_G                      | -112  |                        |                        |        |                                  |   |                            |               |        |                                  |
|   | NR_FDD_FR1_H                      | -111.5                                      |                        |                        |        |                                  |   |                            |               |        |                                  |
|   | $N_{oc}$ <sup>Note2</sup>         | NR_FDD_FR1_A<br>,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2,4,5                | dBm/SS<br>B SCS        | -94.65 | $(N_{oc}$ for<br>Cell 3<br>+8dB) | -115  |                            |               |        |                                  |
|   |                                   | NR_FDD_FR1_B                                |                        |                        |        |                                  | -114.5                                      |                            |               |        |                                  |
| NR_TDD_FR1_C                                |                                   | -114  |                        |                        |        |                                  |   |                            |               |        |                                  |
| NR_FDD_FR1_D<br>,<br>NR_TDD_FR1_D           |                                   | -113.5                                      |                        |                        |        |                                  |   |                            |               |        |                                  |
| NR_FDD_FR1_E<br>,<br>NR_TDD_FR1_E           |                                   | -113  |                        |                        |        |                                  |   |                            |               |        |                                  |
| NR_FDD_FR1_F                                |                                   | -112.5                                      |                        |                        |        |                                  |   |                            |               |        |                                  |
| NR_FDD_FR1_G                                |                                   | -112  |                        |                        |        |                                  |   |                            |               |        |                                  |
| NR_FDD_FR1_H                                |                                   | -111.5                                      |                        |                        |        |                                  |   |                            |               |        |                                  |
| NR_FDD_FR1_A<br>,<br>NR_TDD_FR1_A<br>NOTE 5 |                                   | 3,6   |                        |                        |        |                                  | -91.65                                      | $(N_{oc}$ for<br>C 3 +8dB) | -112.00       |        |                                  |
| NR_SDL_FR1_A                                |                                   |   |                        |                        |        |                                  |   |                            | -112.50       |        |                                  |
| NR_FDD_FR1_B                                |                                   |   | -112.00                |                        |        |                                  |   |                            |               |        |                                  |
| NR_TDD_FR1_C                                |                                   |   | -112.00                |                        |        |                                  |   |                            |               |        |                                  |

|                           |  |         |                      |                               |   |         |   |
|---------------------------|--|---------|----------------------|-------------------------------|---|---------|---|
|                           | NR_FDD_FR1_D<br>,<br>NR_TDD_FR1_D<br>NR_FDD_FR1_E<br>,<br>NR_TDD_FR1_E<br>NR_FDD_FR1_F<br>NR_FDD_FR1_G<br>NR_FDD_FR1_H |         |                      |                               |   |         | -111.50<br><br>-111.00<br><br>-110.50<br>-110.00<br>-110.50 |
| $\hat{E}_s/I_{ot}$        |  | 1~6     | dB                   | 10                            | 10  | 13      | -3  |
| CSI-RSRP <sup>Note3</sup> | NR_FDD_FR1_A<br>,<br>NR_TDD_FR1_A<br>NOTE 5  | 1,2,4,5 | dBm/SC<br>S          | -84.65                        | (RSRP for<br>Cell 3<br>+25dB)                 | -118.00 |   |
|                           | NR_FDD_FR1_B   |         |                      |                               |   | -117.50 |   |
|                           | NR_TDD_FR1_C   |         |                      |                               |   | -117.00 |   |
|                           | NR_FDD_FR1_D   |         |                      |                               |   | -116.50 |   |
|                           | NR_TDD_FR1_D   |         |                      |                               |   |         |   |
|                           | NR_FDD_FR1_E   |         |                      |                               |   | -116.00 |   |
|                           | NR_TDD_FR1_E   |         |                      |                               |   |         |   |
|                           | NR_FDD_FR1_F   |         |                      |                               |   | -115.50 |   |
|                           | NR_FDD_FR1_G   |         |                      |                               |   | -115.00 |   |
|                           | NR_FDD_FR1_H   |         |                      |                               |   | -114.50 |   |
|                           | NR_FDD_FR1_A<br>,<br>NR_TDD_FR1_A<br>NOTE 5  | 3,6     | -81.65               | (RSRP for<br>Cell 3<br>+25dB) | -115.00                                       |         |   |
|                           | NR_FDD_FR1_B   |         |                      |                               | -114.50                                       |         |   |
|                           | NR_TDD_FR1_C   |         |                      |                               | -114.00                                       |         |   |
|                           | NR_FDD_FR1_D   |         |                      |                               | -113.50                                       |         |   |
| NR_TDD_FR1_D              |  |         |                      |                               |   |         |   |
| NR_FDD_FR1_E              | -113.00  |         |                      |                               |   |         |   |
| NR_TDD_FR1_E              |  |         |                      |                               |   |         |   |
| NR_FDD_FR1_F              | -112.50  |         |                      |                               |   |         |   |
| NR_FDD_FR1_G              | -112.00  |         |                      |                               |   |         |   |
| NR_FDD_FR1_H              | -111.50  |         |                      |                               |   |         |   |
| $I_o$ <sup>Note3</sup>    | NR_FDD_FR1_A<br>,<br>NR_TDD_FR1_A<br>NOTE 6  | 1,2,4,5 | dBm/<br>9.36MH<br>z  | -56.28                        | (I <sub>o</sub> for<br>Channel 3<br>+19.75dB) | -85.28  |   |
|                           | NR_FDD_FR1_B   |         |                      |                               |   | -84.78  |   |
|                           | NR_TDD_FR1_C   |         |                      |                               |   | -84.28  |   |
|                           | NR_FDD_FR1_D   |         |                      |                               |   | -83.78  |   |
|                           | NR_TDD_FR1_D   |         |                      |                               |   |         |   |
|                           | NR_FDD_FR1_E   |         |                      |                               |   | -83.28  |   |
|                           | NR_TDD_FR1_E   |         |                      |                               |   |         |   |
|                           | NR_FDD_FR1_F   |         |                      |                               |   | -82.78  |   |
|                           | NR_FDD_FR1_G   |         |                      |                               |   | -82.28  |   |
|                           | NR_FDD_FR1_H   |         |                      |                               |   | -81.78  |   |
|                           | NR_FDD_FR1_A<br>,<br>NR_TDD_FR1_A<br>NOTE 6  | 3,6     | dBm/<br>38.16M<br>Hz | -50.19                        | (I <sub>o</sub> for<br>Channel 3<br>+19.75dB) | -79.19  |   |
|                           | NR_FDD_FR1_B   |         |                      |                               |   | -78.69  |   |
|                           | NR_TDD_FR1_C   |         |                      |                               |   | -78.19  |   |
|                           |  |         |                      |                               |   |         |   |

|                       |  |    |      |    |      |  |        |
|-----------------------|--|----|------|----|------|--|--------|
|                       | NR_FDD_FR1_D   |    |      |    |      |  | -77.69 |
|                       | NR_TDD_FR1_D   |    |      |    |      |  |        |
|                       | NR_FDD_FR1_E   |    |      |    |      |  | -77.19 |
|                       | NR_TDD_FR1_E   |    |      |    |      |  |        |
|                       | NR_FDD_FR1_F   |    |      |    |      |  | -76.69 |
|                       | NR_FDD_FR1_G   |    |      |    |      |  | -76.19 |
|                       | NR_FDD_FR1_H   |    |      |    |      |  | -75.69 |
| $\hat{E}_s / N_{oc}$  | 1~6  | dB | 10   | 10 | 13   |  | -3     |
| Propagation condition | 1~6  | -  | AWGN |    | AWGN |  |        |
| Antenna configuration |  |    | 1x2  |    | 1x2  |  |        |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |    |      |    |      |  |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |    |      |    |      |  |        |
| Note 3:               | CSI-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |    |      |    |      |  |        |
| Note 4:               | CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |    |      |    |      |  |        |
| Note 5:               | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |    |      |    |      |  |        |

A.4.7.8.2.3 Test Requirements

The CSI-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the Absolute requirement in clause 10.1.4.2.1 and Relative requirement in clause 10.1.4.2.2.

A.4.7.9 CSI-RSRQ

A.4.7.9.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.4.7.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.

A.4.7.9.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.9.1.2-1. The absolute accuracy of CSI-RSRQ intra-frequency measurement is test by using the parameters in Table A.4.7.9.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

**Table A.4.7.9.1.2-1: CSI-RSRQ Intra frequency CSI-RSRQ supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, FDD duplex mode                                 |
| 2      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, TDD duplex mode                                 |
| 3      | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40MHz bandwidth, TDD duplex mode                                  |
| 4      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, FDD duplex mode                                 |
| 5      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, TDD duplex mode                                 |
| 6      | LTE TDD, NR 30kHz SSB and CSI-RS SCS, 40MHz bandwidth, TDD duplex mode                                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

**Table A.4.7.9.1.2-2: CSI-RSRQ Intra frequency test parameters**

| Parameter                                |                  | Unit         | Test 1                                  |        | Test 2      |        | Test 3      |        |
|--|------------------|--------------|---|--------|-------------|--------|-------------|--------|
|  |                  |              | Cell 2                                  | Cell 3 | Cell 2      | Cell 3 | Cell 2      | Cell 3 |
| SSB ARFCN                                |                  |              | freq1                                   |        | freq1       |        | freq1       |        |
| Duplex mode                              | Config 1,4       |              | FDD                                     |        |             |        |             |        |
|  | Config 2,3,5,6   |              | TDD                                     |        |             |        |             |        |
| TDD configuration                        | Config 1,4       |              | Not Applicable                          |        |             |        |             |        |
|  | Config 2,5       |              | TDDConf.1.1                             |        |             |        |             |        |
|  | Config 3,6       |              | TDDConf.2.1                             |        |             |        |             |        |
| BW <sub>channel</sub>                    | Config 1,4       | MHz          | 10: N <sub>RB,c</sub> = 52              |        |             |        |             |        |
|  | Config 2,5       |              | 10: N <sub>RB,c</sub> = 52              |        |             |        |             |        |
|  | Config 3,6       |              | 40: N <sub>RB,c</sub> = 106             |        |             |        |             |        |
| BWP configuration                        | Initial DL BWP   |              | DLBWP.0.1                               |        |             |        |             |        |
|  | Dedicated DL BWP |              | DLBWP.1.1                               |        |             |        |             |        |
|  | Initial UL BWP   |              | ULBWP.0.1                               |        |             |        |             |        |
|  | Dedicated UL BWP |              | ULBWP.1.1                               |        |             |        |             |        |
| DRX Cycle                                |                  | ms           | Not Applicable                          |        |             |        |             |        |
| PDSCH Reference measurement channel      | Config 1,4       |              | SR.1.1 FDD                              | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|  | Config 2,5       |              | SR.1.1 TDD                              |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|  | Config 3,6       |              | SR.2.1 TDD                              |        | SR.2.1 TDD  |        | SR.2.1 TDD  |        |
| RMSI CORESET Reference Channel           | Config 1,4       |              | CR.1.1 FDD                              | -      | CR.1.1 FDD  | -      | CR.1.1 FDD  |        |
|  | Config 2,5       |              | CR.1.1 TDD                              |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|  | Config 3,6       |              | CR.2.1 TDD                              |        | CR.2.1 TDD  |        | CR.2.1 TDD  |        |
| Control Channel RMC                      | Config 1,4       |              | CCR.1.1 FDD                             | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|  | Config 2,5       |              | CCR.1.1 TDD                             |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|  | Config 3,6       |              | CCR.2.1 TDD                             |        | CCR.2.1 TDD |        | CCR.2.1 TDD |        |
| TRS configuration                        | Config 1,4       |              | TRS.1.1 FDD                             | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD | -      |
|  | Config 2,5       |              | TRS.1.1 TDD                             |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|  | Config 3,6       |              | TRS.1.2 TDD                             |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns                            |                  |              | OP. 1                                   |        |             |        |             |        |
| Time offset with Cell 2                  | Config 1,2,4,5   | μs           | -                                       | 4.7    | -           | 4.7    | -           | 4.7    |
|  | Config 3,6       | μs           | -                                       | 2.35   | -           | 2.35   | -           | 2.35   |
| SMTC configuration                       | Config 1,4       |              | SMTC.2                                  |        |             |        |             |        |
|  | Config 2,3,5,6   |              | SMTC.1                                  |        |             |        |             |        |
| SSB configuration                        | Config 1,2,4,5   |              | SSB.1 FR1                               |        |             |        |             |        |
|  | Config 3,6       |              | SSB.2 FR1                               |        |             |        |             |        |
| CSI-RS configuration for RRM             | Config 1,4       |              | CSI-RS.RRM.FR1.1 FDD                    |        |             |        |             |        |
|  | Config 2, 5      |              | CSI-RS.RRM.FR1.1 TDD                    |        |             |        |             |        |
|  | Config 3, 6      |              | CSI-RS.RRM.FR1.2 TDD                    |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5   | kHz          | 15 kHz                                  |        |             |        |             |        |
|  | Config 3,6       |              | 30kHz                                   |        |             |        |             |        |
| EPRE ratio of PSS to SSS                 |                  | dB           | 0                                       | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS           |                  |              |   |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS          |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS          |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS          |                  |              |   |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH             |                  |              |   |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |              |   |        |             |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |              |   |        |             |        |             |        |
| N <sub>oc</sub><br>Note2                 | Config 1,2,4,5   |              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | -85    |             | -101   |             | -114   |
|  |                  | NR_FDD_FR1_B |   |        |             |        |             |        |
|  |                  |              | -113.5                                  |        |             |        |             |        |

|                   |                |   |          |       |     |        |        |        |        |
|-------------------|----------------|---|----------|-------|-----|--------|--------|--------|--------|
|                   |                | NR_TDD_FR1_C                            |          |       |     |        |        | -113   |        |
|                   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |          |       |     |        |        | -112.5 |        |
|                   |                | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |          |       |     |        |        | -112   |        |
|                   |                | NR_FDD_FR1_F                            |          |       |     |        |        | -111.5 |        |
|                   |                | NR_FDD_FR1_G                            |          |       |     |        |        | -111   |        |
|                   |                | NR_FDD_FR1_H                            |          |       |     |        |        | -110.5 |        |
|                   | Config 3,6     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 |          | -91   |     | -      |        | -114   |        |
|                   |                | NR_FDD_FR1_B                            |          |       |     |        |        | -113.5 |        |
|                   |                | NR_TDD_FR1_C                            |          |       |     |        |        | -113   |        |
|                   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |          |       |     |        |        | -112.5 |        |
|                   |                | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |          |       |     |        |        | -112   |        |
|                   |                | NR_FDD_FR1_F                            |          |       |     |        |        | -111.5 |        |
|                   |                | NR_FDD_FR1_G                            |          |       |     |        |        | -111   |        |
|                   |                | NR_FDD_FR1_H                            |          |       |     |        |        | -110.5 |        |
| $N_{oc}$<br>Note2 | Config 1,2,4,5 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/SC S | -85   |     | -101   |        | -114   |        |
|                   |                | NR_FDD_FR1_B                            |          |       |     |        |        | -113.5 |        |
|                   |                | NR_TDD_FR1_C                            |          |       |     |        |        | -113   |        |
|                   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |          |       |     |        |        | -112.5 |        |
|                   |                | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |          |       |     |        |        | -112   |        |
|                   |                | NR_FDD_FR1_F                            |          |       |     |        |        | -111.5 |        |
|                   |                | NR_FDD_FR1_G                            |          |       |     |        |        | -111   |        |
|                   |                | NR_FDD_FR1_H                            |          |       |     |        |        | -110.5 |        |
|                   | Config 3,6     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 |          | -88   |     | -      |        | -111   |        |
|                   |                | NR_FDD_FR1_B                            |          |       |     |        |        | -110.5 |        |
|                   |                | NR_TDD_FR1_C                            |          |       |     |        |        | -110   |        |
|                   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |          |       |     |        |        | -109.5 |        |
|                   |                | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |          |       |     |        |        | -109   |        |
|                   |                | NR_FDD_FR1_F                            |          |       |     |        |        | -108.5 |        |
|                   |                | NR_FDD_FR1_G                            |          |       |     |        |        | -108   |        |
|                   |                | NR_FDD_FR1_H                            |          |       |     |        |        | -107.5 |        |
|                   |                |   | dB       | -1.76 |     | -4.7   |        | -5.46  | -5.46  |
|                   |                |   | dB       | 3     | 3   | -2.9   | -2.9   | -4     | -4     |
| CSI-RSRP<br>Note3 | Config 1,2,4,5 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/SC S | -82   | -82 | -103.9 | -103.9 | -118   | -118   |
|                   |                | NR_FDD_FR1_B                            |          |       |     |        |        | -117.5 | -117.5 |
|                   |                | NR_TDD_FR1_C                            |          |       |     |        |        | -117   | -117   |
|                   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |          |       |     |        |        | -116.5 | -116.5 |
|                   |                | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |          |       |     |        |        | -116   | -116   |
|                   |                | NR_FDD_FR1_F                            |          |       |     |        |        | -115.5 | -115.5 |
|                   |                | NR_FDD_FR1_G                            |          |       |     |        |        | -115   | -115   |
|                   |                | NR_FDD_FR1_H                            |          |       |     |        |        | -114.5 | -114.5 |
|                   | Config 3,6     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 |          | -85   | -85 | -      | -      | -115   | -115   |
|                   |                | NR_FDD_FR1_B                            |          |       |     |        |        | -114.5 | -114.5 |
|                   |                | NR_TDD_FR1_C                            |          |       |     |        |        | -114   | -114   |
|                   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |          |       |     |        |        | -113.5 | -113.5 |



|   |               |   |   |                 |        |        |        |        |        |
|---|---------------|---|---|-----------------|--------|--------|--------|--------|--------|
|   |               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                 |        |        |        | -113   | -113   |
|   |               | NR_FDD_FR1_F                            |   |                 |        |        |        | -112.5 | -112.5 |
|   |               | NR_FDD_FR1_G                            |   |                 |        |        |        | -112   | -112   |
|   |               | NR_FDD_FR1_H                            |   |                 |        |        |        | -111.5 | -111.5 |
| CSI-RSRQ  | Note3         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dB                                      | -14.77          | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
|   |               | NR_FDD_FR1_B                            |   |                 |        |        |        |        |        |
|   |               | NR_TDD_FR1_C                            |   |                 |        |        |        |        |        |
|   |               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                 |        |        |        |        |        |
|   |               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                 |        |        |        |        |        |
|   |               | NR_FDD_FR1_F                            |   |                 |        |        |        |        |        |
|   |               | NR_FDD_FR1_G                            |   |                 |        |        |        |        |        |
|   |               | NR_FDD_FR1_H                            |   |                 |        |        |        |        |        |
| I <sub>o</sub>  | Note3         | Config<br>1,2,4,5                       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/<br>9.36MHz | -50    | -70    |        | -83.5  |        |
|   |               |   |   |                 |        |        |        | -83    |        |
|   |               |   |   |                 |        |        |        | -82.5  |        |
|   |               |   |   |                 |        |        |        | -82    |        |
|   |               |   |   |                 |        |        |        | -81.5  |        |
|   |               |   |   |                 |        |        |        | -81    |        |
|   |               |   |   |                 |        |        |        | -80.5  |        |
|   | -80           |   |   |                 |        |        |        |        |        |
|   | Config<br>3,6 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 7 | dBm/<br>38.16M<br>Hz                    | -50             | -      |        | -77.4  |        |        |
|   |               |   |   |                 |        |        | -76.9  |        |        |
|   |               |   |   |                 |        |        | -76.4  |        |        |
|   |               |   |   |                 |        |        | -75.9  |        |        |
|   |               |   |   |                 |        |        | -75.4  |        |        |
|   |               |   |   |                 |        |        | -74.9  |        |        |
| -74.4   |               |   |   |                 |        |        |        |        |        |
| -73.9   |               |   |   |                 |        |        |        |        |        |
| Propagation condition   |               |   | -                                       | AWGN            | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   |
| Antenna configuration   |               |   |   | 1x2             | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RSRQ, CSI-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-RSRQ, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 6: Subtest 2 is not used when testing with 30kHz SSB and CSI-RS SCS</p> <p>Note 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |               |   |   |                 |        |        |        |        |        |

### A.4.7.9.1.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.

## A.4.7.9.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.4.7.9.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter frequency measurement.

### A.4.7.9.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.9.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test parameters in Table A.4.7.9.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.4.7.9.2.2-1: CSI-RSRQ Inter frequency CSI-RSRQ supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.4.7.9.2.2-2: CSI-RSRQ Inter frequency test parameters**

| Parameter                           |                | Unit | Test 1                      |        | Test 2      |        | Test 3      |        |
|-------------------------------------|----------------|------|-----------------------------|--------|-------------|--------|-------------|--------|
|                                     |                |      | Cell 2                      | Cell 3 | Cell 2      | Cell 3 | Cell 2      | Cell 3 |
| SSB ARFCN                           |                |      | freq1                       | freq2  | freq1       | freq2  | freq1       | freq2  |
| Duplex mode                         | Config 1,4     |      | FDD                         |        |             |        |             |        |
|                                     | Config 2,3,5,6 |      | TDD                         |        |             |        |             |        |
| TDD configuration                   | Config 1,4     |      | Not Applicable              |        |             |        |             |        |
|                                     | Config 2,5     |      | TDDConf.1.1                 |        |             |        |             |        |
|                                     | Config 3,6     |      | TDDConf.2.1                 |        |             |        |             |        |
| BW <sub>channel</sub>               | Config 1,4     | MHz  | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 2,5     |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 3,6     |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| BWP BW                              | Config 1,4     | MHz  | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 2,5     |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 3,6     |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| DRX Cycle                           |                | ms   | Not Applicable              |        |             |        |             |        |
| PDSCH Reference measurement channel | Config 1,4     |      | SR.1.1 FDD                  | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|                                     | Config 2,5     |      | SR.1.1 TDD                  |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|                                     | Config 3,6     |      | SR.2.1 TDD                  |        | SR.2.1 TDD  |        | SR.2.1 TDD  |        |
| RMSI CORESET Reference Channel      | Config 1,4     |      | CR.1.1 FDD                  | -      | CR.1.1 FDD  | -      | CR.1.1 FDD  | -      |
|                                     | Config 2,5     |      | CR.1.1 TDD                  |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|                                     | Config 3,6     |      | CR.2.1 TDD                  |        | CR.2.1 TDD  |        | CR.2.1 TDD  |        |
| Dedicated CORESET Reference Channel | Config 1,4     |      | CCR.1.1 FDD                 | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|                                     | Config 2,5     |      | CCR.1.1 TDD                 |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|                                     | Config 3,6     |      | CCR.2.1 TDD                 |        | CCR.2.1 TDD |        | CCR.2.1 TDD |        |
| TRS configuration                   | Config 1,4     |      | TRS.1.1 FDD                 | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD | -      |
|                                     | Config 2,5     |      | TRS.1.1 TDD                 |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|                                     | Config 3,6     |      | TRS.1.2 TDD                 |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| CSI-RS configuration for RRM        | Config 1,4     |      | CSI-RS.RRM.FR1.1 FDD        |        |             |        |             |        |
|                                     | Config 2,5     |      | CSI-RS.RRM.FR1.1 TDD        |        |             |        |             |        |
|                                     | Config 3,6     |      | CSI-RS.RRM.FR1.2 TDD        |        |             |        |             |        |
| OCNG Patterns                       |                |      | OCNG pattern 1              |        |             |        |             |        |
| Time offset with Cell 2             | Config 1,2,4,5 | µs   | -                           | 4.7    | -           | 4.7    | -           | 4.7    |
|                                     | Config 3,6     | µs   | -                           | 2.35   | -           | 2.35   | -           | 2.35   |

|  |                |                |            |           |        |      |      |      |      |        |        |
|--|----------------|----------------|------------|-----------|--------|------|------|------|------|--------|--------|
| SMTC configuration                       |                | Config 1,4     |            | SMTC.2    |        |      |      |      |      |        |        |
|  |                | Config 2,3,5,6 |            | SMTC.1    |        |      |      |      |      |        |        |
| SSB configuration                        |                | Config 1,2,4,5 |            | SSB.1 FR1 |        |      |      |      |      |        |        |
|  |                | Config 3,6     |            | SSB.2 FR1 |        |      |      |      |      |        |        |
| PDSCH/PDCCH subcarrier spacing           |                | Config 1,2,4,5 | kHz        | 15 kHz    |        |      |      |      |      |        |        |
|  |                | Config 3,6     |            | 30 kHz    |        |      |      |      |      |        |        |
| EPRE ratio of PSS to SSS                 |                |                | dB         | 0         | 0      | 0    | 0    | 0    | 0    |        |        |
| EPRE ratio of PBCH DMRS to SSS           |                |                |            |           |        |      |      |      |      |        |        |
| EPRE ratio of PBCH to PBCH DMRS          |                |                |            |           |        |      |      |      |      |        |        |
| EPRE ratio of PDCCH DMRS to SSS          |                |                |            |           |        |      |      |      |      |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                |                |            |           |        |      |      |      |      |        |        |
| EPRE ratio of PDSCH DMRS to SSS          |                |                |            |           |        |      |      |      |      |        |        |
| EPRE ratio of PDSCH to PDSCH             |                |                |            |           |        |      |      |      |      |        |        |
| EPRE ratio of OCNB DMRS to SSS(Note 1)   |                |                |            |           |        |      |      |      |      |        |        |
| EPRE ratio of OCNB to OCNB DMRS (Note 1) |                |                |            |           |        |      |      |      |      |        |        |
| $N_{oc}$ <sup>Note2</sup>                | Config 1,2,4,5 | NR_FDD_FR1_A   | dBm/15 kHz | -80.18    | -80.18 | -106 | -106 | -116 | -116 |        |        |
|  |                | NR_TDD_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_SDL_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_FDD_FR1_B   |            |           |        |      |      |      |      | -      | -115.5 |
|  |                | NR_TDD_FR1_C   |            |           |        |      |      |      |      | 115.5  | -115   |
|  |                | NR_FDD_FR1_D   |            |           |        |      |      |      |      | -115   | -115   |
|  |                | NR_TDD_FR1_D   |            |           |        |      |      |      |      | -      | -114.5 |
|  |                | NR_FDD_FR1_E   |            |           |        |      |      |      |      | 114.5  | -114   |
|  | NR_TDD_FR1_E   | -114           | -114       |           |        |      |      |      |      |        |        |
|  | NR_FDD_FR1_G   | -113           | -113       |           |        |      |      |      |      |        |        |
|  | NR_FDD_FR1_H   | -              | -112.5     |           |        |      |      |      |      |        |        |
|  |                | 112.5          | -116       |           |        |      |      |      |      |        |        |
|  | Config 3,6     | NR_FDD_FR1_A   | dBm/15 kHz | -86.27    | -86.27 | -113 | -113 | -116 | -116 |        |        |
|  |                | NR_TDD_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_SDL_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_FDD_FR1_B   |            |           |        |      |      |      |      | -      | -115.5 |
| NR_TDD_FR1_C                             |                | 115.5          |            |           |        |      |      |      |      | -115   |        |
| NR_FDD_FR1_D                             |                | -115           |            |           |        |      |      |      |      | -115   |        |
| NR_TDD_FR1_D                             |                | -              |            |           |        |      |      |      |      | -114.5 |        |
| NR_FDD_FR1_E                             |                | 114.5          |            |           |        |      |      |      |      | -114   |        |
| NR_TDD_FR1_E                             | -114           | -114           |            |           |        |      |      |      |      |        |        |
| NR_FDD_FR1_G                             | -113           | -113           |            |           |        |      |      |      |      |        |        |
| NR_FDD_FR1_H                             | -              | -112.5         |            |           |        |      |      |      |      |        |        |
|  | 112.5          | -116           |            |           |        |      |      |      |      |        |        |
| $N_{oc}$ <sup>Note2</sup>                | Config 1,2,4,5 | NR_FDD_FR1_A   | dBm/S CS   | -80.18    | -80.18 | -106 | -106 | -116 | -116 |        |        |
|  |                | NR_TDD_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_SDL_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_FDD_FR1_B   |            |           |        |      |      |      |      | -      | -115.5 |
|  |                | NR_TDD_FR1_C   |            |           |        |      |      |      |      | 115.5  | -115   |
|  |                | NR_FDD_FR1_D   |            |           |        |      |      |      |      | -115   | -115   |
|  |                | NR_TDD_FR1_D   |            |           |        |      |      |      |      | -      | -114.5 |
|  |                | NR_FDD_FR1_E   |            |           |        |      |      |      |      | 114.5  | -114   |
|  | NR_TDD_FR1_E   | -114           | -114       |           |        |      |      |      |      |        |        |
|  | NR_FDD_FR1_G   | -113           | -113       |           |        |      |      |      |      |        |        |
|  | NR_FDD_FR1_H   | -              | -112.5     |           |        |      |      |      |      |        |        |
|  |                | 112.5          | -116       |           |        |      |      |      |      |        |        |
|  | Config 3,6     | NR_FDD_FR1_A   | dBm/S CS   | -83.27    | -83.27 | -110 | -110 | -113 | -113 |        |        |
|  |                | NR_TDD_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_SDL_FR1_A   |            |           |        |      |      |      |      |        |        |
|  |                | NR_FDD_FR1_B   |            |           |        |      |      |      |      | -      | -112.5 |
| NR_TDD_FR1_C                             | 112.5          | -112           |            |           |        |      |      |      |      |        |        |
|  | -112           | -112           |            |           |        |      |      |      |      |        |        |

|                                 |                |                              |                 |                      |        |         |         |            |         |         |
|---------------------------------|----------------|------------------------------|-----------------|----------------------|--------|---------|---------|------------|---------|---------|
|                                 |                | NR_FDD_FR1_D<br>NR_TDD_FR1_D |                 |                      |        |         |         | -<br>111.5 | -111.5  |         |
|                                 |                | NR_FDD_FR1_E<br>NR_TDD_FR1_E |                 |                      |        |         |         | -111       | -111    |         |
|                                 |                | NR_FDD_FR1_G                 |                 |                      |        |         |         | -110       | -110    |         |
|                                 |                | NR_FDD_FR1_H                 |                 |                      |        |         |         | -<br>109.5 | -109.5  |         |
| $\hat{E}_s / I_{ot}$            |                |                              | dB              | -1.75                | -1.75  | -1.75   | -1.75   | 3          | -1.75   |         |
| $\hat{E}_s / N_{oc}$            |                |                              | dB              | -1.75                | -1.75  | -1.75   | -1.75   | 3          | -1.75   |         |
| CSI-RSRP <sup>Note3</sup>       | Config 1,2,4,5 | NR_FDD_FR1_A                 | dBm/S<br>CS     | -81.93               | -81.93 | -107.75 | -107.75 | -113       | -117.75 |         |
|                                 |                | NR_TDD_FR1_A                 |                 |                      |        |         |         | -          | -117.25 |         |
|                                 |                | NR_SDL_FR1_A                 |                 |                      |        |         |         | -112.5     | -116.75 |         |
|                                 |                | NR_FDD_FR1_B                 |                 |                      |        |         |         | -          | -116.25 |         |
|                                 |                | NR_TDD_FR1_C                 |                 |                      |        |         |         | 111.5      | -115.75 |         |
|                                 |                | NR_FDD_FR1_D                 |                 |                      |        |         |         | -111       | -114.75 |         |
|                                 |                | NR_TDD_FR1_D                 |                 |                      |        |         |         | -          | -114.25 |         |
|                                 |                | NR_FDD_FR1_E                 |                 |                      |        |         |         | 109.5      |         |         |
|                                 | NR_TDD_FR1_E   | -110                         | -114.75         |                      |        |         |         |            |         |         |
|                                 | NR_FDD_FR1_G   | -                            | -114.25         |                      |        |         |         |            |         |         |
|                                 | NR_TDD_FR1_G   | 109.5                        |                 |                      |        |         |         |            |         |         |
|                                 | NR_FDD_FR1_H   | -110                         | -114.75         |                      |        |         |         |            |         |         |
|                                 | NR_TDD_FR1_H   | -                            | -114.25         |                      |        |         |         |            |         |         |
|                                 |                | Config 3,6                   | NR_FDD_FR1_A    |                      | -85.02 | -85.02  | -111.75 | -111.75    | -110    | -114.75 |
|                                 |                |                              | NR_TDD_FR1_A    |                      |        |         |         |            | -       | -114.25 |
|                                 |                |                              | NR_SDL_FR1_A    |                      |        |         |         |            | 109.5   |         |
|                                 |                | NR_FDD_FR1_B                 |                 |                      |        |         |         | -109       | -113.75 |         |
|                                 |                | NR_TDD_FR1_C                 |                 |                      |        |         |         | -          | -113.25 |         |
|                                 |                | NR_FDD_FR1_D                 |                 |                      |        |         |         | 108.5      |         |         |
|                                 |                | NR_TDD_FR1_D                 |                 |                      |        |         |         | -108       | -112.75 |         |
|                                 |                | NR_FDD_FR1_E                 |                 |                      |        |         |         | -107       | -111.75 |         |
|                                 |                | NR_TDD_FR1_E                 |                 |                      |        |         |         | -          | -111.25 |         |
|                                 |                | NR_FDD_FR1_G                 |                 |                      |        |         |         | 106.5      |         |         |
|                                 |                | NR_TDD_FR1_G                 |                 |                      |        |         |         | -          | -111.25 |         |
|                                 |                | NR_FDD_FR1_H                 |                 |                      |        |         |         | -          | -111.25 |         |
|                                 |                | NR_TDD_FR1_H                 |                 |                      |        |         |         | 106.5      |         |         |
| CSI-RSRQ <sup>Note3</sup>       |                | NR_FDD_FR1_A                 | dB              | -14.77               | -14.77 | -40.59  | -40.59  | -          | -14.76  |         |
|                                 |                | NR_TDD_FR1_A                 |                 |                      |        |         |         | 12.56      |         |         |
|                                 |                | NR_FDD_FR1_B                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_C                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_FDD_FR1_D                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_D                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_FDD_FR1_E                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_E                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_FDD_FR1_G                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_G                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_FDD_FR1_H                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_H                 |                 |                      |        |         |         | -          |         |         |
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2,4,5 | NR_FDD_FR1_A                 | dBm/<br>9.36MHz | -50                  | -50    | -75.83  | -75.83  | -          | -85.83  |         |
|                                 |                | NR_TDD_FR1_A                 |                 |                      |        |         |         | 83.28      |         |         |
|                                 |                | NR_SDL_FR1_A                 |                 |                      |        |         |         | -          | -85.33  |         |
|                                 |                | NR_FDD_FR1_B                 |                 |                      |        |         |         | 82.78      |         |         |
|                                 |                | NR_TDD_FR1_C                 |                 |                      |        |         |         | -          | -84.83  |         |
|                                 |                | NR_FDD_FR1_D                 |                 |                      |        |         |         | 82.28      |         |         |
|                                 |                | NR_TDD_FR1_D                 |                 |                      |        |         |         | -          | -84.33  |         |
|                                 |                | NR_FDD_FR1_E                 |                 |                      |        |         |         | 81.78      |         |         |
|                                 | NR_TDD_FR1_E   | -                            | -83.83          |                      |        |         |         |            |         |         |
|                                 | NR_FDD_FR1_G   | 81.28                        |                 |                      |        |         |         |            |         |         |
|                                 | NR_TDD_FR1_G   | -                            | -83.83          |                      |        |         |         |            |         |         |
|                                 | NR_FDD_FR1_H   | 80.28                        |                 |                      |        |         |         |            |         |         |
|                                 | NR_TDD_FR1_H   | -                            | -82.83          |                      |        |         |         |            |         |         |
|                                 |                | Config 3,6                   | NR_FDD_FR1_A    | dBm/<br>38.16M<br>Hz | -50    | -50     | -76.73  | -76.73     | -       | -79.73  |
|                                 |                |                              | NR_TDD_FR1_A    |                      |        |         |         |            | 77.19   |         |
|                                 |                |                              | NR_SDL_FR1_A    |                      |        |         |         |            | -       | -79.23  |
|                                 |                | NR_FDD_FR1_B                 |                 |                      |        |         |         | -          | -79.23  |         |
|                                 |                | NR_TDD_FR1_C                 |                 |                      |        |         |         | 76.69      |         |         |
|                                 |                | NR_FDD_FR1_D                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_D                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_FDD_FR1_E                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_E                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_FDD_FR1_G                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_G                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_FDD_FR1_H                 |                 |                      |        |         |         | -          |         |         |
|                                 |                | NR_TDD_FR1_H                 |                 |                      |        |         |         | -          |         |         |

|  |              |  |      |      |      |      |        |        |
|--|--------------|--|------|------|------|------|--------|--------|
|  | NR_TDD_FR1_C |  |      |      |      |      | -76.19 | -78.73 |
|  | NR_FDD_FR1_D |  |      |      |      |      | -75.69 | -78.23 |
|  | NR_TDD_FR1_D |  |      |      |      |      | -75.19 | -77.73 |
|  | NR_FDD_FR1_E |  |      |      |      |      | -74.19 | -76.73 |
|  | NR_TDD_FR1_E |  |      |      |      |      | -73.69 | -76.53 |
|  | NR_FDD_FR1_G |  |      |      |      |      | -73.69 | -76.53 |
|  | NR_TDD_FR1_G |  |      |      |      |      | -73.69 | -76.53 |
|  | NR_FDD_FR1_H |  |      |      |      |      | -73.69 | -76.53 |
| Propagation condition  |              |  | AWGN | AWGN | AWGN | AWGN | AWGN   | AWGN   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RSRQ, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-RSRQ, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Section 3.5.2.</p> |              |  |      |      |      |      |        |        |

A.4.7.2.2.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in section 10.1.9.

A.4.7.10 CSI-SINR

A.4.7.10.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.4.7.10.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.

A.4.7.10.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.10.1.2-1. The absolute accuracy of CSI-SINR intra-frequency measurement is tested by using the parameters in Table A.4.7.10.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell. CSI-RS for mobility configured for Cell 2 is associated to the SSB of Cell 2, and CSI-RS for mobility configured for Cell 3 is associated to the SSB of Cell 3.

**Table A.4.7.10.1.2-1: CSI-SINR Intra frequency CSI-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.4.7.10.1.2-2: CSI-SINR Intra frequency test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        |
|-----------|------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
|           |      |        |        |        |        |

|  |                                      |             |                      |      |             |      |
|--|--------------------------------------|-------------|----------------------|------|-------------|------|
| SSB ARFCN                                |                                      |             | freq1                |      | freq1       |      |
| Duplex mode                              | Config 1,4                           |             | FDD                  |      |             |      |
|  | Config 2,3,5,6                       |             | TDD                  |      |             |      |
| TDD configuration                        | Config 1,4                           |             | Not Applicable       |      |             |      |
|  | Config 2,5                           |             | TDDConf.1.1          |      |             |      |
|  | Config 3,6                           |             | TDDConf.2.1          |      |             |      |
| Downlink initial BWP configuration       |                                      |             | DLBWP.0.1            |      |             |      |
| Downlink dedicated BWP configuration     |                                      |             | DLBWP.1.1            |      |             |      |
| Uplink initial BWP configuration         |                                      |             | ULBWP.0.1            |      |             |      |
| Uplink dedicated BWP configuration       |                                      |             | ULBWP.1.1            |      |             |      |
| DRX Cycle configuration                  |                                      | ms          | Not Applicable       |      |             |      |
| TRS configuration                        | Config 1, 4                          |             | TRS.1.1 FDD          |      |             |      |
|  | Config 2, 5                          |             | TRS.1.1 TDD          |      |             |      |
|  | Config 3, 6                          |             | TRS.1.2 TDD          |      |             |      |
| PDSCH Reference measurement channel      | Config 1,4                           |             | SR.1.1 FDD           | -    | SR.1.1 FDD  | -    |
|  | Config 2,5                           |             | SR.1.1 TDD           |      | SR.1.1 TDD  |      |
|  | Config 3,6                           |             | SR.2.1 TDD           |      | SR.2.1 TDD  |      |
| RMSI CORESET Reference Channel           | Config 1,4                           |             | CR.1.1 FDD           | -    | CR.1.1 FDD  |      |
|  | Config 2,5                           |             | CR.1.1 TDD           |      | CR.1.1 TDD  |      |
|  | Config 3,6                           |             | CR.2.1 TDD           |      | CR.2.1 TDD  |      |
| Dedicated CORESET Reference Channel      | Config 1,4                           |             | CCR.1.1 FDD          | -    | CCR.1.1 FDD | -    |
|  | Config 2,5                           |             | CCR.1.1 TDD          |      | CCR.1.1 TDD |      |
|  | Config 3,6                           |             | CCR.2.1 TDD          |      | CCR.2.1 TDD |      |
| OCNG Patterns                            |                                      |             | OP.1                 |      |             |      |
| SS-RSSI-Measurement                      |                                      |             | Not Applicable       |      |             |      |
| Time offset with Cell 2                  | Config 1,2,4,5                       | µs          | 2.35                 | 2.35 | 2.35        | 2.35 |
|  | Config 3,6                           | µs          | 1.17                 | 1.17 | 1.17        | 1.17 |
| SMTC configuration                       | Config 1,4                           |             | SMTC.2               |      |             |      |
|  | Config 2,3,5,6                       |             | SMTC.1               |      |             |      |
| SSB configuration                        | Config 1,2,4,5                       |             | SSB.1 FR1            |      |             |      |
|  | Config 3,6                           |             | SSB.2 FR1            |      |             |      |
| CSI-RS configuration for RRM             | Config 1,4                           |             | CSI-RS.RRM.FR1.1 FDD |      |             |      |
|  | Config 2,5                           |             | CSI-RS.RRM.FR1.1 TDD |      |             |      |
|  | Config 3,6                           |             | CSI-RS.RRM.FR1.2 TDD |      |             |      |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5                       | kHz         | 15                   |      |             |      |
|  | Config 3,6                           |             | 30                   |      |             |      |
| EPRE ratio of PSS to SSS                 |                                      | dB          | 0                    | 0    | 0           | 0    |
| EPRE ratio of PBCH DMRS to SSS           |                                      |             |                      |      |             |      |
| EPRE ratio of PBCH to PBCH DMRS          |                                      |             |                      |      |             |      |
| EPRE ratio of PDCCH DMRS to SSS          |                                      |             |                      |      |             |      |
| EPRE ratio of PDCCH to PDCCH DMRS        |                                      |             |                      |      |             |      |
| EPRE ratio of PDSCH DMRS to SSS          |                                      |             |                      |      |             |      |
| EPRE ratio of PDSCH to PDSCH             |                                      |             |                      |      |             |      |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                                      |             |                      |      |             |      |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                                      |             |                      |      |             |      |
| $N_{oc}$ <sup>Note2</sup>                | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm /15k Hz | -93                  |      | -116        |      |
|  | NR_FDD_FR1_B                         |             |                      |      | -115.5      |      |
|  | NR_TDD_FR1_C                         |             |                      |      | -115        |      |
|  | NR_FDD_FR1_D, NR_TDD_FR1_D           |             |                      |      | -114.5      |      |
|  | NR_FDD_FR1_E, NR_TDD_FR1_E           |             |                      |      | -114        |      |
|  | NR_FDD_FR1_F                         |             |                      |      | -113.5      |      |
|  | NR_FDD_FR1_G                         |             |                      |      | -113        |      |
|  | NR_FDD_FR1_H                         |             |                      |      | -112.5      |      |



|                               |                               |   |   |                |        |   |        |        |
|-------------------------------|-------------------------------|---|---|----------------|--------|---|--------|--------|
| $N_{oc}$<br>Note2             | Config 1,2,4,5                |   | dBm /SC S                               | -93            |        | Same as Noc for 15kHz                   |        |        |
|                               | Config 3,6                    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |   | -90            |        | -113                                    |        |        |
|                               |                               | NR_FDD_FR1_B                            |   |                |        | -112.5                                  |        |        |
|                               |                               | NR_TDD_FR1_C                            |   |                |        | -112                                    |        |        |
|                               |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                |        | -111.5                                  |        |        |
|                               |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                |        | -111                                    |        |        |
|                               |                               | NR_FDD_FR1_F                            |   |                |        | -110.5                                  |        |        |
|                               |                               | NR_FDD_FR1_G                            |   |                |        | -110                                    |        |        |
|                               |                               | NR_FDD_FR1_H                            |   |                |        | -109.5                                  |        |        |
| $\hat{E}_s / I_{ot}$          |                               |   | dB                                      | 0              | -3.19  | -5.46                                   | -5.46  |        |
| $\hat{E}_s / N_{oc}$          |                               |   | dB                                      | 4.54           | 2.66   | -4                                      | -4     |        |
| CSI-RSRP <sup>Not e3</sup>    | Config 1,2,4,5                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A           | dBm /SC S                               | -88.46         | -90.34 | -120                                    |        |        |
|                               |                               | NR_FDD_FR1_B                            |   |                |        | -119.5                                  | -119.5 |        |
|                               |                               | NR_TDD_FR1_C                            |   |                |        | -119                                    | -119   |        |
|                               |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                |        | -118.5                                  | -118.5 |        |
|                               |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                |        | -118                                    | -118   |        |
|                               |                               | NR_FDD_FR1_F                            |   |                |        | -117.5                                  | -117.5 |        |
|                               |                               | NR_FDD_FR1_G                            |   |                |        | -117                                    | -117   |        |
|                               |                               | NR_FDD_FR1_H                            |   |                |        | -116.5                                  | -116.5 |        |
|                               |                               | Config 3,6                              |   |                |        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | -85.46 | -87.34 |
|                               | NR_FDD_FR1_B                  |   | -116.5                                  | -116.5         |        |   |        |        |
|                               | NR_TDD_FR1_C                  |   | -116                                    | -116           |        |   |        |        |
|                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |   | -115.5                                  | -115.5         |        |   |        |        |
|                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |   | -115                                    | -115           |        |   |        |        |
|                               | NR_FDD_FR1_F                  |   | -114.5                                  | -114.5         |        |   |        |        |
|                               | NR_FDD_FR1_G                  |   | -114                                    | -114           |        |   |        |        |
|                               | NR_FDD_FR1_H                  |   | -113.5                                  | -113.5         |        |   |        |        |
|                               | CSI-SINR <sup>Note3</sup>     |   |   | dB             | 0      | -3.19                                   |        |        |
|                               | $I_o$ <sup>Note3</sup>        | Config 1,2,4,5                          | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm / 9.36 MHz | -57.5  |   | -85.51 |        |
| NR_FDD_FR1_B                  |                               |   | -85.01                                  |                |        |   |        |        |
| NR_TDD_FR1_C                  |                               |   | -84.51                                  |                |        |   |        |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D |                               |   | -84.01                                  |                |        |   |        |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E |                               |   | -83.51                                  |                |        |   |        |        |
| NR_FDD_FR1_F                  |                               |   | -83.01                                  |                |        |   |        |        |
| NR_FDD_FR1_G                  |                               |   | -82.51                                  |                |        |   |        |        |

|  |   |                         |        |                  |
|--|---|-------------------------|--------|------------------|
| Config 3,6   | NR_FDD_FR1_H                            | dBm<br>/<br>38.1<br>MHz | -51.41 | -82.01           |
|  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                         |        | -79.41           |
|  | NR_FDD_FR1_B                            |                         |        | -78.91           |
|  | NR_TDD_FR1_C                            |                         |        | -78.41           |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                         |        | -77.91           |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                         |        | -77.41           |
|  | NR_FDD_FR1_F                            |                         |        | -76.91           |
|  | NR_FDD_FR1_G<br>NR_FDD_FR1_H            |                         |        | -76.41<br>-75.91 |
| Propagation condition  |   | -                       | AWGN   |                  |
| Antenna configuration  |   | -                       | 1x2    |                  |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{ac}</math> to be fulfilled.</p> <p>Note 3: CSI-SINR, CSI-RSRP, and <math>I_0</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |   |                         |        |                  |

A.4.7.10.1.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.

A.4.7.10.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.4.7.10.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.14.2.1 and 10.1.14.2.2 for inter-frequency measurement.

A.4.7.10.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.10.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test parameters in Table A.4.7.10.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell of which specific test parameters for this test case are specified in Table A.3.7.2.1-1. CSI-RS for mobility configured for Cell 2 is associated to the SSB of Cell 2, and CSI-RS for mobility configured for Cell 3 is associated to the SSB of Cell 3.

**Table A.4.7.10.2.2-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

Table A.4.7.10.2.2-1: CSI-SINR Inter frequency test parameters

| Parameter                            |                | Unit | Test 1               |                 | Test 2          |                 | Test 3          |                 |
|--------------------------------------|----------------|------|----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                      |                |      | Cell 2<br>freq1      | Cell 3<br>freq2 | Cell 2<br>freq1 | Cell 3<br>freq2 | Cell 2<br>freq1 | Cell 3<br>freq2 |
| <b>SSB ARFCN</b>                     |                |      |                      |                 |                 |                 |                 |                 |
| Duplex mode                          | Config 1,4     |      | FDD                  |                 |                 |                 |                 |                 |
|                                      | Config 2,3,5,6 |      | TDD                  |                 |                 |                 |                 |                 |
| TDD configuration                    | Config 1,4     |      | Not Applicable       |                 |                 |                 |                 |                 |
|                                      | Config 2,5     |      | TDDConf.1.1          |                 |                 |                 |                 |                 |
|                                      | Config 3,6     |      | TDDConf.2.1          |                 |                 |                 |                 |                 |
| Downlink initial BWP configuration   |                |      | DLBWP.0.1            |                 |                 |                 |                 |                 |
| Downlink dedicated BWP configuration |                |      | DLBWP.1.1            |                 |                 |                 |                 |                 |
| Uplink initial BWP configuration     |                |      | ULBWP.0.1            |                 |                 |                 |                 |                 |
| Uplink dedicated BWP configuration   |                |      | ULBWP.1.1            |                 |                 |                 |                 |                 |
| DRX Cycle configuration              |                | ms   | Not Applicable       |                 |                 |                 |                 |                 |
| TRS configuration                    | Config 1, 4    |      | TRS.1.1 FDD          |                 |                 |                 |                 |                 |
|                                      | Config 2, 5    |      | TRS.1.1 TDD          |                 |                 |                 |                 |                 |
|                                      | Config 3, 6    |      | TRS.1.2 TDD          |                 |                 |                 |                 |                 |
| PDSCH Reference measurement channel  | Config 1,4     |      | SR.1.1<br>FDD        | -               | SR.1.1<br>FDD   | -               | SR.1.1<br>FDD   | -               |
|                                      | Config 2,5     |      | SR.1.1<br>TDD        |                 | SR.1.1<br>TDD   |                 | SR.1.1<br>TDD   |                 |
|                                      | Config 3,6     |      | SR.2.1<br>TDD        |                 | SR.2.1<br>TDD   |                 | SR.2.1<br>TDD   |                 |
| RMSI CORESET Reference Channel       | Config 1,4     |      | CR.1.1<br>FDD        | -               | CR.1.1<br>FDD   | -               | CR.1.1<br>FDD   | -               |
|                                      | Config 2,5     |      | CR.1.1<br>TDD        |                 | CR.1.1<br>TDD   |                 | CR.1.1<br>TDD   |                 |
|                                      | Config 3,6     |      | CR.2.1<br>TDD        |                 | CR.2.1<br>TDD   |                 | CR.2.1<br>TDD   |                 |
| Dedicated CORESET Reference Channel  | Config 1,4     |      | CCR.1.<br>1 FDD      | -               | CCR.1.<br>1 FDD | -               | CCR.1.<br>1 FDD | -               |
|                                      | Config 2,5     |      | CCR.1.<br>1 TDD      |                 | CCR.1.<br>1 TDD |                 | CCR.1.<br>1 TDD |                 |
|                                      | Config 3,6     |      | CCR.2.<br>1 TDD      |                 | CCR.2.<br>1 TDD |                 | CCR.2.<br>1 TDD |                 |
| OCNG Patterns                        |                |      | OP.1                 |                 |                 |                 |                 |                 |
| SS-RSSI-Measurement                  |                |      | Not Applicable       |                 |                 |                 |                 |                 |
| Time offset with Cell 2              | Config 1,2,4,5 | µs   | -                    | 2.35            | -               | 2.35            | -               | 2.35            |
|                                      | Config 3,6     | µs   | -                    | 1.17            | -               | 1.17            | -               | 1.17            |
| SMTC configuration                   | Config 1,4     |      | SMTC.2               |                 |                 |                 |                 |                 |
|                                      | Config 2,3,5,6 |      | SMTC.1               |                 |                 |                 |                 |                 |
| SSB configuration                    | Config 1,2,4,5 |      | SSB.1 FR1            |                 |                 |                 |                 |                 |
|                                      | Config 3,6     |      | SSB.2 FR1            |                 |                 |                 |                 |                 |
| CSI-RS configuration for RRM         | Config 1,4     |      | CSI-RS.RRM.FR1.1 FDD |                 |                 |                 |                 |                 |
|                                      | Config 2,5     |      | CSI-RS.RRM.FR1.1 TDD |                 |                 |                 |                 |                 |
|                                      | Config 3,6     |      | CSI-RS.RRM.FR1.2 TDD |                 |                 |                 |                 |                 |
| PDSCH/PDCCH subcarrier spacing       | Config 1,2,4,5 | kHz  | 15                   |                 |                 |                 |                 |                 |
|                                      | Config 3,6     |      | 30                   |                 |                 |                 |                 |                 |

|  |                |              |               |        |        |                               |        |   |        |
|--|----------------|--------------|---------------|--------|--------|-------------------------------|--------|---|--------|
| EPRE ratio of PSS to SSS                 |                |              | dB            | 0      | 0      | 0                             | 0      | 0 | 0      |
| EPRE ratio of PBCH DMRS to SSS           |                |              |               |        |        |                               |        |   |        |
| EPRE ratio of PBCH to PBCH DMRS          |                |              |               |        |        |                               |        |   |        |
| EPRE ratio of PDCCH DMRS to SSS          |                |              |               |        |        |                               |        |   |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                |              |               |        |        |                               |        |   |        |
| EPRE ratio of PDSCH DMRS to SSS          |                |              |               |        |        |                               |        |   |        |
| EPRE ratio of PDSCH to PDSCH             |                |              |               |        |        |                               |        |   |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                |              |               |        |        |                               |        |   |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                |              |               |        |        |                               |        |   |        |
| $N_{oc}$<br>Note2                        | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/15k<br>Hz | -88    | -108.5 | -119.5                        |        |   |        |
|  |                | NR_TDD_FR1_A |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_B |               |        |        |                               |        |   | -119   |
|  |                | NR_TDD_FR1_C |               |        |        |                               |        |   | -118.5 |
|  |                | NR_FDD_FR1_D |               |        |        |                               |        |   | -118   |
|  |                | NR_TDD_FR1_D |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_E |               |        |        |                               |        |   | -117.5 |
|  |                | NR_TDD_FR1_E |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_F |               |        |        |                               |        |   | -117   |
| NR_TDD_FR1_F                             |                |              |               |        |        |                               |        |   |        |
| NR_FDD_FR1_G                             |                |              | -116.5        |        |        |                               |        |   |        |
| NR_TDD_FR1_G                             |                |              |               |        |        |                               |        |   |        |
| NR_FDD_FR1_H                             |                |              | -116          |        |        |                               |        |   |        |
| $N_{oc}$<br>Note2                        | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/SC<br>S   | -88    | -108.5 | Same as $N_{oc}$ for<br>15kHz |        |   |        |
|  |                | NR_TDD_FR1_A |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_B |               |        |        |                               |        |   |        |
|  | Config 3,6     | NR_TDD_FR1_C |               | -85    | -105.5 | -116.5                        |        |   |        |
|  |                | NR_FDD_FR1_D |               |        |        |                               |        |   |        |
|  |                | NR_TDD_FR1_D |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_E |               |        |        |                               |        |   | -116   |
|  |                | NR_TDD_FR1_E |               |        |        |                               |        |   | -115.5 |
|  |                | NR_FDD_FR1_F |               |        |        |                               |        |   | -115   |
| NR_TDD_FR1_F                             |                |              |               |        |        |                               |        |   |        |
| NR_FDD_FR1_G                             |                |              | -114.5        |        |        |                               |        |   |        |
| NR_TDD_FR1_G                             |                |              |               |        |        |                               |        |   |        |
| NR_FDD_FR1_H                             |                |              | -114          |        |        |                               |        |   |        |
| NR_TDD_FR1_H                             |                |              | -114.5        |        |        |                               |        |   |        |
|  |                |              |               |        |        |                               |        |   |        |
|  |                |              |               |        |        |                               |        |   |        |
| $\hat{E}_s / I_{ot}$                     |                |              | dB            | -1.75  | 20     | -4.0                          |        |   |        |
| $\hat{E}_s / N_{oc}$                     |                |              | dB            | -1.75  | 20     | -4.0                          |        |   |        |
| CSI-RSRP <sup>Not e3</sup>               | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/SC<br>S   | -89.75 | -88.5  | -123.5                        |        |   |        |
|  |                | NR_TDD_FR1_A |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_B |               |        |        |                               |        |   | -123   |
|  |                | NR_TDD_FR1_C |               |        |        |                               |        |   | -122.5 |
|  |                | NR_FDD_FR1_D |               |        |        |                               |        |   | -122   |
|  |                | NR_TDD_FR1_D |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_E |               |        |        |                               |        |   | -121.5 |
|  |                | NR_TDD_FR1_E |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_F |               |        |        |                               |        |   | -121   |
|  | NR_TDD_FR1_F   |              |               |        |        |                               |        |   |        |
|  | NR_FDD_FR1_G   |              |               |        | -120.5 |                               |        |   |        |
|  | NR_TDD_FR1_G   |              |               |        | -120   |                               |        |   |        |
|  | Config 3,6     | NR_FDD_FR1_H |               | -86.75 | -85.5  | -120.5                        |        |   |        |
|  |                | NR_TDD_FR1_A |               |        |        |                               |        |   |        |
|  |                | NR_FDD_FR1_B |               |        |        |                               |        |   | -120   |
|  |                | NR_TDD_FR1_C |               |        |        |                               |        |   | -119.5 |
|  |                | NR_FDD_FR1_D |               |        |        |                               |        |   | -119   |
|  |                | NR_TDD_FR1_D |               |        |        |                               |        |   |        |
| NR_FDD_FR1_E                             |                |              |               |        |        |                               | -118.5 |   |        |
| NR_TDD_FR1_E                             |                |              |               |        |        |                               |        |   |        |
| NR_FDD_FR1_F                             |                |              |               |        |        |                               | -118   |   |        |
| NR_TDD_FR1_F                             |                |              |               |        |        |                               |        |   |        |
| NR_FDD_FR1_G                             |                |              | -117.5        |        |        |                               |        |   |        |
| NR_TDD_FR1_G                             |                |              |               |        |        |                               |        |   |        |
| NR_FDD_FR1_H                             |                |              | -117          |        |        |                               |        |   |        |
| NR_TDD_FR1_H                             |                |              |               |        |        |                               |        |   |        |
| CSI-SINR <sup>Note3</sup>                | NR_FDD_FR1_A   | dB           | -1.75         | 20     | -4.0   |                               |        |   |        |
|  | NR_TDD_FR1_A   |              |               |        |        |                               |        |   |        |
|  | NR_FDD_FR1_B   |              |               |        |        |                               |        |   |        |
|  | NR_TDD_FR1_C   |              |               |        |        |                               |        |   |        |

|   |                              |  |                 |        |       |  |                      |
|---|------------------------------|--|-----------------|--------|-------|--|----------------------|
|   |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                 |        |       |  |                      |
|   |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                 |        |       |  |                      |
|   |                              | NR_FDD_FR1_F                           |                 |        |       |  |                      |
|   |                              | NR_FDD_FR1_G                           |                 |        |       |  |                      |
|   |                              | NR_FDD_FR1_H                           |                 |        |       |  |                      |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1,2,4,5               | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz | -57.83 | -60.5 | -90.09                                 |                      |
|   |                              | NR_FDD_FR1_B                           |                 |        |       | -89.59                                 |                      |
|   |                              | NR_TDD_FR1_C                           |                 |        |       | -89.09                                 |                      |
|   |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                 |        |       | -88.59                                 |                      |
|   |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                 |        |       | -88.09                                 |                      |
|   |                              | NR_FDD_FR1_F                           |                 |        |       | -87.59                                 |                      |
|   |                              | NR_FDD_FR1_G                           |                 |        |       | -87.09                                 |                      |
|   |                              | NR_FDD_FR1_H                           |                 |        |       | -86.59                                 |                      |
|   |                              | Config 3,6                             |                 |        |       | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MH<br>Z |
|   | NR_FDD_FR1_B                 |  | -83.5           |        |       |  |                      |
|   | NR_TDD_FR1_C                 |  | -83             |        |       |  |                      |
|   | NR_FDD_FR1_D<br>NR_TDD_FR1_D |  | -82.5           |        |       |  |                      |
|   | NR_FDD_FR1_E<br>NR_TDD_FR1_E |  | -82             |        |       |  |                      |
|   | NR_FDD_FR1_F                 |  | -81.5           |        |       |  |                      |
|   | NR_FDD_FR1_G                 |  | -81             |        |       |  |                      |
|   | NR_FDD_FR1_H                 |  | -80.5           |        |       |  |                      |
|   | Propagation condition        |  |                 | -      | AWGN  |  |                      |
|   | Antenna configuration        |  |                 | -      | 1x2   |  |                      |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-SINR, CSI-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |                              |  |                 |        |       |  |                      |

A.4.7.10.2.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.2.1 and 10.1.14.2.2.

A.4.8 Void

## A.4A NE-DC test with all NR cells in FR1

### A.4A.1 Signaling characteristics

#### A.4A.1.1 E-UTRAN PSCell addition

##### A.4A.1.1.1 Test purpose and environment

The purpose of this test is to verify that the LTE PSCell addition/release delay and interruption under NE-DC are within the requirements stated in clause 8.8 and clause 8.2.3.2.3 for the case when the PSCell is known by the UE at the time of addition.

Supported test configurations are shown in A.4A.1.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1.

The test parameters for NR cell are given in Tables A.4A.1.1.1-2 and cell-specific parameters in A.4A.1.1.1-3 below. The test consists of five successive time periods with duration of T1, T2, T3, T4 and T5 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (NR PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (E-UTRAN PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event B1 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event B1. After receiving the Event B1, the test system shall send a RRC message to the UE to release the measurement gaps.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T2, after the measurement gaps are released by the test system. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T3.

The test system shall observe the periodic reporting of CSI for PSCell during T4. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T4.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T4, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T5.

**Table A.4A.1.1.1-1: Applicable E-UTRA and NR configurations for NE-DC PSCell addition and Release test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.4A.1.1.1-2: General Test Parameters for PSCell Addition and Release**

| Parameter   |                                 | Unit | Value | Comment  |
|---|---------------------------------|------|-------|--|
| RF Channel Number                                       |                                 |      | 1, 2  | Two radio channels are used for this test. One for NR cell and second for E-UTRAN Cell |
| Initial   | Active PCell                    |      | Cell1 | PCell on RF channel number 1.  |
|   | Neighbour cell                  |      | Cell2 | Neighbour cell on RF channel number 2.   |
| Final Condition   | Active PCell                    |      | Cell1 | PCell on RF channel number 1.  |
|   | Neighbour Cell                  |      | Cell2 | PSCell released on RF channel number 2.  |
| B1  | Hysteresis                      | dB   | 0     | Hysteresis for evaluation of event B1.   |
|   | Threshold RSRP (Config 1,2,4,5) | dBm  | -96   | Actual RSRP threshold for event B1.  |
|   | Threshold RSRP (Config 3,6)     | dBm  | -93   | Actual RSRP threshold for event B1.  |
|   | Time to Trigger                 | S    | 0     |  |
| DRX   |                                 |      | OFF   | Continuous monitoring of primary cell  |
| Measurement gap pattern Id                              |                                 |      | 0     | Gaps are configured before T2 and released before T3.                                  |
| Cell-individual offset for cells on RF channel number 1 |                                 | dB   | 0     | Individual offset for cells on primary component carrier.                              |
| Cell-individual offset for cells on RF channel number 2 |                                 | dB   | 0     | Individual offset for cells on carrier frequency of cell2.                             |
| T1  |                                 | s    | 1     | During this time the PCell shall be known and cell2 shall be unknown.                  |
| T2  |                                 | s    | 1     | During this time the UE shall identify neighbour cell (cell2) and report event B1.     |
| T3  |                                 | s    | 0.5   | During this time the UE adds the PSCell.   |
| T4  |                                 | s    | 0.5   | During this time the UE sends CSI reports for PSCell.                                  |
| T5  |                                 | s    | 0.5   | During this time the UE releases the PSCell.   |

**Table A.4A.1.1.1-3: NR Cell Specific Parameters for PSCell Addition and Release**

| Parameter | Unit | Config | Test |
|-----------|------|--------|------|
|-----------|------|--------|------|

|  |            |             |                             |
|--|------------|-------------|-----------------------------|
| NR RF Channel Number                     |            | 1,2,3,4,5,6 | 1                           |
| E-UTRA RF Channel Number                 |            | 1,2,3,4,5,6 | 2                           |
| TDD configuration                        |            | 1,4         | Not Applicable              |
|  |            | 2,5         | TDDConf.1.1                 |
|  |            | 3,6         | TDDConf.2.1                 |
| BW <sub>channel</sub>                    | MHz        | 1,4         | 10: N <sub>RB,c</sub> = 52  |
|  |            | 2,5         | 10: N <sub>RB,c</sub> = 52  |
|  |            | 3,6         | 40: N <sub>RB,c</sub> = 106 |
| Initial BWP Configuration                |            | 1,2,3       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP Configuration              |            | 1,2,3       | DLBWP.1.1<br>ULBWP.1.1      |
| PDSCH Reference measurement channel      |            | 1,4         | SR.1.1 FDD                  |
|  |            | 2,5         | SR.1.1 TDD                  |
|  |            | 3,6         | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel           |            | 1,4         | CR.1.1 FDD                  |
|  |            | 2,5         | CR.1.1 TDD                  |
|  |            | 3,6         | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel      |            | 1,4         | CCR.1.1 FDD                 |
|  |            | 2,5         | CCR.1.1 TDD                 |
|  |            | 3,6         | CCR.2.1 TDD                 |
| OCNG Patterns                            |            | 1,2,3,4,5,6 | OP.1                        |
| SSB configuration                        |            | 1,2,4,5     | SSB.1 FR1                   |
|  |            | 3,6         | SSB.2 FR1                   |
| SMTC configuration                       |            | 1,2,4,5     | SMTC.1                      |
|  |            | 3,6         | SMTC.1                      |
| TRS Configuration                        |            | 1,4         | TRS.1.1 FDD                 |
|  |            | 2,5         | TRS.1.1 TDD                 |
|  |            | 3,6         | TRS.1.2 TDD                 |
| CSI-RS configuration for CSI reporting   |            | 1,4         | CSI-RS.1.1 FDD              |
|  |            | 2,5         | CSI-RS.1.1 TDD              |
|  |            | 3,6         | CSI-RS.2.1 TDD              |
| reportConfigType                         |            | 1,2,3,4,5,6 | periodic                    |
| reportQuantity                           |            | 1,2,3,4,5,6 | cri-RI-PMI-CQI              |
| CSI reporting periodicity                | slot       | 1,2,4,5     | 5                           |
|  |            | 3,6         | 10                          |
| CSI reporting offset                     | slot       | 1,2,4,5     | 2                           |
|  |            | 3,6         | 4                           |
| EPRE ratio of PSS to SSS                 | dB         | 1,2,3,4,5,6 | 0                           |
| EPRE ratio of PBCH DMRS to SSS           |            |             |                             |
| EPRE ratio of PBCH to PBCH DMRS          |            |             |                             |
| EPRE ratio of PDCCH DMRS to SSS          |            |             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |             |                             |
| EPRE ratio of PDSCH DMRS to SSS          |            |             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS        |            |             |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |             |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |             |                             |
| $N_{oc}$ <sup>Note2</sup>                | dBm/15 kHz | 1,2,3,4,5,6 | -88                         |
| $N_{oc}$ <sup>Note2</sup>                | dBm/SCS    | 1,2,4,5     | -88                         |
|  |            | 3,6         | -85                         |
| $\hat{E}_s/I_{ot}$                       |            | 1,2,3,4,5,6 | 0                           |
| $\hat{E}_s/N_{oc}$                       |            | 1,2,3,4,5,6 | 0                           |



|   |             |             |      |
|---|-------------|-------------|------|
| SS-RSRP <sup>Note3</sup>  | dBm/SCS     | 1,2,4,5     | -88  |
|   |             | 3,6         | -85  |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/9.36MHz | 1,2,4,5     | -57  |
|   | dBm/38.1MHz | 3,6         | -51  |
| Propagation condition   |             | 1,2,3,4,5,6 | AWGN |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |             |             |      |

**Table A.4A.1.1.1-4: E-UTRAN cell specific test parameters for PSCell Addition and Release tests**

| Parameter   | Unit       | E-UTRAN Cell  |                                     |    |    |    |
|---|------------|---|-------------------------------------|----|----|----|
|   |            | T1  | T2                                  | T3 | T4 | T5 |
| Duplex mode   |            | FDD or TDD  |                                     |    |    |    |
| TDD special subframe configuration <sup>Note1</sup>                                 |            | 6   |                                     |    |    |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |            | 1   |                                     |    |    |    |
| BW <sub>channel</sub>   |            | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100                    |                                     |    |    |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |            | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD          |                                     |    |    |    |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |            | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD      |                                     |    |    |    |
| OCNG Patterns <sup>Note2</sup>  |            | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |                                     |    |    |    |
| PBCH_RA   | dB         | 0   |                                     |    |    |    |
| PBCH_RB   | dB         |   |                                     |    |    |    |
| PSS_RA  | dB         |   |                                     |    |    |    |
| SSS_RA  | dB         |   |                                     |    |    |    |
| PCFICH_RB   | dB         |   |                                     |    |    |    |
| PHICH_RA  | dB         |   |                                     |    |    |    |
| PHICH_RB  | dB         |   |                                     |    |    |    |
| PDCCH_RA  | dB         |   |                                     |    |    |    |
| PDCCH_RB  | dB         |   |                                     |    |    |    |
| PDSCH_RA  | dB         |   |                                     |    |    |    |
| PDSCH_RB  | dB         |   |                                     |    |    |    |
| OCNG_RA <sup>Note3</sup>  | dB         |   |                                     |    |    |    |
| OCNG_RB <sup>Note3</sup>  | dB         |   |                                     |    |    |    |
| N <sub>oc</sub> <sup>Note4</sup>  | dBm/15 kHz |   |                                     |    |    |    |
| $\bar{E}_s/N_{oc}$  | dB         | -infinite   | 17                                  |    |    |    |
| $\bar{E}_s/I_{ot}$  | dB         | -infinite   | 17                                  |    |    |    |
| RSRP <sup>Note5</sup>   | dBm/15 kHz | -infinite   | -87                                 |    |    |    |
| SCH_RP <sup>Note5</sup>   | dBm/15 kHz | -infinite   | -87                                 |    |    |    |
| I <sub>o</sub> <sup>Note5</sup>   | dBm/Ch BW  | N/A   | -59.13+10log(N <sub>RB,c</sub> /50) |    |    |    |
| Propagation Condition   |            | AWGN  |                                     |    |    |    |
| Antenna Configuration   |            | 1x2   |                                     |    |    |    |

|         |  |
|---------|--|
| Note 1: | Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.   |
| Note 2: | DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  |
| Note 3: | OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |
| Note 4: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 5: | $E_s/I_{tot}$ , RSRP, SCH_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |

### A.4A.1.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 120 ms<sup>Note1</sup> into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest 20ms into T5.

Interruption on PCell during PSCell addition and release shall not exceed the values specified for NE-DC in Clause 8.2.3.2.3.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 8.8 [15]:

$$T_{\text{config\_EUTRAN-PSCell}} = 20\text{ms} + T_{\text{activation\_time}} + 50\text{ms} + T_{\text{PCell\_DU}} + T_{\text{E-UTRAN-PSCell\_DU}}$$

Where:

$$T_{\text{activation\_time}} = 20\text{ms}$$

$$T_{\text{PCell\_DU}} = 0\text{ms}$$

$$T_{\text{E-UTRAN-PSCell\_DU}} = 30\text{ms}$$

## A.4A.1.2 Active BWP switch

### A.4A.1.2.1 E-UTRAN PSCell – NR PCell FR1 DCI-based and Timer-based DL active BWP switch in non-DRX in synchronous NE-DC

#### A.4A.1.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.36.2.6. Supported test configurations are shown in Table A.4A.1.2.1.1-1.

The test scenario comprises of one NR PCell (Cell 1), and one E-UTRA PSCell (Cell 2) as given in Table A.4A.1.2.1.1-2. Cell-specific parameters of NR PCell is specified in Table A.4A.1.2.1.1-3. below, and cell-specific parameters of E-UTRA PSCell are specified in Table A.3.7.2.1-1.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PCell's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than at the beginning of the DL slot right after DL slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PCell's BWP-2 starting from the beginning of the DL slot right after DL slot ( $i+T_{BWPswitchDelay}$ ).

The starting time of PSCell(Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell(Cell 1).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PCell's DL slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell at latest at the beginning of the DL slot right after DL slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PCell's BWP-1 starting from the beginning of the DL slot right after DL slot ( $j+T_{BWPswitchDelay}$ ).

The starting time of PSCell(Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PSCell is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during BWP switch of PCell, respectively.

**Table A.4A.1.2.1.1-1: DL BWP switch supported test configurations**

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

**Table A.4A.1.2.1.1-2: General test parameters for DL BWP switch in synchronous NE-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| NR RF Channel Number                                    |      | 1      | One NR radio channel is used for this test     |
| E-UTRA RF Channel Number                                |      | 2      | One E-UTRA radio channel is used for this test |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    | For both PCell and PSCell                      |
| <i>bwp-InactivityTimer</i>                              | ms   | [200]  |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous NE-DC                              |
| T1  | s    | [0.2]  |  |
| T2  | s    | [0.2]  |  |
| T3  | s    | [0.2]  |  |

**Table A.4A.1.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous NE-DC**

| Parameter                                    |                | Unit      | Cell 1                          |
|--|----------------|-----------|---------------------------------|
| Frequency Range                              |                |           | FR1                             |
| Duplex mode                                  | Config 1,4     |           | FDD                             |
|  | Config 2,3,5,6 |           | TDD                             |
| TDD configuration                            | Config 1,4     |           | Not Applicable                  |
|  | Config 2,5     |           | TDDConf.1.1                     |
|  | Config 3,6     |           | TDDConf.2.1                     |
| BW <sub>channel</sub>                        | Config 1,4     |           | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 2,5     |           | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 3,6     |           | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID                                |                |           | 1, 2                            |
| Initial DL BWP Configuration                 | Config 1,4     |           | DLBWP.0.2 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active DL BWP-1 Configuration                | Config 1,4     |           | DLBWP.1.1 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active DL BWP-2 Configuration                | Config 1,4     |           | DLBWP.1.3 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Initial UL BWP Configuration                 | Config 1,4     |           | ULBWP.0.2 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active UL BWP-1 Configuration                | Config 1,4     |           | ULBWP.1.1 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| Active UL BWP-2 Configuration                | Config 1,4     |           | ULBWP.1.3 <sup>Note 4</sup>     |
|  | Config 2,5     |           |                                 |
|  | Config 3,6     |           |                                 |
| PDSCH Reference measurement channel          | Config 1,4     |           | SR.1.1 FDD                      |
|  | Config 2,5     |           | SR.1.1 TDD                      |
|  | Config 3,6     |           | SR.2.1 TDD                      |
| RMSI CORESET parameters                      | Config 1,4     |           | CR.1.1 FDD                      |
|  | Config 2,5     |           | CR.1.1 TDD                      |
|  | Config 3,6     |           | CR.2.1 TDD                      |
| Dedicated CORESET parameters                 | Config 1,4     |           | CCR.1.1 FDD                     |
|  | Config 2,5     |           | CCR.1.1 TDD                     |
|  | Config 3,6     |           | CCR.2.3 TDD                     |
| OCNG Patterns                                |                |           | OP.1                            |
| SSB Configuration                            | Config 1,2,4,5 |           | SSB.1 FR1                       |
|  | Config 3,6     |           | SSB.2 FR1                       |
| SMTTC Configuration                          |                |           | SMTTC.1                         |
| Correlation Matrix and Antenna Configuration |                |           | 1x2 Low                         |
| TRS Configuration                            | Config 1,4     |           | TRS.1.1 FDD                     |
|  | Config 2,5     |           | TRS.1.1 TDD                     |
|  | Config 3,6     |           | TRS.1.2 TDD                     |
| EPRE ratio of PSS to SSS                     |                | dB        | 0                               |
| EPRE ratio of PBCH DMRS to SSS               |                |           |                                 |
| EPRE ratio of PBCH to PBCH DMRS              |                |           |                                 |
| EPRE ratio of PDCCH DMRS to SSS              |                |           |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |           |                                 |
| EPRE ratio of PDSCH DMRS to SSS              |                |           |                                 |
| EPRE ratio of PDSCH to PDSCH                 |                |           |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |           |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |           |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>            | Config 1,2,4,5 | dBm/SCS   | [-104]                          |
|  | Config 3,6     |           | [-101]                          |
| N <sub>oc</sub> <sup>Note 2</sup>            |                | dBm/15kHz | -104                            |
| SS-RSRP <sup>Note 3</sup>                    | Config 1,2,4,5 | dBm/SCS   | [-87]                           |
|  | Config 3,6     |           | [-90]                           |
| $\bar{E}_s/I_{ot}$                           |                | dB        | 17                              |
| $\bar{E}_s/N_{oc}$                           |                | dB        | 17                              |

|                       |   |              |         |
|-----------------------|---|--------------|---------|
| Io <sup>Note3</sup>   | Config 1,2,4,5  | dBm/9.36MHz  | [-59]   |
|                       | Config 3,6  | dBm/38.16MHz | [-61.9] |
| Propagation Condition |   |              | AWGN    |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |         |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.   |              |         |
| Note 3:               | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |         |
| Note 4:               | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. |              |         |

### A.4A.1.2.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PCell in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PCell in the DL slot right after DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

During T1, the start time of PSCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PSCell interruption of during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.36.2.6.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

## A.4A.2 Measurement performance

### A.4A.2.1 SFTD accuracy

#### A.4A.2.1.1 SFTD accuracy

##### A.4A.2.1.1.1 Test Purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 10.21.1.1 for NE-DC SFTD measurements.

##### A.4A.2.1.1.2 Test Environment

Supported test configurations are shown in Table A.4A.2.1.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is NR FR1 PCell and Cell 2 is E-UTRAN target cell. The test parameters of cell 1 are given in clause

A.4A.2.1.1.2-2. The test parameters of cell 2 are given in Table A.3.7.2.1. The SFTD between PCell and target cell shall be set by the test equipment to one of the time differences in Table A.4A.2.1.1.2-3.

**Table A.4A.2.1.1.2-1: Supported test configurations for SFTD accuracy**

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

**Table A.4A.2.1.1.2-2: Test parameters for SFTD accuracy (Cell 1)**

| Parameter   | Config  | Unit | Test 1                      |     |
|---|---|------|-----------------------------|-----|
| SSB GSCN  | 1~6   |      | freq1                       |     |
| Duplex mode                                       | 1,4   |      | FDD                         |     |
|   | 2,5   |      | TDD                         |     |
|   | 3,6   |      | TDD                         |     |
| TDD Configuration                                 | 1,4   |      | N/A                         |     |
|   | 2,5   |      | TDDConf.1.1                 |     |
|   | 3,6   |      | TDDConf.2.1                 |     |
| BW <sub>channel</sub>                             | 1,4   | MHz  | 10: N <sub>RB,c</sub> = 52  |     |
|   | 2,5   |      | 10: N <sub>RB,c</sub> = 52  |     |
|   | 3,6   |      | 40: N <sub>RB,c</sub> = 106 |     |
| PDSCH Reference measurement channel               | 1,4   |      | SR.1.1 FDD                  |     |
|   | 2,5   |      | SR.1.1 TDD                  |     |
|   | 3,6   |      | SR.2.1 TDD                  |     |
| RMSI CORESET Reference Channel                    | 1,4   |      | CR.1.1 FDD                  |     |
|   | 2,5   |      | CR.1.1 TDD                  |     |
|   | 3,6   |      | CR.2.1 TDD                  |     |
| RMC CORESET Reference Channel                     | 1,4   |      | CCR.1.1 FDD                 |     |
|   | 2,5   |      | CCR.1.1 TDD                 |     |
|   | 3,6   |      | CCR.2.1 TDD                 |     |
| SSB configuration                                 | 1,4   |      | SSB.1 FR1                   |     |
|   | 2,5   |      | SSB.1 FR1                   |     |
|   | 3,6   |      | SSB.2 FR1                   |     |
| SMTc configuration                                | 1~6   |      | SMTc.1                      |     |
| DL BWP configuration                              | 1~6   |      | DLBWP.1.1                   |     |
| UL BWP configuration                              | 1~6   |      | ULBWP.1.1                   |     |
| OCNG Patterns                                     | 1~6   |      | OP.1                        |     |
| EPRE ratio of PSS to SSS                          | 1~6   | dB   | 0                           |     |
| EPRE ratio of PBCH DMRS to SSS                    |   |      |                             |     |
| EPRE ratio of PBCH to PBCH DMRS                   |   |      |                             |     |
| EPRE ratio of PDCCH DMRS to SSS                   |   |      |                             |     |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |      |                             |     |
| EPRE ratio of PDSCH DMRS to SSS                   |   |      |                             |     |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |      |                             |     |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |      |                             |     |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |      |                             |     |
| N <sub>oc</sub> <sup>Note 2</sup>                 |   |      |                             | 1~6 |
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> |      |                             |     |
|   | NR_FDD_FR1_B<br>NR_TDD_FR1_C                    |      |                             |     |



|                           |   |         |              |        |
|---------------------------|---|---------|--------------|--------|
|                           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |              |        |
|                           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |              |        |
|                           | NR_FDD_FR1_F                                    |         |              |        |
|                           | NR_FDD_FR1_G                                    |         |              |        |
|                           | NR_FDD_FR1_H                                    |         |              |        |
| $N_{oc}$ <sup>Note2</sup> | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 1,2,4,5 | dBm/SSB SCS  | -104   |
|                           | NR_FDD_FR1_B                                    |         |              |        |
|                           | NR_TDD_FR1_C                                    |         |              |        |
|                           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |              |        |
|                           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |              |        |
|                           | NR_FDD_FR1_F                                    |         |              |        |
|                           | NR_FDD_FR1_G                                    |         |              |        |
|                           | NR_FDD_FR1_H                                    |         |              |        |
|                           | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 3,6     |              | -101   |
|                           | NR_FDD_FR1_B                                    |         |              |        |
|                           | NR_TDD_FR1_C                                    |         |              |        |
|                           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |              |        |
|                           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |              |        |
|                           | NR_FDD_FR1_F                                    |         |              |        |
|                           | NR_FDD_FR1_G                                    |         |              |        |
|                           | NR_FDD_FR1_H                                    |         |              |        |
| $\hat{E}_s / I_{ot}$      | 1~6   |         | dB           | -3     |
| $\hat{E}_s / N_{oc}$      | 1~6   |         | dB           | -3     |
| SS-RSRP <sup>Note3</sup>  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 1,2,4,5 | dBm/SCS      | -107   |
|                           | NR_FDD_FR1_B                                    |         |              |        |
|                           | NR_TDD_FR1_C                                    |         |              |        |
|                           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |              |        |
|                           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |              |        |
|                           | NR_FDD_FR1_F                                    |         |              |        |
|                           | NR_FDD_FR1_G                                    |         |              |        |
|                           | NR_FDD_FR1_H                                    |         |              |        |
|                           | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 3,6     |              | -104   |
|                           | NR_FDD_FR1_B                                    |         |              |        |
|                           | NR_TDD_FR1_C                                    |         |              |        |
|                           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |              |        |
|                           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |              |        |
|                           | NR_FDD_FR1_F                                    |         |              |        |
|                           | NR_FDD_FR1_G                                    |         |              |        |
|                           | NR_FDD_FR1_H                                    |         |              |        |
| $I_o$ <sup>Note3</sup>    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup> | 1,2,4,5 | dBm/9.36 MHz | -74.28 |
|                           | NR_FDD_FR1_B                                    |         |              |        |
|                           | NR_TDD_FR1_C                                    |         |              |        |
|                           | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                   |         |              |        |
|                           | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                   |         |              |        |
|                           | NR_TDD_FR1_E                                    |         |              |        |

|   |     |                  |        |
|---|-----|------------------|--------|
| NR_FDD_FR1_F  |     |                  |        |
| NR_FDD_FR1_G  |     |                  |        |
| NR_FDD_FR1_H  |     |                  |        |
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A <sup>NOTE 5</sup>   | 3,6 | dBm/38.16<br>MHz | -68.18 |
| NR_FDD_FR1_B  |     |                  |        |
| NR_TDD_FR1_C  |     |                  |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D   |     |                  |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E   |     |                  |        |
| NR_FDD_FR1_F  |     |                  |        |
| NR_FDD_FR1_G  |     |                  |        |
| NR_FDD_FR1_H  |     |                  |        |
| Propagation condition   | 1~6 |                  | AWGN   |
| Antenna configuration   | 1~6 |                  | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_0</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |     |                  |        |

**Table A.4A.2.1.1.2-3: Timing offsets for SFTD accuracy test**

| Configuration | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
|---------------|-------------------------------------|---|
| 1             | 100                                 | -122000   |
| 2             | 300                                 | -60540  |
| 3             | 500                                 | 1000  |
| 4             | 700                                 | 62540   |
| 5             | 900                                 | 124000  |

**A.4A.2.1.1.3 Test Requirements**

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and E-UTRAN target cell. The reported SFTD accuracy shall fulfil the requirement in clause 10.1.21.1.

## A.5 EN-DC tests with one or more NR cells in FR2

### A.5.1 Void

### A.5.2 Void

### A.5.3 RRC\_CONNECTED state mobility

#### A.5.3.1 Void

#### A.5.3.2 RRC Connection Mobility Control

##### A.5.3.2.1 Void

##### A.5.3.2.2 Random Access

##### A.5.3.2.2.1 4-step RA type contention based random access test in FR2 for PSCell/SCell in EN-DC

##### A.5.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.1.1-1. UE capable of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.1.1-2 and Table A.5.3.2.2.1.1-3.

**Table A.5.3.2.2.1.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                                |
| 2      | LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                                |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.5.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter   |            | Unit     | Test-1   | Comments  |
|---|------------|----------|--|---|
| SSB Configuration   | Config 1,2 |          | SSB.1 FR2  | As defined in A.3.10  |
| CSI-RS for tracking   | Config 1,2 |          | TRS.2.1 TDD  |   |
| Duplex Mode for Cell 2  | Config 1,2 |          | TDD  |   |
| TDD Configuration   | Config 1,2 |          | TDDConf.3.1  |   |
| BW <sub>channel</sub>   | Config 1   | MHz      | 100: N <sub>RB,c</sub> = 24                        |   |
| OCNG Pattern <sup>Note 1</sup>  |            |          | OP.3   | As defined in A.3.2.1.  |
| PDSCH Reference Channel <sup>Note 2</sup>   | Config 1,2 |          | SR.3.1 TDD   | As defined in A.3.1.1.  |
| RMSI CORESET Reference Channel  | Config 1,2 |          | CR.3.1 TDD   | As defined in A.3.1.2   |
| Dedicated CORESET Reference Channel   | Config 1,2 |          | CCR.3.1 TDD  |   |
| NR RF Channel Number  |            |          | 1  |   |
| EPRE ratio of PSS to SSS  |            | dB       | 0  |   |
| EPRE ratio of PBCH_DMRS to SSS  |            | dB       |  |   |
| EPRE ratio of PBCH to PBCH_DMRS   |            | dB       |  |   |
| EPRE ratio of PDCCH_DMRS to SSS   |            | dB       |  |   |
| EPRE ratio of PDCCH to PDCCH_DMRS   |            | dB       |  |   |
| EPRE ratio of PDSCH_DMRS to SSS   |            | dB       |  |   |
| EPRE ratio of PDSCH to PDSCH_DMRS   |            | dB       |  |   |
| ss-PBCH-BlockPower  |            | dBm/ SCS | +20 + $\Delta_{UL}$                                | As defined in TS 38.331 [2].<br>$\Delta_{UL}$ is derived from the uplink calibration process <sup>Note 3</sup>  |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ )   |            | dBm      | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19]  |
| PRACH Configuration   |            |          | FR2 PRACH configuration 1                          | As defined in A.3.8.3, with exceptions as defined below.  |
| rsrp-ThresholdSSB   |            | dBm      | RSRP_69 + $\Delta_{DL}$                            | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process <sup>Note 4</sup> |
| preambleReceivedTargetPower   |            | dBm      | -100   | As defined in TS 38.331 [2]   |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> <p>Note 3: The <math>\Delta_{UL}</math> value is calculated as <math>-\text{ROUND}(\text{PPRACH}_0 - 1)</math>, where PPRACH<sub>0</sub> is the measured first PRACH power with -80.6dBm/SCS applied, <i>preambleReceivedTargetPower</i> = -100dBm and <i>ss-PBCH-BlockPower</i> = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.</p> <p>Note 4: The <math>\Delta_{DL}</math> value is calculated as <math>(\text{RSRP}_{\text{REP}} - \text{RSRP}_{76})</math>, where RSRP<sub>REP</sub> is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP<sub>x</sub>, x is treated as a positive integer value.</p> |            |          |  |   |

**Table A.5.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter  |                      | Unit          | Test-1  | Comments   |
|--|----------------------|---------------|---------|--|
| AoA setup  |                      |               | Setup 1 | As defined in A.3.15.1   |
| Assumption for UE beams <sup>Note 3</sup>  |                      |               | Rough   |  |
| SSB with index 0   | Es <sup>Note1</sup>  | dBm/SCS       | -80.6   | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -80.6   |  |
|  | Es/lot <sub>BB</sub> | dB            | 21.09   |  |
|  | lo                   | dBm/95.04 MHz | -56.01  | lo in symbols containing SSB index 0   |
| SSB with index 1   | Es <sup>Note1</sup>  | dBm/SCS       | -95.0   | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -95.0   |  |
|  | Es/lot <sub>BB</sub> | dB            | 6.69    |  |
|  | lo                   | dBm/95.04 MHz | -70.41  | lo in symbols containing SSB index 1   |
| Propagation Condition  |                      | -             | AWGN    |  |
| Note 1: No artificial noise is applied in this test.   |                      |               |         |  |
| Note 2: Void.  |                      |               |         |  |
| Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                      |               |         |  |

#### A.5.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.5.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.5.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

A.5.3.2.2.1.2.5 Void

A.5.3.2.2.1.2.6 Void

#### A.5.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

### A.5.3.2.2.2 4-step RA type non-contention based random access test in FR2 for PSCell/SCell in EN-DC

#### A.5.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.2.1-1. UE capable of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.2.1-2 and Table A.5.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2). Test 2 is only applicable to UE which supports csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

**Table A.5.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                                |
| 2      | LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                                |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.5.3.2.2.1-2: General test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter   |            | Unit     | Test-1   | Test-2   | Comments  |
|---|------------|----------|--|--|---|
| SSB Configuration   | Config 1,2 |          | SSB.1 FR2  | SSB.1 FR2  | As defined in A.3.1.0   |
| CSI-RS Configuration  | Config 1,2 |          | N/A  | CSI-RS.3.1 TDD                                     | As defined in A.3.1.4   |
| CSI-RS for tracking   | Config 1,2 |          | TRS.2.1 TDD  | TRS.2.1 TDD  |   |
| Duplex Mode for Cell 2  | Config 1,2 |          | TDD  | TDD  |   |
| TDD Configuration   | Config 1,2 |          | TDDConf.3.1  | TDDConf.3.1  |   |
| BW <sub>channel</sub>   | Config 1,2 | MHz      | 100: N <sub>RB,c</sub> = 24                        | 100: N <sub>RB,c</sub> = 24                        |   |
| OCNG Pattern <sup>Note 1</sup>  |            |          | OCNG pattern 1                                     | OCNG pattern 1                                     | As defined in A.3.2.1.  |
| PDSCH Reference Channel <sup>Note 2</sup>   | Config 1,2 |          | SR3.1 TDD  | SR3.1 TDD  | As defined in A.3.1.1.  |
| RMSI CORESET Reference Channel  | Config 1,2 |          | CR.3.1 TDD   | CR.3.1 TDD   | As defined in A.3.1.2   |
| Dedicated CORESET Reference Channel   | Config 1,2 |          | CCR.3.1 TDD  | CCR.3.1 TDD  |   |
| NR RF Channel Number  |            |          | 1  | 1  |   |
| EPRE ratio of PSS to SSS  |            | dB       | 0  | 0  |   |
| EPRE ratio of PBCH_DMRS to SSS  |            | dB       |  |  |   |
| EPRE ratio of PBCH to PBCH_DMRS   |            | dB       |  |  |   |
| EPRE ratio of PDCCH_DMRS to SSS   |            | dB       |  |  |   |
| EPRE ratio of PDCCH to PDCCH_DMRS   |            | dB       |  |  |   |
| EPRE ratio of PDSCH_DMRS to SSS   |            | dB       |  |  |   |
| EPRE ratio of PDSCH to PDSCH_DMRS   |            | dB       |  |  |   |
| ss-PBCH-BlockPower  |            | dBm/ SCS | +20 + $\Delta_{UL}$                                | +20 + $\Delta_{UL}$                                | As defined in TS 38.331 [2]. $\Delta_{UL}$ is derived from the uplink calibration process <sup>Note 3</sup>     |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ )   |            | dBm      | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19]  |
| PRACH Configuration   |            |          | FR2 PRACH configuration 2                          | FR2 PRACH configuration 3                          | As defined in A.3.8.3, with exceptions as defined below   |
| rsrp-ThresholdSSB   |            | dBm      | RSRP_69 + $\Delta_{DL}$                            | RSRP_69 + $\Delta_{DL}$                            | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process <sup>Note 4</sup> |
| preambleReceivedTargetPower   |            | dBm      | -100   | -100   | As defined in TS 38.331 [2]   |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> <p>Note 3: The <math>\Delta_{UL}</math> value is calculated as <math>-\text{ROUND}(\text{PPRACH}_0 - 1)</math>, where PPRACH<sub>0</sub> is the measured first PRACH power with -80.6dBm/SCS applied, <math>\text{preambleReceivedTargetPower} = -100\text{dBm}</math> and <math>\text{ss-PBCH-BlockPower} = 20\text{dBm}</math>. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.</p> <p>Note 4: The <math>\Delta_{DL}</math> value is calculated as <math>(\text{RSRP}_{\text{REP}} - \text{RSRP}_{76})</math>, where RSRP<sub>REP</sub> is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP<sub>x</sub>, x is treated as a positive integer value.</p> |            |          |  |  |   |

**Table A.5.3.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter  |                        | Unit          | Test-1  | Test-2  | Comments   |
|--|------------------------|---------------|---------|---------|--|
| AoA setup  |                        |               | Setup 1 | Setup 1 | As defined in A.3.15.1   |
| Assumption for UE beams <sup>Note 3</sup>  |                        |               | Rough   | Rough   |  |
| SSB with index 0   | $E_s$ <sup>Note1</sup> | dBm/SCS       | -80.6   | -80.6   | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP                 | dBm/SCS       | -80.6   | -80.6   |  |
|  | $E_s/lot_{BB}$         | dB            | 21.09   | 21.09   |  |
|  | $l_o$                  | dBm/95.04 MHz | -56.01  | -56.01  | $l_o$ in symbols containing SSB index 0  |
| SSB with index 1   | $E_s$ <sup>Note1</sup> | dBm/SCS       | -95.0   | -95.0   | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP                 | dBm/SCS       | -95.0   | -95.0   |  |
|  | $E_s/lot_{BB}$         | dB            | 6.69    | 6.69    |  |
|  | $l_o$                  | dBm/95.04 MHz | -70.41  | -70.41  | $l_o$ in symbols containing SSB index 1  |
| Propagation Condition  |                        | -             | AWGN    | AWGN    |  |
| Note 1: No artificial noise is applied in this test.   |                        |               |         |         |  |
| Note 2: void.  |                        |               |         |         |  |
| Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                        |               |         |         |  |

#### A.5.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.5.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.5.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS



38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.3 2-step RA type contention based random access test in FR2 for PSCell/SCell in EN-DC

##### A.5.3.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCcell in FR2. Supported test parameters are shown in Table A.5.3.2.2.3.1-1. UE capable of EN-DC with PSCell or SCcell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.3.1-2 and Table A.5.3.2.2.3.1-3.

**Table A.5.3.2.3.1-1: Supported test configurations for 2-step RA type contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability

**Table A.5.3.2.3.1-2: General test parameters for 2-step RA type contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter   | Unit   | Test-1      | Comments   |
|---|--|-------------|--|
| SSB Configuration   | Config 1,2   | SSB.1 FR2   | As defined in A.3.10   |
| Duplex Mode for Cell 2                                      | Config 1,2   | TDD         |  |
| TDD Configuration   | Config 1,2   | TDDConf.3.1 |  |
| BW <sub>channel</sub>                                       | Config 1   | MHz         | 100: NRB <sub>c</sub> = 24   |
| OCNG Pattern <sup>Note 1</sup>                              |  |             | OP.3   |
| PDSCH Reference Channel <sup>Note 2</sup>                   | Config 1,2   |             | SR.3.1 TDD   |
| RMSI CORESET Reference Channel                              | Config 1,2   |             | CR.3.1 TDD   |
| RMC CORESET Reference Channel                               | Config 1,2   |             | CCR.3.1 TDD  |
| NR RF Channel Number  |  |             | 1  |
| EPRE ratio of PSS to SSS                                    | dB   |             | 0  |
| EPRE ratio of PBCH_DMRS to SSS                              | dB   |             |  |
| EPRE ratio of PBCH to PBCH_DMRS                             | dB   |             |  |
| EPRE ratio of PDCCH_DMRS to SSS                             | dB   |             |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                           | dB   |             |  |
| EPRE ratio of PDSCH_DMRS to SSS                             | dB   |             |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                           | dB   |             |  |
| ss-PBCH-BlockPower  | dBm/ SCS   |             | +20 +ΔUL   |
|   |  |             | As defined in TS 38.331 [2].<br>ΔUL is derived from the uplink calibration process<br>Note 3                     |
| Configured UE transmitted power ( $P_{\text{CMAX}, f, c}$ ) | dBm  |             | maximum value configurable for certain power class   |
| MsgA Configuration  |  |             | FR2 MsgA configuration 1   |
| msgA-RSRP-ThresholdSSB                                      | dBm  |             | RSRP <sub>69</sub> +ΔDL  |
|   |  |             | RSRP <sub>69</sub> corresponds to -88dBm. ΔDL is derived from the downlink calibration process <sup>Note 4</sup> |
| msgA-PreambleReceivedTargetPower                            | dBm  |             | -100   |
|   |  |             | As defined in TS 38.331 [2]  |
| Note 1:   | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.   |             |  |
| Note 2:   | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |             |  |
| Note 3:   | The Δ <sub>UL</sub> value is calculated as -ROUND(P <sub>MsgA0</sub> -1), where P <sub>MsgA0</sub> is the measured first MsgA PRACH power with -80.6dBm/SCS applied, msgA-PreambleReceivedTargetPower = -100dBm and ss-PBCH-BlockPower = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.  |             |  |
| Note 4:   | The Δ <sub>DL</sub> value is calculated as (RSRP <sub>REP</sub> - RSRP <sub>76</sub> ), where RSRP <sub>REP</sub> is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP <sub>x</sub> , x is treated as a positive integer value. |             |  |

**Table A.5.3.2.2.3.1-3: OTA-related test parameters for 2-step RA type contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter  |                      | Unit          | Test-1  | Comments  |
|--|----------------------|---------------|---------|---|
| AoA setup  |                      |               | Setup 1 | As defined in A.3.15.1  |
| Assumption for UE beams <sup>Note 2</sup>  |                      |               | Rough   |   |
| SSB with index 0   | Es <sup>Note1</sup>  | dBm/SCS       | -80.6   | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -80.6   |   |
|  | Es/lot <sub>BB</sub> | dB            | 21.09   |   |
|  | lo                   | dBm/95.04 MHz | -56.01  | lo in symbols containing SSB index 0  |
| SSB with index 1   | Es <sup>Note1</sup>  | dBm/SCS       | -95.0   | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -95.0   |   |
|  | Es/lot <sub>BB</sub> | dB            | 6.69    |   |
|  | lo                   | dBm/95.04 MHz | -70.41  | lo in symbols containing SSB index 1  |
| Propagation Condition  |                      | -             | AWGN    |   |
| Note 1: No artificial noise is applied in this test.   |                      |               |         |   |
| Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                      |               |         |   |

#### A.5.3.2.2.3.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.5.3.2.2.3.2.1 MsgA Transmission

To test the UE behaviour specified in Clause 6.2.2.3.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble transmission shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA PRACH and MsgA PUSCH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.5.3.2.2.3.2.2 MsgB Reception

To test the UE behaviour specified in Clause 6.2.2.3.1.2 the System Simulator shall transmit a MsgB with successRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB(s) and shall transmit an ACK if the MsgB with a successRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble and if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgBs contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble transmission shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm

with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.3.2.3 No MsgB Reception

To test the UE behaviour specified in clause 6.2.2.3.1.3 the System Simulator shall transmit a MsgB with successRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the RA Response window.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble transmission shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA PRACH and MsgA PUSCH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.4 2-step RA type non-contention based random access test in FR2 for PSCell/SCell in EN-DC

##### A.5.3.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.4.1-1. UE capable of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.4.1-2 and Table A.5.3.2.2.4.1-3 for SSB-based non-contention based random access test.

**Table A.5.3.2.2.4.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Config | Description   |
|--------|---|
| 1      | LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                                |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.5.3.2.4.1-2: General test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter  |  | Unit     | Test-1   | Comments   |
|--|--|----------|--|--|
| SSB Configuration                                    | Config 1   |          | SSB.1 FR2  | As defined in A.3.10   |
| Duplex Mode for Cell 2                               | Config 1   |          | TDD  |  |
| TDD Configuration                                    | Config 1   |          | TDDConf.3.1  |  |
| BW <sub>channel</sub>                                | Config 1   | MHz      | 100: N <sub>RB,c</sub> = 24                        |  |
| OCNG Pattern <sup>Note 1</sup>                       |  |          | OCNG pattern 1                                     | As defined in A.3.2.1.   |
| PDSCH Reference Channel <sup>Note 2</sup>            | Config 1   |          | SR3.1 TDD  | As defined in A.3.1.1.   |
| RMSI CORESET Reference Channel                       | Config 1   |          | CR.3.1 TDD   | As defined in A.3.1.2  |
| RMC CORESET Reference Channel                        | Config 1   |          | CCR.3.1 TDD  |  |
| NR RF Channel Number                                 |  |          | 1  |  |
| EPRE ratio of PSS to SSS                             |  | dB       | 0  |  |
| EPRE ratio of PBCH_DMRS to SSS                       |  | dB       |  |  |
| EPRE ratio of PBCH to PBCH_DMRS                      |  | dB       |  |  |
| EPRE ratio of PDCCH_DMRS to SSS                      |  | dB       |  |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                    |  | dB       |  |  |
| EPRE ratio of PDSCH_DMRS to SSS                      |  | dB       |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                    |  | dB       |  |  |
| ss-PBCH-BlockPower                                   |  | dBm/ SCS |  | +20 + $\Delta_{UL}$  |
| Configured UE transmitted power ( $P_{CMAX, f, c}$ ) |  | dBm      | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19]   |
| MsgA Configuration                                   |  |          | FR2 MsgA configuration 2                           | As defined in A.3.20.3.2, with exceptions as defined below   |
| msgA-RSRP-ThresholdSSB                               |  | dBm      | RSRP <sub>69</sub> + $\Delta_{DL}$                 | RSRP <sub>69</sub> corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process <sup>Note 4</sup> |
| preambleReceivedTargetPower                          |  | dBm      | -100   | As defined in TS 38.331 [2]  |
| Note 1:  | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.   |          |  |  |
| Note 2:  | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |          |  |  |
| Note 3:  | The $\Delta_{UL}$ value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, <i>msgA-PreambleReceivedTargetPower</i> = -100dBm and <i>ss-PBCH-BlockPower</i> = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.  |          |  |  |
| Note 4:  | The $\Delta_{DL}$ value is calculated as (RSRP <sub>REP</sub> – RSRP <sub>76</sub> ), where RSRP <sub>REP</sub> is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP <sub>x</sub> , x is treated as a positive integer value. |          |  |  |

**Table A.5.3.2.4.1-3: OTA-related test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter  |                         | Unit          | Test-1  | Comments  |
|--|-------------------------|---------------|---------|---|
| AoA setup  |                         |               | Setup 1 | As defined in A.3.15.1  |
| Assumption for UE beams <sup>Note 2</sup>  |                         |               | Rough   |   |
| SSB with index 0   | $E_s$ <sup>Note 1</sup> | dBm/SCS       | -80.6   | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP                  | dBm/SCS       | -80.6   |   |
|  | $E_s/lot_{BB}$          | dB            | 21.09   |   |
|  | $l_o$                   | dBm/95.04 MHz | -56.01  | $l_o$ in symbols containing SSB index 0   |
| SSB with index 1   | $E_s$ <sup>Note 1</sup> | dBm/SCS       | -95.0   | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP                  | dBm/SCS       | -95.0   |   |
|  | $E_s/lot_{BB}$          | dB            | 6.69    |   |
|  | $l_o$                   | dBm/95.04 MHz | -70.41  | $l_o$ in symbols containing SSB index 1   |
| Propagation Condition  |                         | -             | AWGN    |   |
| Note 1: No artificial noise is applied in this test.   |                         |               |         |   |
| Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                         |               |         |   |

#### A.5.3.2.2.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.5.3.2.2.4.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2.3.2.1, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA PRACH on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.5.3.2.2.4.2.3 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.2.2 the System Simulator shall transmit a MsgB containing a fallbackRAR MAC subPDU.

The UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH and monitoring contention resolution as described in clause 8.2A in TS 38.213 [3].

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA and msg3 transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.4.2.4 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.2.3 the System Simulator shall transmit a MsgB containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.3 Void

## A.5.4 Timing

### A.5.4.1 UE transmit timing

#### A.5.4.1.1 NR UE Transmit Timing Test for FR2

##### A.5.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 5.4.1.1.1-1.

**Table A.5.4.1.1.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2             | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.3.7.2.1. Tables A.5.4.1.1.1-2 and A.5.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.5.4.1.1.1-3.

**Table A.5.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test1 | Test2 | Band Group |
|-----------|------|--------|-------|-------|------------|
|-----------|------|--------|-------|-------|------------|

|   |     |     |                             |                             |  |
|---|-----|-----|-----------------------------|-----------------------------|--|
| SSB ARFCN   |     | 1,2 | Freq1                       | Freq1                       |  |
| Duplex Mode   |     | 1,2 | TDD                         |                             |  |
| TDD configuration   |     | 1,2 | TDDConf.3.1                 |                             |  |
| BW <sub>channel</sub>   | MHz | 1,2 | 100: N <sub>RB,c</sub> = 66 |                             |  |
| Data RBs allocated  |     | 1,2 | 66                          |                             |  |
| Initial BWP Configuration   |     | 1,2 | DLBWP.0.1<br>ULBWP.0.1      |                             |  |
| Dedicated BWP Configuration   |     | 1,2 | DLBWP.1.1<br>ULBWP.1.1      |                             |  |
| TRS Configuration   |     | 1,2 | TRS.2.1 TDD                 |                             |  |
| PDSCH/PDCCH TCI state   |     | 1,2 | TCI.State.2                 |                             |  |
| DRx Cycle   | ms  | 1,2 | N/A                         | DRX.8 <sup>Note5</sup>      |  |
| PDSCH Reference measurement channel   |     | 1,2 | SR.3.3 TDD                  |                             |  |
| RMSI CORESET Reference Channel  |     | 1,2 | CR.3.2 TDD                  |                             |  |
| Dedicated CORESET Reference Channel   |     | 1,2 | CCR.3.7 TDD                 |                             |  |
| OCNG Patterns   |     | 1,2 | O P.1                       |                             |  |
| SSB Configuration   |     | 1,2 | SSB.4 FR2                   |                             |  |
| SMTc Configuration  |     | 1,2 | SMTc.1                      |                             |  |
| PDSCH/PDCCH subcarrier spacing  | kHz | 1,2 | 120                         |                             |  |
| EPRE ratio of PSS to SSS  | dB  | 1,2 | 0                           | 0                           |  |
| EPRE ratio of PBCH DMRS to SSS  |     |     |                             |                             |  |
| EPRE ratio of PBCH to PBCH DMRS   |     |     |                             |                             |  |
| EPRE ratio of PDCCH DMRS to SSS   |     |     |                             |                             |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |     |     |                             |                             |  |
| EPRE ratio of PDSCH DMRS to SSS   |     |     |                             |                             |  |
| EPRE ratio of PDSCH to PDSCH  |     |     |                             |                             |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |     |     |                             |                             |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |     |     |                             |                             |  |
| Propagation condition   |     |     |                             |                             |  |
| SRS Config  |     | 1,2 | SRSCConf.1 <sup>Note6</sup> | SRSCConf.2 <sup>Note6</sup> |  |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: Void</p> <p>Note 4: Void</p> <p>Note 5: DRx related parameters are given in Table A.3.3.8-1</p> <p>Note 6: SRS configs are given in Table A.5.4.1.1.1-3</p> |     |     |                             |                             |  |



Table A.5.4.1.1.1-2A: OTA related test parameters

| Parameter                                 | Unit   | Test 1                               | Test 2 |
|---|--|--------------------------------------|--------|
| Angle of arrival configuration            |  | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 6</sup> |  | Fine                                 |        |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sup>Note4</sup>   | -112                                 |        |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sup>Note3</sup>   | -100                                 |        |
| $\hat{E}_s/N_{oc}$                        | dB   | 4                                    |        |
| SS-RSRP <sup>Note2</sup>                  | dBm/SCS <sup>Note4</sup>   | -96                                  |        |
| $\hat{E}_s/I_{ot}$                        | dB   | 4                                    |        |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sup>Note4</sup>   | -68.5                                |        |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                      |        |
| Note 2:                                   | SSB_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                                      |        |
| Note 3:                                   | Void   |                                      |        |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                                      |        |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |                                      |        |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                      |        |

Table A.5.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

|                 | Field                               | SRSCConf.1 | SRSCConf.2 | Comments                             |
|-----------------|-------------------------------------|------------|------------|--------------------------------------|
| SRS-ResourceSet | srs-ResourceSetId                   | 0          | 0          |                                      |
|                 | srs-ResourceSetList                 | 0          | 0          |                                      |
|                 | resourceType                        | Periodic   | Periodic   |                                      |
|                 | Usage                               | Codebook   | Codebook   |                                      |
| SRS-Resource    | SRS-ResourceSetId                   | 0          | 0          |                                      |
|                 | nrofSRS-Ports                       | Port1      | Port1      |                                      |
|                 | transmissionComb                    | n2         | n2         |                                      |
|                 | combOffset-n2                       | 0          | 0          |                                      |
|                 | cyclicShift-n2                      | 0          | 0          |                                      |
|                 | resourceMapping<br>startPosition    | 0          | 0          |                                      |
|                 | resourceMapping<br>nrofSymbols      | n1         | n1         |                                      |
|                 | resourceMapping<br>repetitionFactor | n1         | n1         |                                      |
|                 | freqDomainPosition                  | 0          | 0          |                                      |
|                 | freqDomainShift                     | 0          | 0          |                                      |
|                 | freqHopping<br>c-SRS                | 17         | 17         | Matches $N_{RB,c}$                   |
|                 | freqHopping<br>b-SRS                | 0          | 0          |                                      |
|                 | freqHopping<br>b-hop                | 0          | 0          |                                      |
|                 | groupOrSequenceHopping              | Neither    | Neither    |                                      |
|                 | resourceType                        | Periodic   | Periodic   |                                      |
|                 | periodicityAndOffset-p              | sl1,0      | sl2560,4   | Offset to align with DRx periodicity |
|                 | sequenceId                          | 0          | 0          | Any 10 bit number                    |

**Table A.5.4.1.1.1-4: Void****A.5.4.1.1.2 Test requirements**

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.2-1 and setup NR PSCell according to parameters given in Table A.5.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 13792
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.5.4.1.1.2-1

**Table A.5.4.1.1.2-1 Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value    |                     |
|--------------------------|---------------------|---------------------|
|                          | Test1               | Test2               |
| 240                      | +8*64T <sub>c</sub> | +4*64T <sub>c</sub> |

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

**A.5.4.2 UE timer accuracy****A.5.4.3 Timing advance****A.5.4.3.1 EN-DC FR2 timing advance adjustment accuracy****A.5.4.3.1.1 Test Purpose and Environment**

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

**A.5.4.3.1.2 Test Parameters**

Supported test configurations are shown in table A.5.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.5.4.3.1.2-2, A.5.4.3.1.2-3, A.5.4.3.1.2-3A and A.5.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in clause A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.5.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to

31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.5.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in clause 7.3.2.1, the UE adjusts its uplink timing at slot  $n+k$  for a timing advance command received in slot  $n$ . This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

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

**Table A.5.4.3.1.2-1: Timing advance supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.4.3.1.2-2: General test parameters for timing advance**

| Parameter  | Unit | Value                  | Comment   |
|--|------|------------------------|---|
| RF channel number                                |      | Cell 1: 1<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>2 for NR PSCell  |
| Initial DL BWP                                   |      | DLBWP.0.1              | As specified in Table A.3.9.2.1-1   |
| Dedicated DL BWP                                 |      | DLBWP.1.1              | As specified in Table A.3.9.2.2-1   |
| Initial UL BWP                                   |      | ULBWP.0.1              | As specified in Table A.3.9.3.1-1   |
| Dedicated UL BWP                                 |      | ULBWP.1.1              | As specified in Table A.3.9.3.2-1   |
| Timing Advance Command ( $T_A$ ) value during T1 |      | 31                     | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ( $T_A$ ) value during T2 |      | 39                     | For 120 kHz SCS $N_{TA\_new} = N_{TA\_old} + 1024 * T_c$ (based on equation in clause 4.2 of TS 38.213 [3])   |
| T1   | s    | 5                      |   |
| T2   | s    | 5                      |   |

Table A.5.4.3.1.2-3: Cell specific test parameters for timing advance

| Parameter   | Unit | Test1                       |    |
|---|------|-----------------------------|----|
|   |      | T1                          | T2 |
| Duplex mode   |      | TDD                         |    |
| TDD configuration   |      | TDDConf.3.1                 |    |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |    |
| BWP BW  | MHz  | 100: N <sub>RB,c</sub> = 66 |    |
| DRx Cycle   | ms   | Not Applicable              |    |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  |    |
| RMSI CORESET Reference Channel  |      | CR.3.1 TDD                  |    |
| Dedicated CORESET Reference Channel   |      | CCR.3.1 TDD                 |    |
| TRS configuration   |      | TRS.2.1 TDD                 |    |
| PDSCH/PDCCH TCI state   |      | TCI.State.2                 |    |
| OCNG Patterns   |      | OCNG pattern 1              |    |
| SMTC configuration  |      | SMTC.1 FR2                  |    |
| SSB configuration   |      | SSB.3 FR2                   |    |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120 kHz                     |    |
| PUCCH/PUSCH subcarrier spacing  | kHz  | 120 kHz                     |    |
| EPRE ratio of PSS to SSS  | dB   | 0                           |    |
| EPRE ratio of PBCH DMRS to SSS  |      |                             |    |
| EPRE ratio of PBCH to PBCH DMRS   |      |                             |    |
| EPRE ratio of PDCCH DMRS to SSS   |      |                             |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                             |    |
| EPRE ratio of PDSCH DMRS to SSS   |      |                             |    |
| EPRE ratio of PDSCH to PDSCH  |      |                             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |      |                             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                             |    |
| Propagation condition   |      |                             |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |    |

Table A.5.4.3.1.2-3A: OTA related test parameters

| Parameter   | Unit                           | Test 1                               |    |
|---|--------------------------------|--------------------------------------|----|
|   |                                | T1                                   | T2 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |    |
| Assumption for UE beams <sup>Note6</sup>  |                                | Fine                                 |    |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -112                                 |    |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -103                                 |    |
| $\hat{E}_s/N_{oc}$  | dB                             | 4                                    |    |
| SS-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -99                                  |    |
| $\hat{E}_s/I_{ot}$  | dB                             | 4                                    |    |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -68.5                                |    |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |    |

Table A.5.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

| Field  | Value       | Comment   |
|--|-------------|---|
| c-SRS  | 16          | Frequency hopping is disabled   |
| b-SRS  | 0           |   |
| b-hop  | 0           |   |
| freqDomainPosition   | 0           | Frequency domain position of SRS  |
| freqDomainShift  | 0           |   |
| groupOrSequenceHopping   | neither     | No group or sequence hopping  |
| SRS-PeriodicityAndOffset   | s15=4       | Once every 5 slots  |
| pathlossReferenceRS  | ssb-Index=0 | SSB #0 is used for SRS path loss estimation   |
| usage  | Codebook    | Codebook based UL transmission  |
| startPosition  | 0           | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols  | n1          |   |
| repetitionFactor   | n1          |   |
| combOffset-n2  | 0           | transmissionComb setting  |
| cyclicShift-n2   | 0           |   |
| nrofSRS-Ports  | port1       | Number of antenna ports used for SRS transmission   |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |             |   |

### A.5.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e.  $k+1$  slots after the reception of the timing advance command, where  $k = 11$ .

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

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

## A.5.5 Signaling characteristics

### A.5.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

*Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.*

#### A.5.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

##### A.5.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.5.5.1.1.1-1. The test parameters are given in Tables A.5.5.1.1.1-2, A.5.5.1.1.1-3, and A. 5.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.5.5.1.1.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

**Table A.5.5.1.1.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode              |
| 2             | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode              |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

Table A.5.5.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

| Parameter   |  | Unit | Value                       |
|---|--|------|-----------------------------|
|   |  |      | Test 1                      |
| Active E-UTRA PCell   |  |      | Cell 1                      |
| E-UTRA RF Channel Number  |  |      | 1                           |
| Active PSCell   |  |      | Cell 2                      |
| RF Channel Number   |  |      | 2                           |
| Duplex mode   | Config 1, 2  |      | TDD                         |
| BW <sub>channel</sub>   | Config 1, 2  |      | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated  | Config 1, 2  |      | 24                          |
| DL initial BWP configuration  | Config 1, 2  |      | DLBWP.0.1                   |
| DL dedicated BWP configuration  | Config 1, 2  |      | DLBWP.1.1                   |
| UL initial BWP configuration  | Config 1, 2  |      | ULBWP.0.1                   |
| UL dedicated BWP configuration  | Config 1, 2  |      | ULBWP.1.1                   |
| TDD Configuration   | Config 1, 2  |      | TDDConf.3.1                 |
| RMSI CORESET Reference Channel  | Config 1, 2  |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | Config 1, 2  |      | CCR.3.4 TDD                 |
| SSB Configuration   | Config 1, 2  |      | SSB.1 FR2                   |
| SMTC Configuration  | Config 1, 2  |      | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing  | Config 1, 2  |      | 120 KHz                     |
| PRACH Configuration   | Config 1, 2  |      | Table A.3.8.3.4             |
| SSB index assigned as RLM RS  | Config 1, 2  |      | 0,1                         |
| OCNG parameters   |  |      | OP.5                        |
| CP length   |  |      | Normal                      |
| Out of sync transmission parameters   | DCI format   |      | 1-0                         |
|   | Number of Control OFDM symbols                                   |      | 2                           |
|   | Aggregation level  | CCE  | 8                           |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|   | DMRS precoder granularity  |      | REG bundle size             |
| REG bundle size   |  |      | 6                           |
| DRX   |  |      | OFF                         |
| Gap pattern ID  |  |      | gp0                         |
| Layer 3 filtering   |  |      | Enabled                     |
| T310 timer  |  | ms   | 0                           |
| T311 timer  |  | ms   | 1000                        |
| N310  |  |      | 1                           |
| N311  |  |      | 1                           |
| CSI-RS for CSI reporting  | Config 1, 2  |      | CSI-RS.3.1 TDD              |
| reportConfigType  |  |      | periodic                    |
| reportQuantity  |  |      | cri-RI-PMI-CQI              |
| CSI reporting periodicity   |  | slot | 40                          |
| CSI reporting offset  |  | slot | 4                           |
| TCI states for PDCCH/PDSCH  |  |      | TCI.State.2                 |
| CSI-RS for tracking   | Config 1, 2  |      | TRS.2.1 TDD                 |
| T1  |  | s    | 0.2                         |
| T2  |  | s    | 9.68                        |
| T3  |  | s    | 9.68                        |
| D1  |  | s    | 9.64                        |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |      |                             |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |      |                             |
| Note 3: E-UTRAN is in non-DRX mode under test.  |  |      |                             |

**Table A.5.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter  |             | Unit          | Test 1                          |    |    |                 |    |    |                     |                      |     |
|--|-------------|---------------|---------------------------------|----|----|-----------------|----|----|---------------------|----------------------|-----|
|  |             |               | T1                              | T2 | T3 | T1              | T2 | T3 |                     |                      |     |
| AoA setup  |             |               | Setup 3 defined in A.3.15       |    |    |                 |    |    |                     |                      |     |
|  |             |               | AoA1                            |    |    | AoA2            |    |    |                     |                      |     |
| Assumption for UE beams <sup>Note 5</sup>  |             |               | Rough                           |    |    | Rough           |    |    |                     |                      |     |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB            | 4                               |    |    | Not sent        |    |    |                     |                      |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |             | dB            | 0                               |    |    |                 |    |    |                     |                      |     |
| EPRE ratio of PBCH DMRS to SSS   |             | dB            |                                 |    |    |                 |    |    |                     |                      |     |
| EPRE ratio of PBCH to PBCH DMRS  |             | dB            |                                 |    |    |                 |    |    |                     |                      |     |
| EPRE ratio of PSS to SSS   |             | dB            |                                 |    |    |                 |    |    |                     |                      |     |
| EPRE ratio of PDSCH DMRS to SSS  |             | dB            |                                 |    |    |                 |    |    |                     |                      |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |             | dB            |                                 |    |    |                 |    |    |                     |                      |     |
| EPRE ratio of OCNG DMRS to SSS   |             | dB            |                                 |    |    |                 |    |    |                     |                      |     |
| EPRE ratio of OCNG to OCNG DMRS  |             | dB            |                                 |    |    |                 |    |    |                     |                      |     |
| ssb-Index 0 SNR  | Config 1, 2 | dB            |                                 |    |    |                 |    |    | 2 <sup>Note 6</sup> | -6 <sup>Note 6</sup> | -15 |
| ssb-Index 1 SNR  | Config 1, 2 |               |                                 |    |    | Not sent        |    |    | 2 <sup>Note 6</sup> | -15                  | -15 |
| $N_{oc}$   | Config 1, 2 | dBm/<br>15kHz | -92.1                           |    |    | -92.1           |    |    |                     |                      |     |
| Time multiplexing of the downlink transmissions from each AoA  |             |               | Defined in Figure A.5.5.1.1.1-2 |    |    |                 |    |    |                     |                      |     |
| Propagation condition  |             |               | TDL-A 30ns 75Hz                 |    |    | TDL-A 30ns 75Hz |    |    |                     |                      |     |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |             |               |                                 |    |    |                 |    |    |                     |                      |     |

**Table A.5.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode**

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



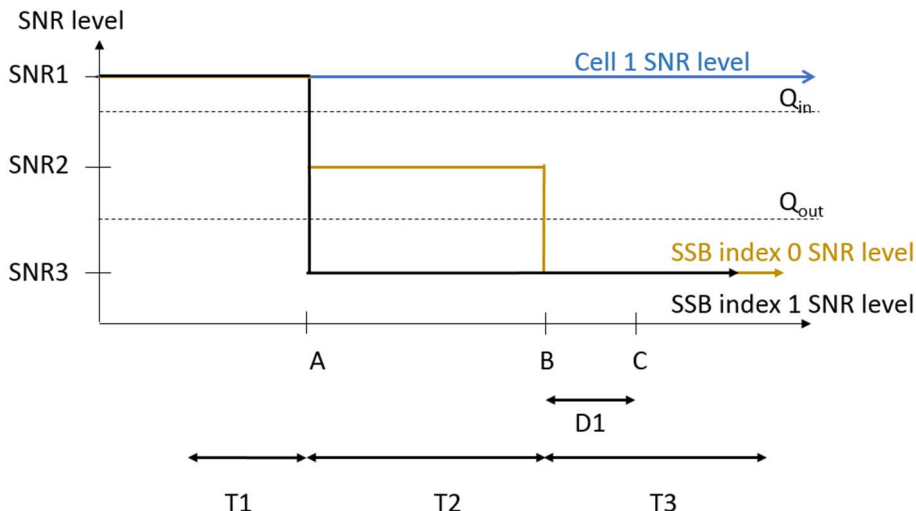


Figure A.5.5.1.1.1-1: SNR variation for out-of-sync testing

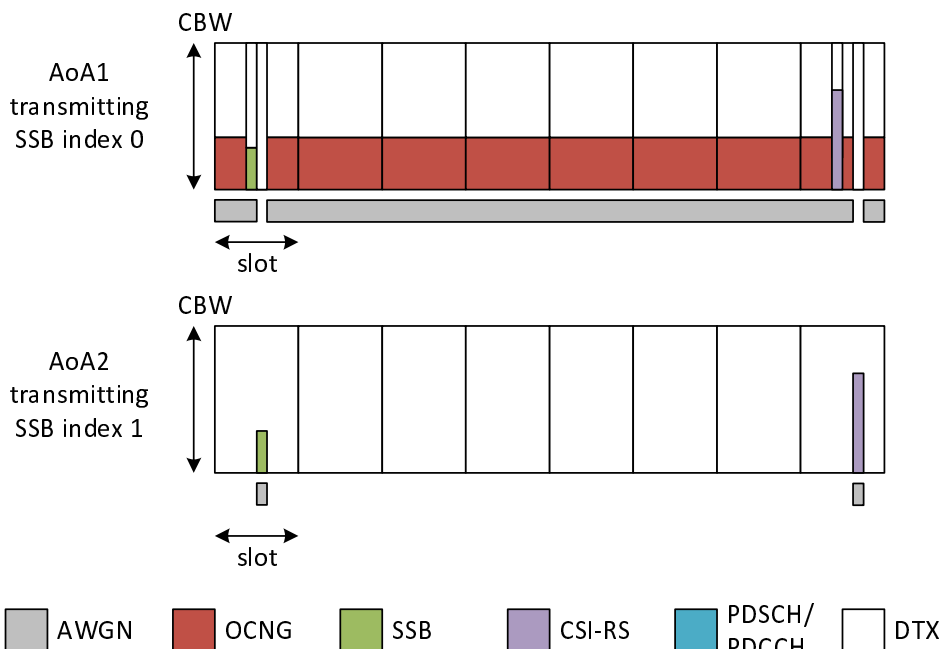


Figure A.5.5.1.1.1-2: Time multiplexed downlink transmissions

A.5.5.1.1.2 Test Requirements

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

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

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

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

## A.5.5.1.2 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

### A.5.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.5.5.1.2.1-1. The test parameters are given in Tables A.5.5.1.2.1-2, and A.5.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.5.5.1.2.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms.

**Table A.5.5.1.2.1-1: Supported test configurations for FR2 PSCell**

| Configuration  | Description   |
|--|---|
| 1  | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 |   |

**Table A.5.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode**

| Parameter                           |  | Unit | Value                |
|-------------------------------------|--|------|----------------------|
|                                     |  |      | Test 1               |
| Active E-UTRA PCell                 |  |      | Cell 1               |
| E-UTRA RF Channel Number            |  |      | 1                    |
| Active PSCell                       |  |      | Cell 2               |
| RF Channel Number                   |  |      | 2                    |
| Duplex mode                         | Config 1, 2  |      | TDD                  |
| $BW_{channel}$                      | Config 1, 2  |      | 100: $N_{RB,c} = 66$ |
| Data RBs allocated                  | Config 1, 2  |      | 24                   |
| DL initial BWP configuration        | Config 1, 2  |      | DLBWP.0.1            |
| DL dedicated BWP configuration      | Config 1, 2  |      | DLBWP.1.1            |
| UL initial BWP configuration        | Config 1, 2  |      | ULBWP.0.1            |
| UL dedicated BWP configuration      | Config 1, 2  |      | ULBWP.1.1            |
| TDD Configuration                   | Config 1, 2  |      | TDDConf.3.1          |
| RMSI CORESET Reference Channel      | Config 1, 2  |      | CR.3.1 TDD           |
| Dedicated CORESET Reference Channel | Config 1, 2  |      | CCR.3.1 TDD          |
| SSB Configuration                   | Config 1, 2  |      | SSB.1 FR2            |
| SMTC Configuration                  | Config 1, 2  |      | SMTC.3               |
| PDSCH/PDCCH subcarrier spacing      | Config 1, 2  |      | 120 KHz              |
| PRACH Configuration                 | Config 1, 2  |      | Table A.3.8.3.4      |
| SSB index assigned as RLM RS        | Config 1, 2  |      | 0,1                  |
| OCNG parameters                     |  |      | OP.5                 |
| CP length                           |  |      | Normal               |
| In sync transmission parameters     | DCI format   |      | 1-0                  |
|                                     | Number of Control OFDM symbols                                 |      | 2                    |
|                                     | Aggregation level  | CCE  | 4                    |
|                                     | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB   | 0                    |

|                                     |   |     |                 |
|-------------------------------------|---|-----|-----------------|
|                                     | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy                | dB  | 0               |
|                                     | DMRS precoder granularity   |     | REG bundle size |
|                                     | REG bundle size   |     | 6               |
| Out of sync transmission parameters | DCI format  |     | 1-0             |
|                                     | Number of Control OFDM symbols  |     | 2               |
|                                     | Aggregation level   | CCE | 8               |
|                                     | Ratio of hypothetical PDCCH RE energy to average SSS RE energy                  | dB  | 4               |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy                | dB  | 4               |
|                                     | DMRS precoder granularity   |     | REG bundle size |
|                                     | REG bundle size   |     | 6               |
| DRX                                 |   |     | OFF             |
| Gap pattern ID                      |   |     | N.A.            |
| Layer 3 filtering                   |   |     | Enabled         |
| T310 timer                          | ms  |     | 4000            |
| T311 timer                          | ms  |     | 1000            |
| N310                                |   |     | 1               |
| N311                                |   |     | 1               |
| CSI-RS for CSI reporting            | Config 1, 2   |     | CSI-RS.3.1 TDD  |
| reportConfigType                    |   |     | periodic        |
| reportQuantity                      |   |     | cri-RI-PMI-CQI  |
| CSI reporting periodicity           | slot  |     | 40              |
| CSI reporting offset                | slot  |     | 4               |
| TCI states for PDCCH/PDSCH          |   |     | TCI.State.2     |
| CSI-RS for tracking                 | Config 1, 2   |     | TRS.2.1 TDD     |
| T1                                  | s   |     | 0.2             |
| T2                                  | s   |     | 0.2             |
| T3                                  | s   |     | 1.88            |
| T4                                  | s   |     | 0.2             |
| T5                                  | s   |     | 3.84            |
| D1                                  | s   |     | 3.8             |
| Note 1:                             | All configurations are assigned to the UE prior to the start of time period T1. |     |                 |
| Note 2:                             | UE-specific PDCCH is not transmitted after T1 starts.                           |     |                 |
| Note 3:                             | E-UTRAN is in non-DRX mode under test.  |     |                 |

**Table A.5.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter   | Unit  | Test 1                    |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
|---|---|---------------------------|---------------------------------|----|----|----|----------|-----------------|----|----|----|----|---------------------|----------------------|-----|------|
|   |   | T1                        | T2                              | T3 | T4 | T5 | T1       | T2              | T3 | T4 | T5 |    |                     |                      |     |      |
| AoA setup   |   | Setup 3 defined in A.3.15 |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
|   |   | AoA1                      |                                 |    |    |    | AoA2     |                 |    |    |    |    |                     |                      |     |      |
| Assumption for UE beams <sup>Note 5</sup>                     |   | Rough                     |                                 |    |    |    | Rough    |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of PDCCH DMRS to SSS                               | dB  | 0                         |                                 |    |    |    | Not sent |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of PDCCH to PDCCH DMRS                             | dB  | 0                         |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of PBCH DMRS to SSS                                | dB  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of PBCH to PBCH DMRS                               | dB  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of PSS to SSS                                      | dB  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of PDSCH DMRS to SSS                               | dB  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of PDSCH to PDSCH DMRS                             | dB  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of OCNG DMRS to SSS                                | dB  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| EPRE ratio of OCNG to OCNG DMRS                               | dB  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| ssb-Index 0 SNR   | Config 1, 2   |                           |                                 |    |    |    |          |                 |    |    |    | dB | 2 <sup>Note 6</sup> | -6 <sup>Note 6</sup> | -15 | -4.5 |
| ssb-Index 1 SNR   | Config 1, 2   |                           |                                 |    |    |    |          | Not sent        |    |    |    |    | 2 <sup>Note 6</sup> | -15                  | -15 | -15  |
| $N_{oc}$  | Config 1, 2   | dBm/15KH z                | -92.1                           |    |    |    |          | -92.1           |    |    |    |    |                     |                      |     |      |
| Time multiplexing of the downlink transmissions from each AoA |   |                           | Defined in Figure A.5.5.1.2.1-2 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| Propagation condition   |   |                           | TDL-A 30ns 75Hz                 |    |    |    |          | TDL-A 30ns 75Hz |    |    |    |    |                     |                      |     |      |
| Note 1:   | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| Note 2:   | The signal contains PDCCH for UEs other than the device under test as part of OCNG.   |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| Note 3:   | SNR levels correspond to the signal to noise ratio over the SSS REs.  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| Note 4:   | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| Note 5:   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |
| Note 6:   | This value allows up to 1dB degradation from applied SNR to UE baseband   |                           |                                 |    |    |    |          |                 |    |    |    |    |                     |                      |     |      |

Table A.5.5.1.2.1-4: Void

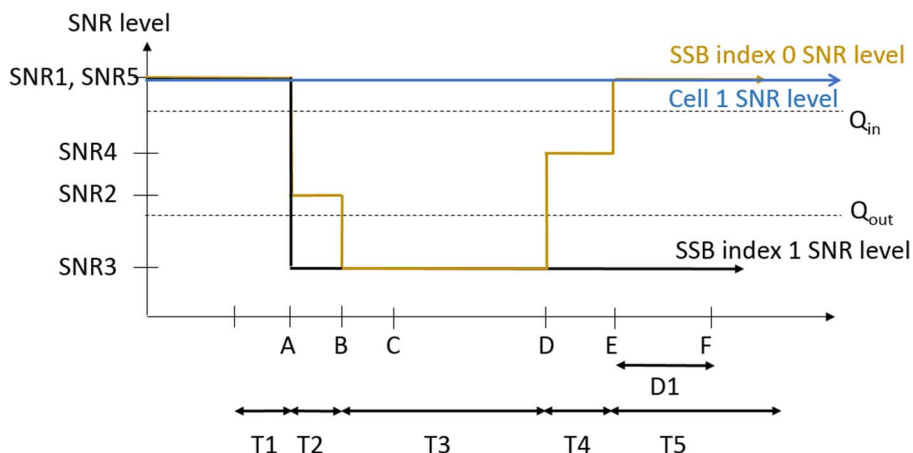


Figure A.5.5.1.2.1-1: SNR variation for in-sync testing

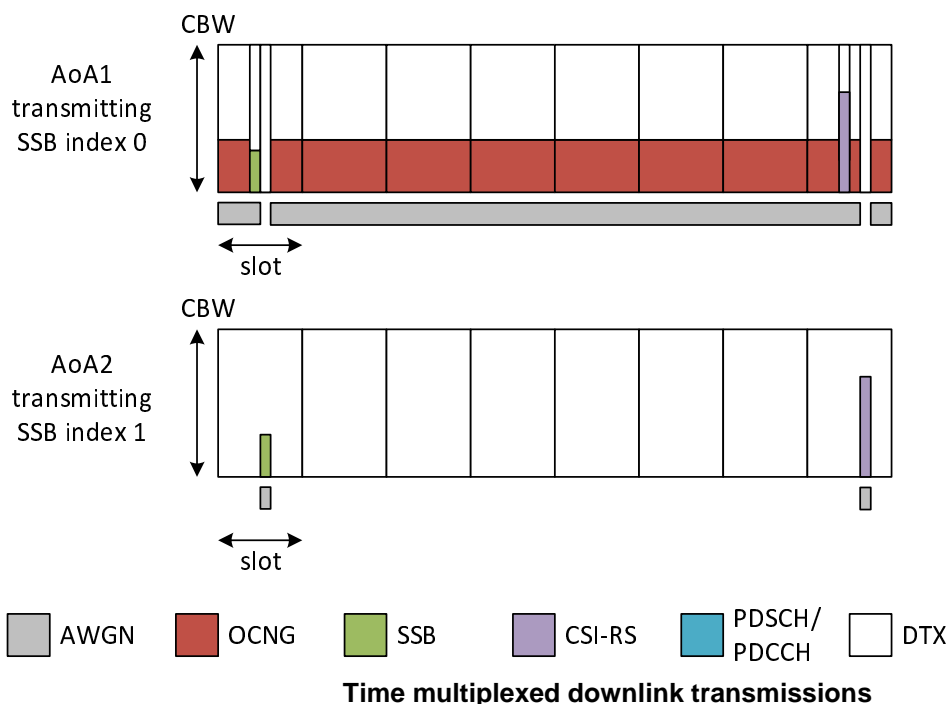


Figure A.5.5.1.2.1-2:

A.5.5.1.2.2 Test Requirements

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

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

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

### A.5.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

#### A.5.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.5.5.1.3.1-1. The test parameters are given in Tables A.5.5.1.3.1-2, and A.5.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.5.5.1.3.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode              |
| 2             | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode              |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

Table A.5.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

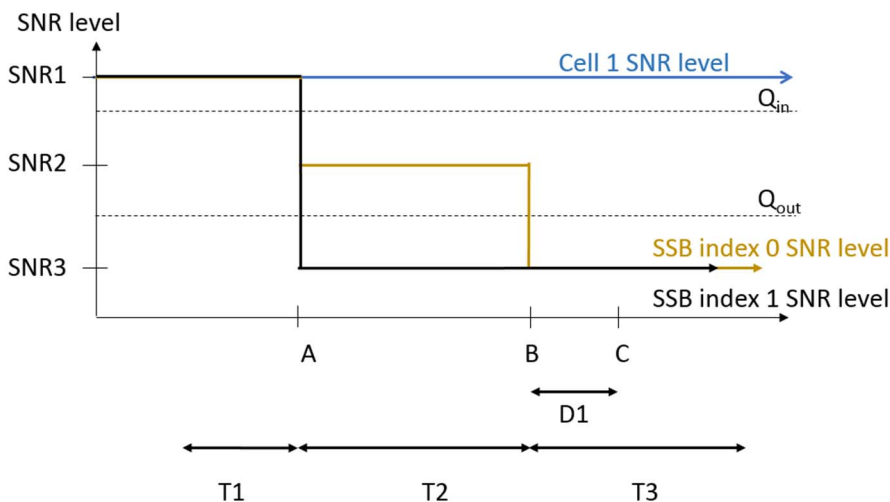
| Parameter   |  | Unit | Value                       |
|---|--|------|-----------------------------|
|   |  |      | Test 1                      |
| Active E-UTRA PCell   |  |      | Cell 1                      |
| E-UTRA RF Channel Number  |  |      | 1                           |
| Active PCell  |  |      | Cell 2                      |
| RF Channel Number   |  |      | 2                           |
| Duplex mode   | Config 1, 2  |      | TDD                         |
| $BW_{\text{channel}}$   | Config 1, 2  |      | 100: $N_{\text{RB,C}} = 66$ |
| Data RBs allocated  | Config 1, 2  |      | 66                          |
| DL initial BWP configuration  | Config 1, 2  |      | DLBWP.0.1                   |
| DL dedicated BWP configuration  | Config 1, 2  |      | DLBWP.1.1                   |
| UL initial BWP configuration  | Config 1, 2  |      | ULBWP.0.1                   |
| UL dedicated BWP configuration  | Config 1, 2  |      | ULBWP.1.1                   |
| TDD Configuration   | Config 1, 2  |      | TDDConf.3.1                 |
| RMSI CORESET Reference Channel  | Config 1, 2  |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | Config 1, 2  |      | CCR.3.4 TDD                 |
| SSB Configuration   | Config 1, 2  |      | SSB.1 FR2                   |
| SMTTC Configuration   | Config 1, 2  |      | SMTTC.1                     |
| PDSCH/PDCCH subcarrier spacing  | Config 1, 2  |      | 120 KHz                     |
| PRACH Configuration   | Config 1, 2  |      | Table A.3.8.3.4             |
| SSB index assigned as RLM RS  | Config 1, 2  |      | 0,1                         |
| OCNG parameters   |  |      | OP.1                        |
| CP length   |  |      | Normal                      |
| Out of sync transmission parameters   | DCI format   |      | 1-0                         |
|   | Number of Control OFDM symbols                                   |      | 2                           |
|   | Aggregation level  | CCE  | 8                           |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|   | DMRS precoder granularity  |      | REG bundle size             |
|   | REG bundle size  |      | 6                           |
| DRX Configuration   |  |      | DRX.3                       |
| Gap pattern ID  |  |      | N.A.                        |
| Layer 3 filtering   |  |      | <i>Enabled</i>              |
| T310 timer  |  | ms   | 0                           |
| T311 timer  |  | ms   | 1000                        |
| N310  |  |      | 1                           |
| N311  |  |      | 1                           |
| CSI-RS for CSI reporting  | Config 1, 2  |      | CSI-RS.3.1 TDD              |
| reportConfigType  |  |      | periodic                    |
| reportQuantity  |  |      | cri-RI-PMI-CQI              |
| CSI reporting periodicity   |  | slot | 40                          |
| CSI reporting offset  |  | slot | 4                           |
| TCI states for PDCCH/PDSCH  |  |      | TCI.State.2                 |
| CSI-RS for tracking   | Config 1, 2  |      | TRS.2.1 TDD                 |
| T1  |  | s    | 0.2                         |
| T2  |  | s    | 14.48                       |
| T3  |  | s    | 14.48                       |
| D1  |  | s    | 14.44                       |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |      |                             |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |      |                             |
| Note 3: E-UTRAN is in non-DRX mode under test.  |  |      |                             |

**Table A.5.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter   |             | Unit       | Test 1                    |                      |     |
|---|-------------|------------|---------------------------|----------------------|-----|
|   |             |            | T1                        | T2                   | T3  |
| AoA setup   |             |            | Setup 1 defined in A.3.15 |                      |     |
| Assumption for UE beams <sup>Note 5</sup>   |             |            | Rough                     |                      |     |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB         | 4                         |                      |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB         | 0                         |                      |     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB         | 0                         |                      |     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB         |                           |                      |     |
| EPRE ratio of PSS to SSS  |             | dB         |                           |                      |     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB         |                           |                      |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB         |                           |                      |     |
| EPRE ratio of OCNG DMRS to SSS  |             | dB         |                           |                      |     |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB         |                           |                      |     |
| ssb-Index 0 SNR   | Config 1, 2 | dB         | 2 <sup>Note 6</sup>       | -6 <sup>Note 6</sup> | -15 |
| ssb-Index 1 SNR   | Config 1, 2 |            | 2 <sup>Note 6</sup>       | -15                  | -15 |
| $N_{oc}$  | Config 1, 2 | dBm/15K Hz | -104.7dBm                 |                      |     |
| Propagation condition   |             |            | TDL-A 30ns 75Hz           |                      |     |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.<br>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband |             |            |                           |                      |     |

**Table A.5.5.1.3.1-4: Void**

**Table A.5.5.1.3.1-5: Void**



**Figure A.5.5.1.3.1-1: SNR variation for out-of-sync testing**

**A.5.5.1.3.2 Test Requirements**

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



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

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

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

#### A.5.5.1.4 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

##### A.5.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.5.5.1.4.1-1. The test parameters are given in Tables A.5.5.1.4.1-2, and A.5.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.5.5.1.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode              |
| 2             | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode              |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

**Table A.5.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode**

| Parameter                           |             | Unit | Value                       |
|-------------------------------------|-------------|------|-----------------------------|
|                                     |             |      | Test 1                      |
| Active E-UTRA PCell                 |             |      | Cell 1                      |
| E-UTRA RF Channel Number            |             |      | 1                           |
| Active PSCell                       |             |      | Cell 2                      |
| RF Channel Number                   |             |      | 2                           |
| Duplex mode                         | Config 1, 2 |      | TDD                         |
| BW <sub>channel</sub>               | Config 1, 2 |      | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated                  | Config 1, 2 |      | 66                          |
| DL initial BWP configuration        | Config 1, 2 |      | DLBWP.0.1                   |
| DL dedicated BWP configuration      | Config 1, 2 |      | DLBWP.1.1                   |
| UL initial BWP configuration        | Config 1, 2 |      | ULBWP.0.1                   |
| UL dedicated BWP configuration      | Config 1, 2 |      | ULBWP.1.1                   |
| TDD Configuration                   | Config 1, 2 |      | TDDConf.3.1                 |
| RMSI CORESET Reference Channel      | Config 1, 2 |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel | Config 1, 2 |      | CCR.3.1 TDD                 |
| SSB Configuration                   | Config 1, 2 |      | SSB.1 FR2                   |
| SMTc Configuration                  | Config 1, 2 |      | SMTc.3                      |
| PDSCH/PDCCH subcarrier spacing      | Config 1, 2 |      | 120 KHz                     |

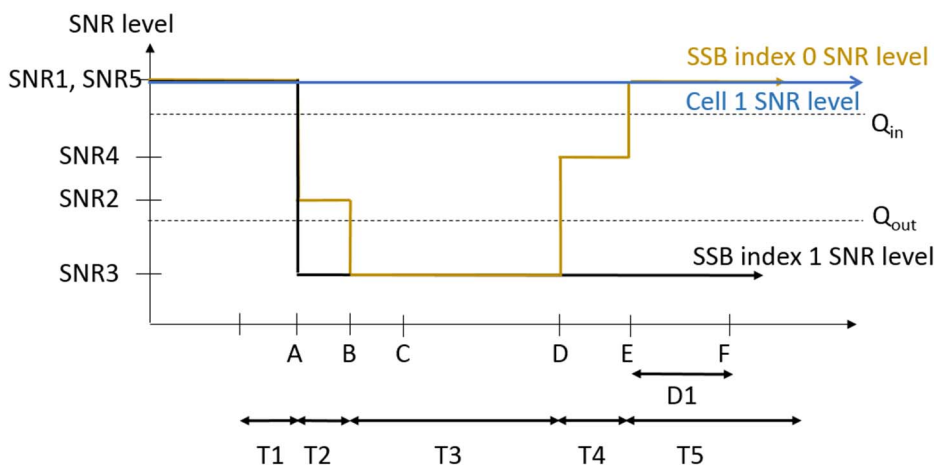
|   |  |             |                 |
|---|--|-------------|-----------------|
| PRACH Configuration   |  | Config 1, 2 | Table A.3.8.3.4 |
| SSB index assigned as RLM RS  |  | Config 1, 2 | 0,1             |
| OCNG parameters   |  |             | OP.1            |
| CP length   |  |             | Normal          |
| In sync transmission parameters   | DCI format   |             | 1-0             |
|   | Number of Control OFDM symbols                                   |             | 2               |
|   | Aggregation level  |             | CCE<br>4        |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   |             | dB<br>0         |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy |             | dB<br>0         |
|   | DMRS precoder granularity  |             | REG bundle size |
|   | REG bundle size  |             | 6               |
| Out of sync transmission parameters   | DCI format   |             | 1-0             |
|   | Number of Control OFDM symbols                                   |             | 2               |
|   | Aggregation level  |             | CCE<br>8        |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   |             | dB<br>4         |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy |             | dB<br>4         |
|   | DMRS precoder granularity  |             | REG bundle size |
|   | REG bundle size  |             | 6               |
| DRX Configuration   |  |             | DRX.11          |
| Gap pattern ID  |  |             | N.A.            |
| Layer 3 filtering   |  |             | <i>Enabled</i>  |
| T310 timer  |  | ms          | 4000            |
| T311 timer  |  | ms          | 1000            |
| N310  |  |             | 1               |
| N311  |  |             | 1               |
| CSI-RS for CSI reporting  |  | Config 1, 2 | CSI-RS.3.1 TDD  |
| reportConfigType  |  |             | periodic        |
| reportQuantity  |  |             | cri-RI-PMI-CQI  |
| CSI reporting periodicity   |  | slot        | 40              |
| CSI reporting offset  |  | slot        | 4               |
| TCI states for PDCCH/PDSCH  |  |             | TCI.State.2     |
| CSI-RS for tracking   |  | Config 1, 2 | TRS.2.1 TDD     |
| T1  |  | s           | 0.2             |
| T2  |  | s           | 0.2             |
| T3  |  | s           | 2.8             |
| T4  |  | s           | 0.2             |
| T5  |  | s           | 3.88            |
| D1  |  | s           | 3.84            |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |             |                 |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |             |                 |
| Note 3: E-UTRAN is in non-DRX mode under test.  |  |             |                 |

**Table A.5.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring test in DRX mode**

| Parameter   |             | Unit       | Test 1                    |                      |     |      |                     |
|---|-------------|------------|---------------------------|----------------------|-----|------|---------------------|
|   |             |            | T1                        | T2                   | T3  | T4   | T5                  |
| AoA setup   |             |            | Setup 1 defined in A.3.15 |                      |     |      |                     |
| Assumption for UE beams <sup>Note 5</sup>   |             |            | Rough                     |                      |     |      |                     |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB         | 0                         |                      |     |      |                     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB         | 0                         |                      |     |      |                     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB         | 0                         |                      |     |      |                     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB         |                           |                      |     |      |                     |
| EPRE ratio of PSS to SSS  |             | dB         |                           |                      |     |      |                     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB         |                           |                      |     |      |                     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB         |                           |                      |     |      |                     |
| EPRE ratio of OCNB DMRS to SSS  |             | dB         |                           |                      |     |      |                     |
| EPRE ratio of OCNB to OCNB DMRS   |             | dB         |                           |                      |     |      |                     |
| ssb-Index 0 SNR   | Config 1, 2 | dB         | 2 <sup>Note 6</sup>       | -6 <sup>Note 6</sup> | -15 | -4.5 | 2 <sup>Note 6</sup> |
| ssb-Index 1 SNR   | Config 1, 2 |            | 2 <sup>Note 6</sup>       | -15                  | -15 | -15  | -15                 |
| $N_{oc}$  | Config 1, 2 | dBm/1 5KHz | -104.7dBm                 |                      |     |      |                     |
| Propagation condition   |             |            | TDL-A 30ns 75Hz           |                      |     |      |                     |
| <p>Note 1: OCNB shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNB.3</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |             |            |                           |                      |     |      |                     |

**Table A.5.5.1.4.1-4: Void**

**Table A.5.5.1.4.1-5: Void**



**Figure A.5.5.1.4.1-1: SNR variation for in-sync testing.**

### A.5.5.1.4.2 Test Requirements

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

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

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

### A.5.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode

#### A.5.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.5.1-1, A.5.5.1.5.1-2, A.5.5.1.5.1-3 and A.5.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.5.5.1.5.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                    |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                    |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

**Table A.5.5.1.5.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in non-DRX mode**

| Parameter                      |             | Unit | Value                       |
|--------------------------------|-------------|------|-----------------------------|
|                                |             |      | Test 1                      |
| Active E-UTRA PCell            |             |      | Cell 1                      |
| E-UTRA RF Channel Number       |             |      | 1                           |
| Active PSCell                  |             |      | Cell 2                      |
| RF Channel Number              |             |      | 2                           |
| Duplex Mode                    |             |      | TDD                         |
| BW <sub>channel</sub>          | Config 1, 2 |      | 100: N <sub>RB,C</sub> = 66 |
| Data RBs allocated             | Config 1, 2 |      | 24                          |
| BW <sub>occupied</sub>         | Config 1, 2 |      | 24                          |
| TDD Configuration              | Config 1    |      | TDDConf.3.1                 |
|                                | Config 2    |      | TDDConf.3.1                 |
| DL initial BWP configuration   | Config 1, 2 |      | DLBWP.0.1                   |
| DL dedicated BWP configuration | Config 1, 2 |      | DLBWP.1.4                   |
| UL initial BWP configuration   | Config 1, 2 |      | ULBWP.0.1                   |
| UL dedicated BWP configuration | Config 1, 2 |      | ULBWP.1.4                   |
| RMSI CORESET Reference Channel | Config 1    |      | CR.3.1 TDD                  |
|                                | Config 2    |      | CR.3.1 TDD                  |

|   |   |      |  |
|---|---|------|--|
| Dedicated CORESET Reference Channel                           | Config 1  |      | CCR.3.4 TDD<br>CCR.3.6 TDD                               |
|   | Config 2  |      | CCR.3.4 TDD<br>CCR.3.6 TDD                               |
| SSB Configuration   | Config 1  |      | SSB.1 FR2  |
|   | Config 2  |      | SSB.1 FR2  |
| SMTC Configuration  | Config 1  |      | SMTC.1   |
|   | Config 2  |      | SMTC.1   |
| PDSCH/PDCCH subcarrier spacing                                | Config 1  |      | 120 KHz  |
|   | Config 2  |      | 120 KHz  |
| CSI-RS for RLM  | Config 1, 2   |      | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration   |   |      | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH                           |   |      | TCI.State.2  |
| TCI configuration for PDCCH#2                                 |   |      | TCI.State.3  |
| OCNG parameters   |   |      | OP.5   |
| CP length   |   |      | Normal   |
| Out of sync transmission parameters                           | DCI format  |      | 1-0  |
|   | Number of Control OFDM symbols                                      |      | 2  |
|   | Aggregation level   | CCE  | 8  |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4  |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4  |
|   | DMRS precoder granularity   |      | REG bundle size  |
|   | REG bundle size   |      | 6  |
| DRX   |   |      | OFF  |
| Gap pattern ID  |   |      | gp0  |
| Layer 3 filtering   |   |      | Enabled  |
| T310 timer  |   | ms   | 0  |
| T311 timer  |   | ms   | 1000   |
| N310  |   |      | 1  |
| N311  |   |      | 1  |
| CSI-RS for CSI reporting                                      | Config 1  |      | CSI-RS.3.1 TDD   |
|   | Config 2  |      | CSI-RS.3.1 TDD   |
| reportConfigType  |   |      | periodic   |
| reportQuantity  |   |      | cri-RI-PMI-CQI   |
| CSI reporting periodicity                                     |   | slot | 40   |
| CSI reporting offset  |   | slot | 4  |
| T1  |   | s    | 0.2  |
| T2  |   | s    | 0.35   |
| T3  |   | s    | 0.35   |
| D1  |   | s    | 0.31   |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |      |  |
| Note 2: E-UTRAN is in non-DRX mode under test.                |   |      |  |

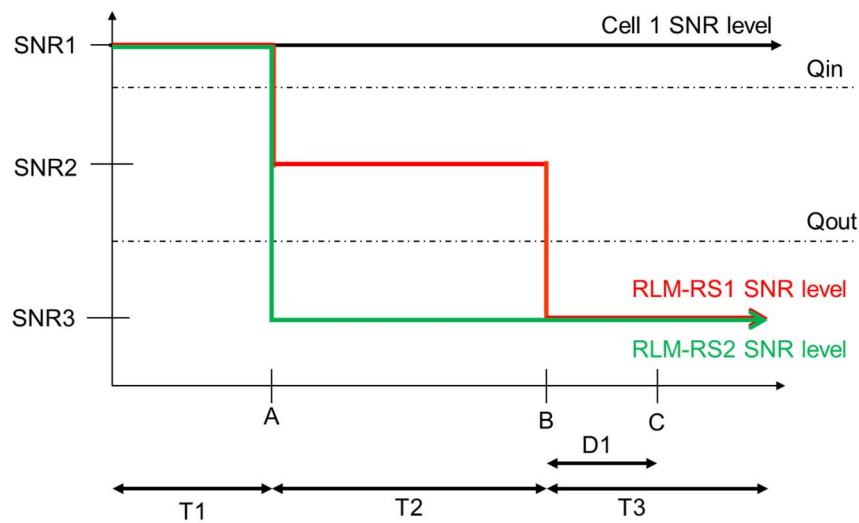
**Table A.5.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Parameter   |             | Unit      | Test 1                    |    |    |                 |    |    |                      |                       |     |
|---|-------------|-----------|---------------------------|----|----|-----------------|----|----|----------------------|-----------------------|-----|
|   |             |           | T1                        | T2 | T3 | T1              | T2 | T3 |                      |                       |     |
| AoA setup   |             |           | Setup 3 defined in A.3.15 |    |    |                 |    |    |                      |                       |     |
|   |             |           | AoA1                      |    |    | AoA2            |    |    |                      |                       |     |
| Assumption for UE beams <sup>Note 10</sup>  |             |           | Rough                     |    |    | Rough           |    |    |                      |                       |     |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB        | 4                         |    |    | Not sent        |    |    |                      |                       |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB        | 0                         |    |    |                 |    |    |                      |                       |     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB        |                           |    |    |                 |    |    |                      |                       |     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB        |                           |    |    |                 |    |    |                      |                       |     |
| EPRE ratio of PSS to SSS  |             | dB        |                           |    |    |                 |    |    |                      |                       |     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB        |                           |    |    |                 |    |    |                      |                       |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB        |                           |    |    |                 |    |    |                      |                       |     |
| EPRE ratio of OCNG DMRS to SSS  |             | dB        |                           |    |    |                 |    |    |                      |                       |     |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB        |                           |    |    |                 |    |    |                      |                       |     |
| SNR on RLM-RS1  | Config 1, 2 | dB        |                           |    |    |                 |    |    | 2 <sup>Note 11</sup> | -6 <sup>Note 11</sup> | -15 |
| SNR on RLM-RS2  | Config 1, 2 |           |                           |    |    | Not sent        |    |    | 2 <sup>Note 11</sup> | -14                   | -15 |
| $N_{oc}$  | Config 1, 2 | dBm/15kHz | -92.1                     |    |    | -92.1           |    |    |                      |                       |     |
| Propagation condition   |             |           | TDL-A 30ns 75Hz           |    |    | TDL-A 30ns 75Hz |    |    |                      |                       |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.1.5.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |             |           |                           |    |    |                 |    |    |                      |                       |     |

**Table A.5.5.1.5.1-3A: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

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

**Table A.5.5.1.5.1-4: Void**



**Figure A.5.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing**

**A.5.5.1.5.2 Test Requirements**

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

**A.5.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode**

**A.5.5.1.6.1 Test Purpose and Environment**

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.6.1-1, A.5.5.1.6.1-2, and A.5.5.1.6.1-3 below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.5.5.1.6.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                    |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                    |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

**Table A.5.5.1.6.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter                           |   | Unit | Value  |
|-------------------------------------|---|------|--|
|                                     |   |      | Test 1   |
| Active E-UTRA PCell                 |   |      | Cell 1   |
| E-UTRA RF Channel Number            |   |      | 1  |
| Active PSCell                       |   |      | Cell 2   |
| RF Channel Number                   |   |      | 2  |
| Duplex Mode                         |   |      | TDD  |
| BW <sub>channel</sub>               | Config 1, 2   |      | 100: N <sub>RB,c</sub> = 66                              |
| Data RBs allocated                  | Config 1, 2   |      | 24   |
| BW <sub>occupied</sub>              | Config 1, 2   |      | 24   |
| TDD Configuration                   | Config 1  |      | TDDConf.3.1  |
|                                     | Config 2  |      | TDDConf.3.1  |
| DL initial BWP configuration        | Config 1, 2   |      | DLBWP.0.1  |
| DL dedicated BWP configuration      | Config 1, 2   |      | DLBWP.1.4  |
| UL initial BWP configuration        | Config 1, 2   |      | ULBWP.0.1  |
| UL dedicated BWP configuration      | Config 1, 2   |      | ULBWP.1.4  |
| RMSI CORESET Reference Channel      | Config 1  |      | CR.3.1 TDD   |
|                                     | Config 2  |      | CR.3.1 TDD   |
| Dedicated CORESET Reference Channel | Config 1  |      | CCR.3.1 TDD<br>CCR.3.3 TDD                               |
|                                     | Config 2  |      | CCR.3.1 TDD<br>CCR.3.3 TDD                               |
| SSB Configuration                   | Config 1  |      | SSB.1 FR2  |
|                                     | Config 2  |      | SSB.1 FR2  |
| SMTC Configuration                  | Config 1  |      | SMTC.1   |
|                                     | Config 2  |      | SMTC.1   |
| PDSCH/PDCCH subcarrier spacing      | Config 1  |      | 120 KHz  |
|                                     | Config 2  |      | 120 KHz  |
| CSI-RS for RLM                      | Config 1, 2   |      | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| OCNG parameters                     |   |      | OP.5   |
| TRS configuration                   |   |      | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH |   |      | TCI.State.2  |
| TCI configuration for PDCCH#2       |   |      | TCI.State.3  |
| CP length                           |   |      | Normal   |
| Out of sync transmission parameters | DCI format  |      | 1-0  |
|                                     | Number of Control OFDM symbols                                      |      | 2  |
|                                     | Aggregation level   | CCE  | 8  |
|                                     | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4  |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4  |
|                                     | DMRS precoder granularity   |      | REG bundle size  |
|                                     | REG bundle size   |      | 6  |
|                                     | DCI format  |      | 1-0  |



|   |   |      |                 |
|---|---|------|-----------------|
| In sync transmission parameters                               | Number of Control OFDM symbols                                      |      | 2               |
|   | Aggregation level   | CCE  | 4               |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0               |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0               |
|   | DMRS precoder granularity   |      | REG bundle size |
|   | REG bundle size   |      | 6               |
| DRX   |   |      | <i>OFF</i>      |
| Gap pattern ID  |   |      | N.A.            |
| Layer 3 filtering   |   |      | <i>Enabled</i>  |
| T310 timer  |   | ms   | 1000            |
| T311 timer  |   | ms   | 1000            |
| N310  |   |      | 1               |
| N311  |   |      | 1               |
| CSI-RS for CSI reporting                                      | Config 1  |      | CSI-RS.3.1 TDD  |
|   | Config 2  |      | CSI-RS.3.1 TDD  |
| reportConfigType  |   |      | periodic        |
| reportQuantity  |   |      | cri-RI-PMI-CQI  |
| CSI reporting periodicity                                     |   | slot | 40              |
| CSI reporting offset  |   | slot | 4               |
| T1  |   | s    | 0.2             |
| T2  |   | s    | 0.2             |
| T3  |   | s    | 0.24            |
| T4  |   | s    | 0.2             |
| T5  |   | s    | 0.88            |
| D1  |   | s    | 0.84            |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |      |                 |
| Note 2: E-UTRAN is in non-DRX mode under test.                |   |      |                 |

**Table A.5.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter  | Unit        | Test 1                    |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
|--|-------------|---------------------------|-----------------|----|----|----|----------|-----------------|----|----|----|----|----------------------|-----------------------|-----|------|----------------------|
|  |             | T1                        | T2              | T3 | T4 | T5 | T1       | T2              | T3 | T4 | T5 |    |                      |                       |     |      |                      |
| AoA setup  |             | Setup 3 defined in A.3.15 |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
|  |             | AoA1                      |                 |    |    |    | AoA2     |                 |    |    |    |    |                      |                       |     |      |                      |
| Assumption for UE beams <sup>Note 10</sup>   |             | Rough                     |                 |    |    |    | Rough    |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDCCH DMRS to SSS  | dB          | 0                         |                 |    |    |    | Not sent |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDCCH to PDCCH DMRS  | dB          | 0                         |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PBCH DMRS to SSS   | dB          |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PBCH to PBCH DMRS  | dB          |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PSS to SSS   | dB          |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDSCH DMRS to SSS  | dB          |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDSCH to PDSCH DMRS  | dB          |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of OCNG DMRS to SSS   | dB          |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of OCNG to OCNG DMRS  | dB          |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |
| SNR on RLM-RS1   | Config 1, 2 |                           |                 |    |    |    |          |                 |    |    |    | dB | 2 <sup>Note 11</sup> | -6 <sup>Note 11</sup> | -15 | -4.5 | 2 <sup>Note 11</sup> |
| SNR on RLM-RS2   | Config 1, 2 |                           |                 |    |    |    |          | Not sent        |    |    |    |    | 2 <sup>Note 11</sup> | -14                   | -15 | -15  | -14                  |
| $N_{oc}$   | Config 1, 2 | dBm/15KHz                 | -92.1           |    |    |    |          | -92.1           |    |    |    |    |                      |                       |     |      |                      |
| Propagation condition  |             |                           | TDL-A 30ns 75Hz |    |    |    |          | TDL-A 30ns 75Hz |    |    |    |    |                      |                       |     |      |                      |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.6.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |             |                           |                 |    |    |    |          |                 |    |    |    |    |                      |                       |     |      |                      |

**Table A.5.5.1.6.1-3A: Void**

**Table A.5.5.1.6.1-4: Void**

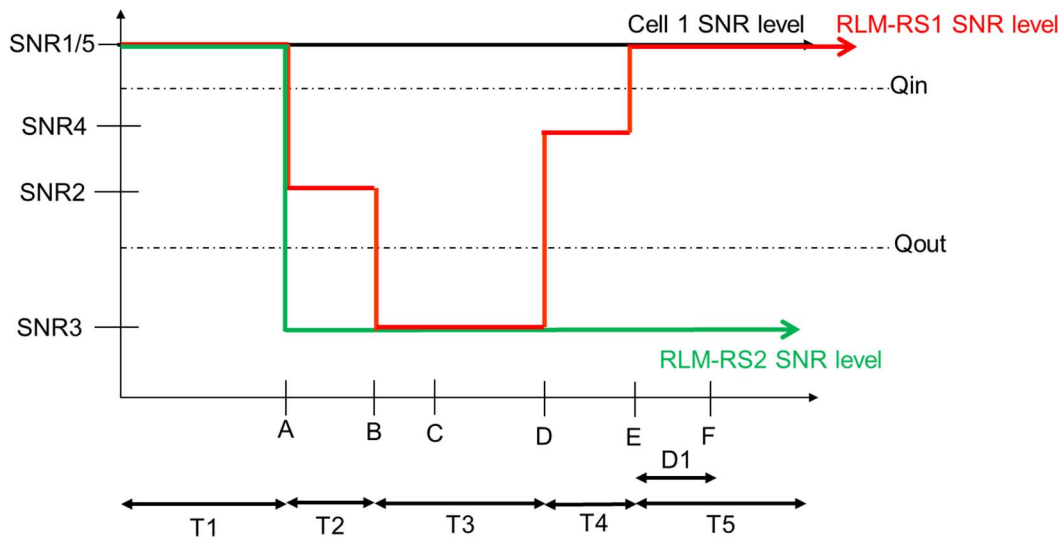


Figure A.5.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

A.5.5.1.6.2 Test Requirements

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

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

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

A.5.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

A.5.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.7.1-1, A.5.5.1.7.1-2, and A.5.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.5.5.1.7.1-1: Supported test configurations for FR2 PSCell

| Configuration  | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 |   |

**Table A.5.5.1.7.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in DRX mode**

| Parameter | Unit | Value  |
|-----------|------|--------|
|           |      | Test 1 |

|                                     |   |     |  |
|-------------------------------------|---|-----|--|
| Active E-UTRA PCell                 |   |     | Cell 1   |
| E-UTRA RF Channel Number            |   |     | 1  |
| Active PSCell                       |   |     | Cell 2   |
| RF Channel Number                   |   |     | 2  |
| Duplex Mode                         |   |     | TDD  |
| TDD Configuration                   | Config 1  |     | TDDConf.3.1  |
|                                     | Config 2  |     | TDDConf.3.1  |
| DL initial BWP configuration        | Config 1, 2   |     | DLBWP.0.1  |
| DL dedicated BWP configuration      | Config 1, 2   |     | DLBWP.1.1  |
| UL initial BWP configuration        | Config 1, 2   |     | ULBWP.0.1  |
| UL dedicated BWP configuration      | Config 1, 2   |     | ULBWP.1.1  |
| RMSI CORESET Reference Channel      | Config 1  |     | CR. 3.1 TDD  |
|                                     | Config 2  |     | CR. 3.1 TDD  |
| Dedicated CORESET Reference Channel | Config 1  |     | CCR. 3.4 TDD<br>CCR.3.6 TDD                              |
|                                     | Config 2  |     | CCR. 3.4 TDD<br>CCR.3.6 TDD                              |
| SSB Configuration                   | Config 1  |     | SSB.1 FR2  |
|                                     | Config 2  |     | SSB.1 FR2  |
| SMTC Configuration                  | Config 1  |     | SMTC.1   |
|                                     | Config 2  |     | SMTC.1   |
| PDSCH/PDCCH subcarrier spacing      | Config 1  |     | 120 KHz  |
|                                     | Config 2  |     | 120 KHz  |
| CSI-RS for RLM                      | Config 1, 2   |     | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration                   |   |     | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH |   |     | TCI.State.2  |
| TCI configuration for PDCCH#2       |   |     | TCI.State.3  |
| OCNG parameters                     |   |     | OP.1   |
| CP length                           |   |     | Normal   |
| Out of sync transmission parameters | DCI format  |     | 1-0  |
|                                     | Number of Control OFDM symbols                                      |     | 2  |
|                                     | Aggregation level   | CCE | 8  |
|                                     | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB  | 4  |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB  | 4  |
|                                     | DMRS precoder granularity   |     | REG bundle size  |
| REG bundle size                     |   |     | 6  |
| DRX                                 |   |     | DRX.3  |
| Gap pattern ID                      |   |     | N.A.   |
| Layer 3 filtering                   |   |     | Enabled  |
| T310 timer                          | ms  |     | 0  |
| T311 timer                          | ms  |     | 1000   |
| N310                                |   |     | 1  |
| N311                                |   |     | 1  |
| CSI-RS for CSI reporting            | Config 1  |     | CSI-RS.3.1 TDD   |
|                                     | Config 2  |     | CSI-RS.3.1 TDD   |

|   |      |                |
|---|------|----------------|
| reportConfigType  |      | periodic       |
| reportQuantity  |      | cri-RI-PMI-CQI |
| CSI reporting periodicity                                     | slot | 40             |
| CSI reporting offset  | slot | 4              |
| T1  | s    | 0.2            |
| T2  | s    | 1.28           |
| T3  | s    | 1.28           |
| D1  | s    | 1.24           |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |      |                |
| Note 2: E-UTRAN is in non-DRX mode under test.                |      |                |

**Table A.5.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter   |             | Unit      | Test 1                    |                       |     |
|---|-------------|-----------|---------------------------|-----------------------|-----|
|   |             |           | T1                        | T2                    | T3  |
| AoA setup   |             |           | Setup 1 defined in A.3.15 |                       |     |
| Assumption for UE beams <sup>Note 10</sup>  |             |           | Rough                     |                       |     |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB        | 4                         |                       |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB        | 0                         |                       |     |
| EPRE ratio of PBCH DMRS to SSS  |             | dB        |                           |                       |     |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB        |                           |                       |     |
| EPRE ratio of PSS to SSS  |             | dB        |                           |                       |     |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB        |                           |                       |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB        |                           |                       |     |
| EPRE ratio of OCNG DMRS to SSS  |             | dB        |                           |                       |     |
| EPRE ratio of OCNG to OCNG DMRS   |             | dB        |                           |                       |     |
| SNR on RLM-RS1  | Config 1, 2 | dB        | <sup>2</sup> Note 11      | <sup>-6</sup> Note 11 | -15 |
| SNR on RLM-RS2  | Config 1, 2 |           | <sup>2</sup> Note 11      | -14                   | -15 |
| $N_{oc}$  | Config 1    | dBm/15KHz | -104.7                    |                       |     |
|   | Config 2    |           | -104.7                    |                       |     |
| Propagation condition   |             |           | DL-A 30ns 75Hz            |                       |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.1.7.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.</p> |             |           |                           |                       |     |

Table A.5.5.1.7.1-3A: Void

Table A.5.5.1.7.1-4: Void

Table A.5.5.1.7.1-5: Void

Table A.5.5.1.7.1-6: Void

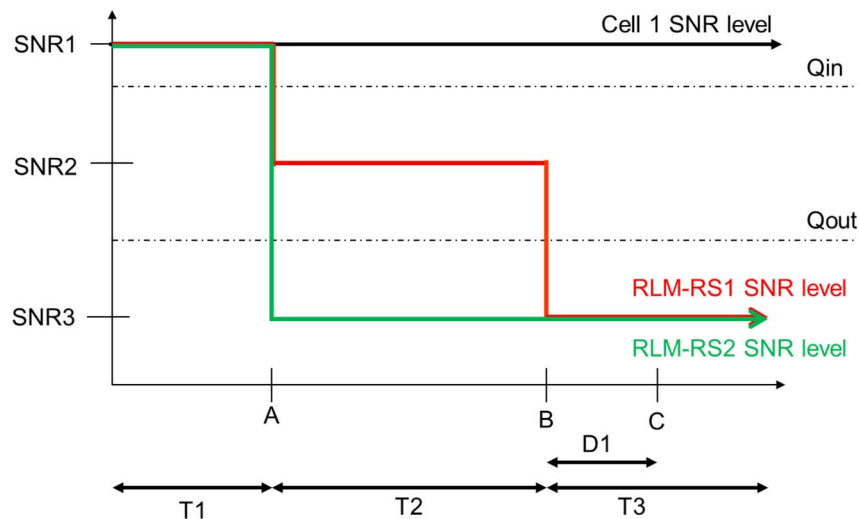


Figure A.5.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.5.5.1.7.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

#### A.5.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

##### A.5.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.8.1-1, A.5.5.1.8.1-2, A.5.5.1.8.1-3 and A.5.5.1.8.1-3A below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.5.5.1.8.1-1: Supported test configurations for FR2 PSCell**

| Configuration  | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 |   |

**Table A.5.5.1.8.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter                           |                                | Unit | Value  |
|-------------------------------------|--------------------------------|------|--|
|                                     |                                |      | Test 1   |
| Active E-UTRA PCell                 |                                |      | Cell 1   |
| E-UTRA RF Channel Number            |                                |      | 1  |
| Active PSCell                       |                                |      | Cell 2   |
| RF Channel Number                   |                                |      | 2  |
| Duplex Mode                         |                                |      | TDD  |
| TDD Configuration                   | Config 1                       |      | TDDConf.3.1  |
|                                     | Config 2                       |      | TDDConf.3.1  |
| DL initial BWP configuration        | Config 1, 2                    |      | DLBWP.0.1  |
| DL dedicated BWP configuration      | Config 1, 2                    |      | DLBWP.1.1  |
| UL initial BWP configuration        | Config 1, 2                    |      | ULBWP.0.1  |
| UL dedicated BWP configuration      | Config 1, 2                    |      | ULBWP.1.1  |
| RMSI CORESET Reference Channel      | Config 1                       |      | CR.3.1 TDD   |
|                                     | Config 2                       |      | CR.3.1 TDD   |
| Dedicated CORESET Reference Channel | Config 1                       |      | CCR.3.1 TDD<br>CCR.3.3 TDD                               |
|                                     | Config 2                       |      | CCR.3.1 TDD<br>CCR.3.3 TDD                               |
| SSB Configuration                   | Config 1                       |      | SSB.1 FR2  |
|                                     | Config 2                       |      | SSB.1 FR2  |
| SMTc Configuration                  | Config 1                       |      | SMTc.1   |
|                                     | Config 2                       |      | SMTc.1   |
| PDSCH/PDCCH subcarrier spacing      | Config 1                       |      | 120 KHz  |
|                                     | Config 2                       |      | 120 KHz  |
| CSI-RS for RLM                      | Config 1, 2                    |      | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration                   |                                |      | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH |                                |      | TCI.State.2  |
| TCI configuration for PDCCH#2       |                                |      | TCI.State.3  |
| OCNG parameters                     |                                |      | OP.1   |
| CP length                           |                                |      | Normal   |
| Out of sync transmission parameters | DCI format                     |      | 1-0  |
|                                     | Number of Control OFDM symbols |      | 2  |
|                                     | Aggregation level              | CCE  | 8  |



|   |   |                |                 |
|---|---|----------------|-----------------|
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB             | 4               |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB             | 4               |
|   | DMRS precoder granularity   |                | REG bundle size |
|   | REG bundle size   |                | 6               |
| In sync transmission parameters                               | DCI format  |                | 1-0             |
|   | Number of Control OFDM symbols                                      |                | 2               |
|   | Aggregation level   | CCE            | 4               |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB             | 0               |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB             | 0               |
|   | DMRS precoder granularity   |                | REG bundle size |
|   | REG bundle size   |                | 6               |
|   | DRX   |                | DRX.3           |
| Gap pattern ID  |   | <i>gp0</i>     |                 |
| Layer 3 filtering   |   | <i>Enabled</i> |                 |
| T310 timer  | ms  | 2000           |                 |
| T311 timer  | ms  | 1000           |                 |
| N310  |   | 1              |                 |
| N311  |   | 1              |                 |
| CSI-RS for CSI reporting                                      | Config 1  |                | CSI-RS.3.1 TDD  |
|   | Config 2  |                | CSI-RS.3.1 TDD  |
| reportConfigType  |   |                | periodic        |
| reportQuantity  |   |                | cri-RI-PMI-CQI  |
| CSI reporting periodicity                                     | slot  |                | 40              |
| CSI reporting offset  | slot  |                | 4               |
| T1  | s   |                | 0.2             |
| T2  | s   |                | 0.2             |
| T3  | s   |                | 1.64            |
| T4  | s   |                | 0.2             |
| T5  | s   |                | 1.88            |
| D1  | s   |                | 1.84            |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |                |                 |
| Note 2: E-UTRAN is in non-DRX mode under test.                |   |                |                 |

**Table A.5.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in DRX mode**

| Parameter  |             | Unit      | Test 1                    |    |    |    |    |                      |                       |     |      |                      |
|--|-------------|-----------|---------------------------|----|----|----|----|----------------------|-----------------------|-----|------|----------------------|
|  |             |           | T1                        | T2 | T3 | T4 | T5 |                      |                       |     |      |                      |
| AoA setup  |             |           | Setup 1 defined in A.3.15 |    |    |    |    |                      |                       |     |      |                      |
| Assumption for UE beams <sup>Note 10</sup>   |             |           | Rough                     |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB        | 0                         |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDCCH to PDCCH DMRS  |             | dB        | 0                         |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PBCH DMRS to SSS   |             | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PBCH to PBCH DMRS  |             | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PSS to SSS   |             | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDSCH DMRS to SSS  |             | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDSCH to PDSCH DMRS  |             | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of OCNG DMRS to SSS   |             | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of OCNG to OCNG DMRS  |             | dB        | -104.7                    |    |    |    |    |                      |                       |     |      |                      |
| SNR on RLM-RS1   | Config 1, 2 | dB        |                           |    |    |    |    | <sup>2</sup> Note 11 | -6 <sup>Note 11</sup> | -15 | -4.5 | <sup>2</sup> Note 11 |
| SNR on RLM-RS2   | Config 1, 2 | dB        |                           |    |    |    |    | <sup>2</sup> Note 11 | -14                   | -15 | -15  | -14                  |
| $N_{oc}$   | Config 1, 2 | dBm/15KHz | -104.7                    |    |    |    |    |                      |                       |     |      |                      |
| Propagation condition  |             |           | TDL-A 30ns 75Hz           |    |    |    |    |                      |                       |     |      |                      |
| <p>Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.8.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |             |           |                           |    |    |    |    |                      |                       |     |      |                      |

**Table A.5.5.1.8.1-3A: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in DRX mode**

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

Table A.5.5.1.8.1-4: Void

Table A.5.5.1.8.1-5: Void

Table A.5.5.1.8.1-6: Void

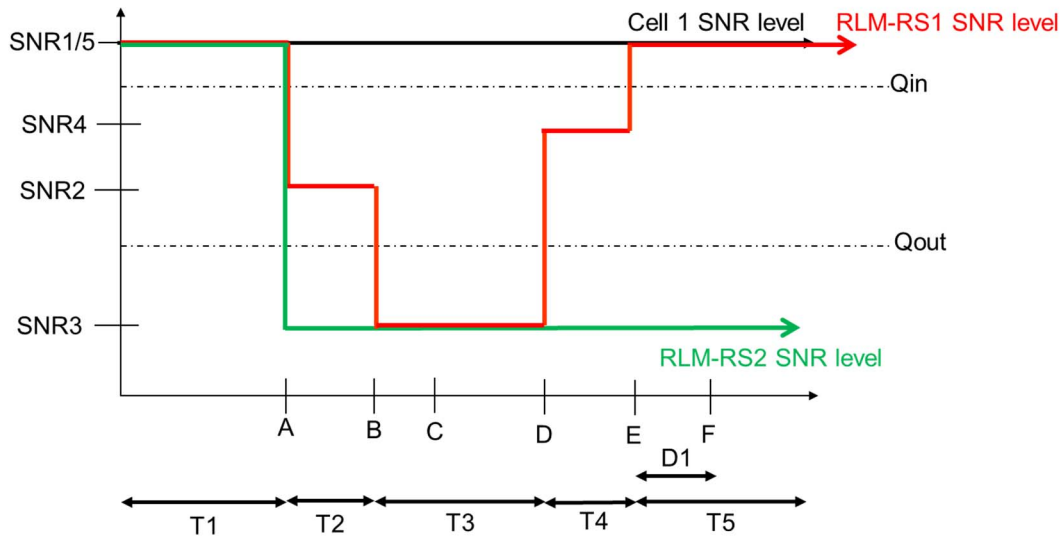


Figure A.5.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

### A.5.5.1.8.2 Test Requirements

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

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

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

### A.5.5.1.9 EN-DC Radio Link Monitoring UE Scheduling Restrictions on FR2

#### A.5.5.1.9.1 Test Purpose and Environment

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly. The test case is only applicable to UE which supports `pdccch-MonitoringAnyOccasions` or `pdccch-MonitoringAnyOccasionsWithSpanGap`.

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and NR FR2 PSCell (Cell 2). The test parameters for NR PSCell are given in table A.5.5.1.9.1-1, table A.5.5.1.9.1-2 and table A.5.5.1.9.1-3 below and the parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

**Table A.5.5.1.9.1-1: Supported test configurations**

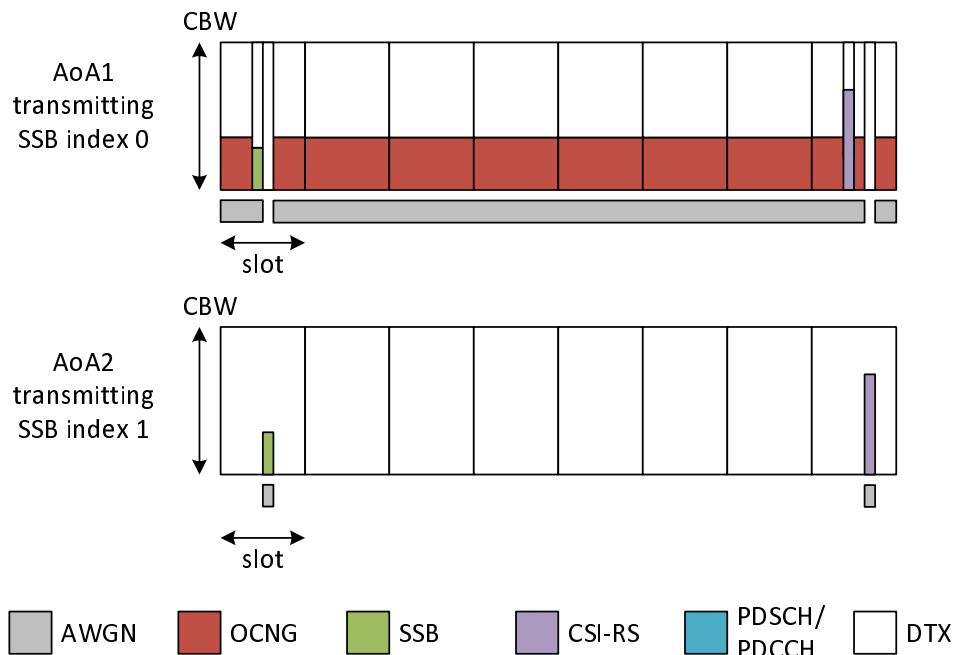
| Configuration   | Description   |
|---|---|
| 1   | FDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | TDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.5.5.1.9.1-2: General test parameters for RLM scheduling restriction test case in FR2**

| Parameter          | Unit | Test configuration | Value          | Comment   |
|--------------------|------|--------------------|----------------|---|
| RF Channel Number  |      | 1, 2               | 1 and 2        | 1 for NR PSCell and 2 for LTE PCell                         |
| SSB configuration  |      | 1, 2               | SSB.1 FR2      |   |
| SMTC configuration |      | 1, 2               | SMTC pattern 1 |   |
| DRX cycle length   | s    | 1, 2               | OFF            |   |
| T1                 | s    | 1, 2               | 5              | During T1 the UE is required to correctly transmit ACK/NACK |

Table A.5.5.1.9.1-3: Cell specific test parameters for RLM scheduling restriction test case in FR2

| Parameter   | Unit  | Test configuration | Cell 2                          |                  |
|---|---|--------------------|---------------------------------|------------------|
|   |   |                    |                                 |                  |
| AoA setup   |   | 1, 2               | Setup 3 defined in A.3.15.3     |                  |
| Assumption for UE beams <sup>Note 1</sup>                     |   |                    | AoA1                            | AoA2             |
|   |   |                    | Rough                           | Rough            |
| TDD configuration   |   | 1, 2               | TDDConf.3.1                     |                  |
| BW <sub>channel</sub>   | MHz   | 1, 2               | 100: N <sub>RB,c</sub> = 66     |                  |
| Data RBs allocated  |   | 1, 2               | 24                              |                  |
| PDSCH Reference measurement channel                           |   | 1, 2               | SR.3.2 TDD                      | Not sent         |
| RMSI CORESET RMC configuration                                |   | 1, 2               | CR.3.1 TDD                      | Not sent         |
| Dedicated CORESET RMC configuration                           |   | 1, 2               | CCR.3.2 TDD                     | Not sent         |
| TRS configuration   |   | 1, 2               | TRS.2.1 TDD                     | TRS.2.2 TDD      |
| PDCCH/PDSCH TCI state   |   | 1, 2               | TCI.State.2                     | Not sent         |
| OCNG Pattern  |   | 1, 2               | OP.5 defined in A.3.2.1         | Not sent         |
| Initial DL BWP configuration                                  |   | 1, 2               | DLBWP.0.1                       |                  |
| Initial UL BWP configuration                                  |   | 1, 2               | ULBWP.0.1                       |                  |
| RLM-RS  |   | 1, 2               | SSB with index 0                | SSB with index 1 |
| $N_{oc}$  | dBm/15kHz   | 1, 2               | -92.1                           | -92.1            |
| $N_{oc}$ <sup>Note2</sup>                                     | dBm/SCS   | 1, 2               | -83.1                           | -83.1            |
| $\hat{E}_s/N_{oc}$  | dB  | 1, 2               | 2                               | 2                |
| $\hat{E}_s/I_{ot\_BB}$ <sup>Note 4</sup>                      | dB  | 1, 2               | 1                               | 1                |
| SSB_RP <sup>Note3</sup>                                       | dBm/SCS   | 1, 2               | -81.1                           | -81.1            |
| Io  | dBm/95.04 MHz   | 1, 2               | -54.35                          | -54.35           |
| Time multiplexing of the downlink transmissions from each AoA |   | 1, 2               | Defined in Figure A.5.5.1.9.1-1 |                  |
| Propagation Condition   |   | 1, 2               | AWGN                            | AWGN             |
| Note 1:   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |                    |                                 |                  |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |                    |                                 |                  |
| Note 3:   | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                    |                                 |                  |
| Note 4:   | Calculation of Es/Iot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                    |                                 |                  |



**Figure A.5.5.1.9.1-1: Time multiplexed downlink transmissions**

**A.5.5.1.9.2 Test Requirements**

The UE behaviour follows the requirements defined in clause 8.1.7.3.

**A.5.5.2 Interruption**

**A.5.5.2.1 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

**A.5.5.2.1.1 Test Purpose and Environment**

The purpose of this test is to verify that when E-UTRA PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.1.1-1.

The general test parameters are given in Table A.5.5.2.1.1-2, and NR cell specific test parameters are given in Table A.5.5.2.1.1-3 and A.5.5.2.1.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.1.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell on and Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

**Table A.5.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.2.1.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter                  | Unit | Value  | Comment  |
|----------------------------|------|--------|--|
| RF Channel Number          |      | 1, 2   | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell               |      | Cell1  | PCell on E-UTRAN RF channel number 1.                    |
| Configured PSCell          |      | Cell2  | PSCell on NR RF channel number 2.                        |
| CP length                  |      | Normal | Applicable to cell1 and cell 2                           |
| DRX                        |      | DRX.4  | DRX related parameters are defined in Table A.3.3.4-1    |
| Measurement gap pattern Id |      | OFF    |  |
| T1                         | s    | 6.25   |  |

**Table A.5.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter  |            | Unit    | Cell 2                      |
|--|------------|---------|-----------------------------|
| Frequency Range  |            |         | FR2                         |
| Duplex mode  | Config 1,2 |         | TDD                         |
| TDD configuration  | Config 1,2 |         | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz     | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | Config 1,2 |         | 66                          |
| Downlink initial BWP Configuration   | Config 1,2 |         | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1,2 |         | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1,2 |         | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1,2 |         | ULBWP.1.1                   |
| TRS configuration  | Config 1,2 |         | TRS.2.1 TDD                 |
| TCI state  | Config 1,2 |         | TCI.State.0                 |
| PDSCH Reference measurement channel  | Config 1,2 |         | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | Config 1,2 |         | CR.3.1 TDD                  |
| RMC CORESET Reference Channel  | Config 1,2 |         | CCR.3.1 TDD                 |
| OCNG Patterns  |            |         | OP.1                        |
| SSB Configuration  |            |         | SSB.3 FR2                   |
| SMTc Configuration   | Config 1,2 |         | SMTc.1                      |
| EPRE ratio of PSS to SSS   |            | dB      | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |         |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |         |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |         |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |         |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |         |                             |
| EPRE ratio of PDSCH to PDSCH   |            |         |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |         |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |         |                             |
| $\bar{E}_s/N_{oc}$   |            | dB      | 17                          |
| Propagation Condition  |            |         | AWGN                        |
| Time offset to cell1   | Note 2     | $\mu$ s | 3                           |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |         |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |         |                             |

**Table A.5.5.2.1.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter  | Unit                           | Cell2                                |
|--|--------------------------------|--------------------------------------|
| Angle of arrival configuration   |                                | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams <sup>Note6</sup>   |                                | Fine                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -112                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -102.97                              |
| $\hat{E}_s/N_{oc}$   | dB                             | 17                                   |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -85.97                               |
| $\hat{E}_s/I_{ot}$   | dB                             | 17                                   |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -56.90                               |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |

**Table A.5.5.2.1.1-5: Void**

### A.5.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause 8. 2.1.

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

### A.5.5.2.2 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

#### A.5.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.2.1-1.

The general test parameters are given in Table A.5.5.2.2.1-2, and NR cell specific test parameters are given in Table A.5.5.2.2.1-3 and A.5.5.2.2.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.2.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.



**Table A.5.5.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.5.2.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter                  | Unit | Value  | Comment  |
|----------------------------|------|--------|--|
| RF Channel Number          |      | 1, 2   | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell               |      | Cell1  | PCell on E-UTRAN RF channel number 1.                    |
| Configured PSCell          |      | Cell2  | PSCell on NR RF channel number 2.                        |
| CP length                  |      | Normal | Applicable to cell1 and cell 2                           |
| DRX                        |      | DRX.6  | DRX related parameters are defined in Table A.3.3.6-1    |
| Measurement gap pattern Id |      | OFF    |  |
| T1                         | s    | 6.25   |  |

**Table A.5.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter  |            | Unit    | Cell 2                      |
|--|------------|---------|-----------------------------|
| Frequency Range  |            |         | FR2                         |
| Duplex mode  | Config 1,2 |         | TDD                         |
| TDD configuration  | Config 1,2 |         | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz     | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | Config 1,2 |         | 66                          |
| Downlink initial BWP Configuration   | Config 1,2 |         | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1,2 |         | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1,2 |         | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1,2 |         | ULBWP.1.1                   |
| TRS configuration  | Config 1,2 |         | TRS.2.1 TDD                 |
| TCI state  | Config 1,2 |         | TCI.State.0                 |
| PDSCH Reference measurement channel  | Config 1,2 |         | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | Config 1,2 |         | CR.3.1 TDD                  |
| RMC CORESET Reference Channel  | Config 1,2 |         | CCR.3.1 TDD                 |
| OCNG Patterns  |            |         | OP.1                        |
| SSB Configuration  |            |         | SSB.3 FR2                   |
| SMTc Configuration   | Config 1,2 |         | SMTc.1                      |
| EPRE ratio of PSS to SSS   |            | dB      | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |         |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |         |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |         |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |         |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |         |                             |
| EPRE ratio of PDSCH to PDSCH   |            |         |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |         |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |         |                             |
| $\hat{E}_s/N_{oc}$   |            |         |                             |
| Propagation Condition  |            |         | AWGN                        |
| Time offset to cell1 <sup>Note 2</sup>   |            | $\mu$ s | 62.5                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |         |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |         |                             |

**Table A.5.5.2.2.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter  | Unit                           | Cell2                                |
|--|--------------------------------|--------------------------------------|
| Angle of arrival configuration   |                                | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams <sup>Note6</sup>   |                                | Fine                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -112                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -102.97                              |
| $\hat{E}_s/N_{oc}$   | dB                             | 17                                   |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -85.97                               |
| $\hat{E}_s/I_{ot}$   | dB                             | 17                                   |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -56.90                               |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |

**Table A.5.5.2.2.1-5: Void**

### A.5.5.2.2.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause 8. 2.1.

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

### A.5.5.2.3 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

#### A.5.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.3.1-1.

The general test parameters are given in Table A.5.5.2.3.1-2, and NR cell specific test parameters are given in Table A.5.5.2.3.1-3 and A.5.5.2.3.1-4 below. The E-UTRAN cell specific test parameters can be found in Table A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 are NR FR2 PSCell and NR FR2 deactivated SCell, respectively. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.5.5.2.3.1-1: Interruption during measurements on deactivated NR SCC supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.5.2.3.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter                                | Unit | Value   | Comment  |
|--|------|---------|--|
| RF Channel Number                        |      | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell                             |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Configured PSCell                        |      | Cell2   | PSCell on NR RF channel number 2.                              |
| Configured deactivated SCell             |      | Cell3   | Deactivated SCell on NR RF channel number 3.                   |
| CP length                                |      | Normal  | Applicable to cell1, cell 2 and cell3                          |
| DRX                                      |      | OFF     |  |
| Measurement gap pattern Id               |      | OFF     |  |
| SCell measurement cycle (measCycleSCell) | Ms   | 640     |  |
| T1                                       | S    | 10      |  |

**Table A.5.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter  |            | Unit | Cell 2                      | Cell 3                      |
|--|------------|------|-----------------------------|-----------------------------|
| Frequency Range  |            |      | FR2                         | FR2                         |
| Duplex mode  | Config 1,2 |      | TDD                         | TDD                         |
| TDD configuration  | Config 1,2 |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | Config 1,2 |      | 66                          | 66                          |
| Downlink initial BWP Configuration   | Config 1,2 |      | DLBWP.0.1                   | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1,2 |      | DLBWP.1.1                   | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1,2 |      | ULBWP.0.1                   | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1,2 |      | ULBWP.1.1                   | ULBWP.1.1                   |
| PDSCH Reference measurement channel  | Config 1,2 |      | SR.3.1 TDD                  | -                           |
| RMSI CORESET Reference Channel   | Config 1,2 |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
| PDCCH CORESET parameters   | Config 1,2 |      | CCR 3.1 TDD                 | CCR 3.1 TDD                 |
| OCNG Patterns  |            |      | OP.1                        | OP.1                        |
| SSB Configuration  | Config 1,2 |      | SSB.1 FR2                   | SSB.1 FR2                   |
| SMTTC Configuration  | Config 1,2 |      | SMTTC.1                     | SMTTC.1                     |
| TRS configuration  | Config 1,2 |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| TCI state  | Config 1,2 |      | TCI.State.0                 | TCI.State.0                 |
| EPRE ratio of PSS to SSS   |            | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH   |            |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |      |                             |                             |
| Propagation Condition  |            |      |                             |                             |
| Time offset to cell1 <sup>Note 2</sup>   |            | μs   | 3                           | 3 + Time offset to cell2    |
| Time offset to cell2 <sup>Note 3</sup>   |            | μs   | -                           | 3                           |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |      |                             |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |      |                             |                             |
| Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells                                      |            |      |                             |                             |

**Table A.5.5.2.3.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter  |              | Unit                              | Cell 2                             | Cell 3 |
|--|--------------|-----------------------------------|------------------------------------|--------|
| Angle of arrival configuration   |              |                                   | Setup 1 defined in clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 6</sup>  |              |                                   | Fine                               | Rough  |
| $N_{oc}$ <sup>Note1</sup>  | NR_TDD_FR2_A | dBm/15kHz                         | -111.7                             | -104.7 |
|  | NR_TDD_FR2_B |                                   |                                    |        |
|  | NR_TDD_FR2_F |                                   |                                    |        |
|  | NR_TDD_FR2_G |                                   |                                    |        |
|  | NR_TDD_FR2_T |                                   |                                    |        |
| $N_{oc}$ <sup>Note1</sup>  | NR_TDD_FR2_Y | dBm/SCS <sup>Note3</sup>          | -102.7                             | -95.7  |
|  | NR_TDD_FR2_A |                                   |                                    |        |
|  | NR_TDD_FR2_B |                                   |                                    |        |
|  | NR_TDD_FR2_F |                                   |                                    |        |
|  | NR_TDD_FR2_G |                                   |                                    |        |
| SSB_RP <sup>Note2</sup>  | NR_TDD_FR2_T | dBm/SCS <sup>Note4</sup>          | -90.7                              | -90.7  |
|  | NR_TDD_FR2_Y |                                   |                                    |        |
|  | NR_TDD_FR2_A |                                   |                                    |        |
|  | NR_TDD_FR2_B |                                   |                                    |        |
|  | NR_TDD_FR2_F |                                   |                                    |        |
| $\hat{E}_s/I_{ot}$   | NR_TDD_FR2_G | dB                                | 12                                 | 5      |
|  | NR_TDD_FR2_T |                                   |                                    |        |
|  | NR_TDD_FR2_Y |                                   |                                    |        |
|  | NR_TDD_FR2_A |                                   |                                    |        |
|  | NR_TDD_FR2_B |                                   |                                    |        |
| $\hat{E}_s/N_{oc}$   | NR_TDD_FR2_F | dB                                | 12                                 | 5      |
|  | NR_TDD_FR2_G |                                   |                                    |        |
|  | NR_TDD_FR2_T |                                   |                                    |        |
|  | NR_TDD_FR2_Y |                                   |                                    |        |
|  | NR_TDD_FR2_A |                                   |                                    |        |
| $I_o$ <sup>Note2</sup>   | NR_TDD_FR2_B | dBm/95.04 MHz<br><sup>Note4</sup> | -61.45                             | -61.45 |
|  | NR_TDD_FR2_F |                                   |                                    |        |
|  | NR_TDD_FR2_G |                                   |                                    |        |
|  | NR_TDD_FR2_T |                                   |                                    |        |
|  | NR_TDD_FR2_Y |                                   |                                    |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |              |                                   |                                    |        |

**A.5.5.2.3.2 Test Requirements**

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.3.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 4 slot before an SMTC and no later than 4 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.3.2-2.

**Table A.5.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 4                          |

**Table A.5.5.2.3.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 8 + SMTC duration          |

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

#### A.5.5.2.4 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

##### A.5.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.4.1-1.

The general test parameters are given in Table A.5.5.2.4.1-2, and NR cell specific test parameters are given in Table A.5.5.2.4.1-3 and A.5.5.2.4.1-4 below. The E-UTRAN cell specific test parameters can be found in Table A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 are NR FR2 PSCell and NR FR2 deactivated SCell, respectively. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.5.5.2.4.1-1: Interruption during measurements on deactivated NR SCC supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.5.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter                                | Unit | Value   | Comment  |
|--|------|---------|--|
| RF Channel Number                        |      | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell                             |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Configured PSCell                        |      | Cell2   | PSCell on NR RF channel number 2.                              |
| Configured deactivated SCell             |      | Cell3   | Deactivated SCell on NR RF channel number 3.                   |
| CP length                                |      | Normal  | Applicable to cell1, cell 2 and cell3                          |
| AoA number                               |      | 1       | Applicable to cell2 and cell3                                  |
| DRX                                      |      | OFF     |  |
| Measurement gap pattern Id               |      | OFF     |  |
| SCell measurement cycle (measCycleSCell) | ms   | 640     |  |
| T1                                       | s    | 10      |  |



**Table A.5.2.4.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter  |            | Unit | Cell 2                      | Cell 3                      |
|--|------------|------|-----------------------------|-----------------------------|
| Frequency Range  |            |      | FR2                         | FR2                         |
| Duplex mode  | Config 1,2 |      | TDD                         | TDD                         |
| TDD configuration  | Config 1,2 |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | Config 1,2 |      | 66                          | 66                          |
| Downlink initial BWP Configuration   | Config 1,2 |      | DLBWP.0.1                   |                             |
| Downlink dedicated BWP Configuration   | Config 1,2 |      | DLBWP.1.1                   |                             |
| Uplink initial BWP configuration   | Config 1,2 |      | ULBWP.0.1                   |                             |
| Uplink dedicated BWP configuration   | Config 1,2 |      | ULBWP.1.1                   |                             |
| PDSCH Reference measurement channel  | Config 1,2 |      | SR.3.1 TDD                  | -                           |
| RMSI CORESET Reference Channel   | Config 1,2 |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
| PDCCH CORESET parameters   | Config 1,2 |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
| OCNG Patterns  |            |      | OP.1                        | OP.1                        |
| SSB Configuration  |            |      | SSB.1 FR2                   | SSB.1 FR2                   |
| SMTTC Configuration  | Config 1,2 |      | SMTTC.1 FR2                 | SMTTC.1 FR2                 |
| TRS configuration  | Config 1,2 |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| TCI state  | Config 1,2 |      | TCI.State.0                 | TCI.State.0                 |
| EPRE ratio of PSS to SSS   |            | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH   |            |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |      |                             |                             |
| Propagation Condition  |            |      |                             |                             |
| Time offset to cell1 <sup>Note 2</sup>   |            | μs   | 62.5                        | 62.5+ Time offset to cell2  |
| Time offset to cell2 <sup>Note 3</sup>   |            | μs   | -                           | 3                           |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |      |                             |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |      |                             |                             |
| Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells                                      |            |      |                             |                             |

**Table A.5.5.2.4.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter  |              | Unit                           | Cell 2                             | Cell 3 |
|--|--------------|--------------------------------|------------------------------------|--------|
| Angle of arrival configuration   |              |                                | Setup 1 defined in clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 6</sup>  |              |                                | Fine                               | Rough  |
| $N_{oc}$ <sup>Note1</sup>  | NR_TDD_FR2_A | dBm/15kHz                      | -111.7                             | -104.7 |
|  | NR_TDD_FR2_B |                                |                                    |        |
|  | NR_TDD_FR2_F |                                |                                    |        |
|  | NR_TDD_FR2_G |                                |                                    |        |
|  | NR_TDD_FR2_T |                                |                                    |        |
|  | NR_TDD_FR2_Y |                                |                                    |        |
| $N_{oc}$ <sup>Note1</sup>  | NR_TDD_FR2_A | dBm/SCS <sup>Note3</sup>       | -102.7                             | -95.7  |
|  | NR_TDD_FR2_B |                                |                                    |        |
|  | NR_TDD_FR2_F |                                |                                    |        |
|  | NR_TDD_FR2_G |                                |                                    |        |
|  | NR_TDD_FR2_T |                                |                                    |        |
|  | NR_TDD_FR2_Y |                                |                                    |        |
| SSB_RP <sup>Note2</sup>  | NR_TDD_FR2_A | dBm/SCS <sup>Note4</sup>       | -90.7                              | -90.7  |
|  | NR_TDD_FR2_B |                                |                                    |        |
|  | NR_TDD_FR2_F |                                |                                    |        |
|  | NR_TDD_FR2_G |                                |                                    |        |
|  | NR_TDD_FR2_T |                                |                                    |        |
|  | NR_TDD_FR2_Y |                                |                                    |        |
| $\hat{E}_s/I_{ot}$   |              | dB                             | 12                                 | 5      |
| $\hat{E}_s/N_{oc}$   |              | dB                             | 12                                 | 5      |
| $I_o$ <sup>Note2</sup>   | NR_TDD_FR2_A | dBm/95.04 MHz <sup>Note4</sup> | -61.45                             | -60.52 |
|  | NR_TDD_FR2_B |                                |                                    |        |
|  | NR_TDD_FR2_F |                                |                                    |        |
|  | NR_TDD_FR2_G |                                |                                    |        |
|  | NR_TDD_FR2_T |                                |                                    |        |
|  | NR_TDD_FR2_Y |                                |                                    |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |              |                                |                                    |        |

#### A.5.5.2.4.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.4.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 4 slot before an SMTC and no later than 4 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.4.2-2.

**Table A.5.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 4                          |

**Table A.5.5.2.4.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 8 + SMTC duration          |

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

### A.5.5.2.5 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

#### A.5.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8.2.1.2. Supported test configurations are shown in table A.5.5.2.5.1-1.

The general test parameters are given in Table A.5.5.2.5.1-2, and NR cell specific test parameters are given in Table A.5.5.2.5.1-3 and A.5.5.2.5.1-4 below. The E-UTRAN cell specific test parameters can be found in Table A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 are LTE PCell and LTE deactivated SCell, respectively, and Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRA SCell is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.5.5.2.5.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.5.5.2.5.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter                                | Unit | Value   | Comment  |
|--|------|---------|--|
| RF Channel Number                        |      | 1, 2, 3 | One is NR RF channel and two are E-UTRAN RF channels |
| Active PCell                             |      | Cell1   | PCell on E-UTRAN RF channel number 1.                |
| Configured PSCell                        |      | Cell2   | PSCell on NR RF channel number 2.                    |
| Configured deactivated SCell             |      | Cell3   | Deactivated SCell on E-UTRAN RF channel number 3.    |
| CP length                                |      | Normal  | Applicable to cell1, cell 2 and cell3                |
| DRX                                      |      | OFF     |  |
| Measurement gap pattern Id               |      | OFF     |  |
| SCell measurement cycle (measCycleSCell) | ms   | 640     |  |
| T1                                       | s    | 10      |  |

**Table A.5.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter  |            | Unit | Cell 2                      |
|--|------------|------|-----------------------------|
| Frequency Range  |            |      | FR2                         |
| Duplex mode  | Config 1,2 |      | TDD                         |
| TDD configuration  | Config 1,2 |      | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz  | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | Config 1,2 |      | 66                          |
| Downlink initial BWP Configuration   | Config 1,2 |      | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1,2 |      | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1,2 |      | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1,2 |      | ULBWP.1.1                   |
| PDSCH Reference measurement channel  | Config 1,2 |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | Config 1,2 |      | CR.3.1 TDD                  |
| PDCCH CORESET parameters   | Config 1,2 |      | CCR.3.1 TDD                 |
| OCNG Patterns  |            |      | OP.1                        |
| SMTc Configuration   | Config 1,2 |      | SMTc.1 FR2                  |
| SSB Configuration  | Config 1,2 |      | SSB.1 FR2                   |
| TRS configuration  | Config 1,2 |      | TRS.2.1 TDD                 |
| TCI state  | Config 1,2 |      | TCI.State.0                 |
| EPRE ratio of PSS to SSS   |            | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |      |                             |
| EPRE ratio of PDSCH to PDSCH   |            |      |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |      |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |      |                             |
| Propagation Condition  |            |      | AWGN                        |
| Time offset to cell1 <sup>Note 2</sup>   |            | μs   | 3                           |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |      |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |      |                             |

**Table A.5.5.2.5.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC**

| Parameter  | Unit                           | Cell2                                |
|--|--------------------------------|--------------------------------------|
| Angle of arrival configuration   |                                | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams <sup>Note6</sup>   |                                | Fine                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -112                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -102.97                              |
| $\hat{E}_s / N_{oc}$   | dB                             | 17                                   |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -85.97                               |
| $\hat{E}_s / I_{ot}$   | dB                             | 17                                   |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -56.90                               |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |

#### A.5.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.5.2-1.

**Table A.5.5.2.5.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 5                          |

**Table A.5.5.2.5.2-2: Void**

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

#### A.5.5.2.6 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

##### A.5.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.6.1-1.

The general test parameters are given in Table A.5.5.2.6.1-2, and NR cell specific test parameters are given in Table A.5.5.2.6.1-3 and A.5.5.2.6.1-4 below. The E-UTRAN cell specific test parameters can be found in Table A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 are LTE PCell and LTE deactivated SCell, respectively, and Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRA SCell is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

**Table A.5.5.2.6.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.5.2.6.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter   | Unit | Value   | Comment  |
|---|------|---------|--|
| RF Channel Number                                 |      | 1, 2, 3 | One is NR RF channel and two are E-UTRAN RF channels |
| Active PCell                                      |      | Cell1   | PCell on E-UTRAN RF channel number 1.                |
| Configured PSCell                                 |      | Cell2   | PSCell on NR RF channel number 2.                    |
| Configured deactivated SCell                      |      | Cell3   | Deactivated SCell on E-UTRAN RF channel number 3.    |
| CP length   |      | Normal  | Applicable to cell1, cell 2 and cell3                |
| DRX   |      | OFF     |  |
| Measurement gap pattern Id                        |      | OFF     |  |
| SCell measurement cycle ( <i>measCycleSCell</i> ) | ms   | 640     |  |
| T1  | s    | 10      |  |

**Table A.5.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC**

| Parameter  |            | Unit | Cell 2                      |
|--|------------|------|-----------------------------|
| Frequency Range  |            |      | FR2                         |
| Duplex mode  | Config 1,2 |      | TDD                         |
| TDD configuration  | Config 1,2 |      | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz  | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | Config 1,2 |      | 66                          |
| Downlink initial BWP Configuration   | Config 1,2 |      | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1,2 |      | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1,2 |      | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1,2 |      | ULBWP.1.1                   |
| PDSCH Reference measurement channel  | Config 1,2 |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | Config 1,2 |      | CR.3.1 TDD                  |
| PDCCH CORESET parameters   | Config 1,2 |      | CCR.3.1 TDD                 |
| OCNG Patterns  |            |      | OP.1                        |
| SMTTC Configuration  | Config 1,2 |      | SMTTC.1 FR2                 |
| SSB Configuration  | Config 1,2 |      | SSB.1 FR2                   |
| TRS configuration  | Config 1,2 |      | TRS.2.1 TDD                 |
| TCI state  | Config 1,2 |      | TCI.State.0                 |
| EPRE ratio of PSS to SSS   |            | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |      |                             |
| EPRE ratio of PDSCH to PDSCH   |            |      |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |      |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |      |                             |
| Propagation Condition  |            |      | AWGN                        |
| Time offset to cell1 <sup>Note 2</sup>   |            | μs   | 62.5                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |      |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |      |                             |

**Table A.5.5.2.6.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC**

| Parameter  | Unit                           | Cell2                                |
|--|--------------------------------|--------------------------------------|
| Angle of arrival configuration   |                                | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams <sup>Note6</sup>   |                                | Fine                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -112                                 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -102.97                              |
| $\hat{E}_s/N_{oc}$   | dB                             | 17                                   |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -85.97                               |
| $\hat{E}_s/I_{ot}$   | dB                             | 17                                   |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -56.90                               |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |

#### A.5.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.6.2-1.

**Table A.5.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 5                          |

**Table A.5.5.2.6.2-2: Void**

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

#### A.5.5.2.7 E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching

##### A.5.5.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS on a PUSCH-less carrier of SCell, the UE can perform carrier based switching to one PUSCH-less SCCs from a CC with PUSCH. The test will verify the interruption requirements on active serving cell in SCG in clause 8.2.1.2.13. Supported test configurations are shown in table A.5.5.2.7.1-1.

In the test there are three cells: cell1, cell2 and cell3. Cell1 is E-UTRAN PCell on the primary component carrier. Cell3 is E-UTRAN SCell on the TDD secondary component carrier which operates in downlink without PUCCH/PUSCH.



Cell2 is NR FR2 PSCell. The UE is configured with the SRS switching between E-UTRAN PCell and E-UTRAN SCell. The general test parameters and NR cell specific test parameters are given in Table A.5.5.2.8.1-2, A.5.5.2.8.1-3. And the E-UTRAN cell specific test parameters (for cell1 and cell3) can refer to Table A.3.7.2.1-1. The test consists of two successive time periods, with duration of T1 and T2, respectively. During T1 LTE PCell and NR PSCell are continuously scheduled in DL. Immediately at the beginning of T2, a PDCCH with SRS-TPC-RNTI is sent to the UE to initiate SRS switching.

**Table A.5.5.2.7.1-1: E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.5.2.7.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Parameter                  | Unit | Value   | Comment  |
|----------------------------|------|---------|--|
| RF Channel Number          |      | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell               |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Active PSCell              |      | Cell2   | PSCell on NR RF channel number 2.                              |
| Activated SCell            |      | Cell3   | SCell on E-UTRAN RF channel number 3.                          |
| CP length                  |      | Normal  | Applicable to Cell1, Cell2 and Cell3                           |
| DRX                        |      | OFF     |  |
| Measurement gap pattern Id |      | OFF     |  |
| T1                         | s    | 0.2     |  |
| T2                         | s    | 0.2     | UE shall perform SRS switching during T2                       |

**Table A.5.5.2.7.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Parameter  |            | Unit | Cell 2                      |
|--|------------|------|-----------------------------|
| Frequency Range  |            |      | FR2                         |
| Duplex mode  | Config 1,2 |      | TDD                         |
| TDD configuration  | Config 1,2 |      | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz  | 100: N <sub>RB,c</sub> = 66 |
| Downlink initial BWP Configuration   | Config 1,2 |      | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1,2 |      | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1,2 |      | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1,2 |      | ULBWP.1.1                   |
| TRS configuration  | Config 1,2 |      | TRS.2.1 TDD                 |
| TCI state  | Config 1,2 |      | TCI.State.0                 |
| PDSCH Reference measurement channel  | Config 1,2 |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | Config 1,2 |      | CR.3.1 TDD                  |
| RMC CORESET Reference Channel  | Config 1,2 |      | CCR.3.1 TDD                 |
| OCNG Patterns  |            |      | OP.1                        |
| SSB Configuration  |            |      | SSB.1 FR2                   |
| SMTc Configuration   | Config 1,2 |      | SMTc.1                      |
| EPRE ratio of PSS to SSS   |            | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |      |                             |
| EPRE ratio of PDSCH to PDSCH   |            |      |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |      |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |      |                             |
| $\dot{E}_s/N_{oc}$   |            |      |                             |
| Propagation Condition  |            |      | AWGN                        |
| Time offset to cell1 <sup>Note 2</sup>   |            | ms   | 3                           |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |      |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |      |                             |

**Table A.5.5.2.7.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter   | Unit                           | Cell2                                |
|---|--------------------------------|--------------------------------------|
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams <sup>Note6</sup>  |                                | Fine                                 |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -112                                 |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -102.97                              |
| $\hat{E}_s/N_{oc}$  | dB                             | 17                                   |
| SS-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -85.97                               |
| $\hat{E}_s/I_{ot}$  | dB                             | 17                                   |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -56.90                               |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |

**Table A.5.5.2.7.1-5: Sounding Reference Symbol Configuration for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Field  | Value | Comment   |
|--|-------|---|
| srsBandwidthConfiguration                                    | bw5   |   |
| srsSubframeConfiguration                                     | Sc8   | Once every 5 subframes                            |
| ackNackSrsSimultaneousTransmission                           | FALSE |   |
| srsMaxUpPTS  | N/A   | Not applicable for E-UTRAN FDD                    |
| srsBandwidth   | 0     | No hopping  |
| srsHoppingBandwidth  | hbw0  |   |
| frequencyDomainPosition                                      | 0     |   |
| Duration   | TRUE  | Indefinite duration                               |
| Srs-ConfigurationIndex                                       | 47    | SRS periodicity of 40ms.                          |
| transmissionComb   | 0     |   |
| cyclicShift  | cs0   | No cyclic shift                                   |
| SRS-AntennaPort  | an1   | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331. |       |   |

### A.5.5.2.7.2 Test Requirements

The UE shall be continuously scheduled in NR FR2 PSCell throughout the test. During T2 two interruption time periods are allowed on Cell2 and Cell1, each interruption due to SRS carrier based switching on Cell2 shall not exceed X defined in Table A.5.5.2.7.2-1.

**Table A.5.5.2.7.2-1: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|-------|---------------------|-------------------------------|
| 2     | 0.25                | 5                             |
| 3     | 0.125               | 9                             |

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

### A.5.5.2.8 E-UTRAN – NR FR2 interruptions at NR SRS carrier based switching

#### A.5.5.2.8.1 Test Purpose and Environment

The purpose of the test is to verify interruptions at NR SRS carrier based switching requirements defined in TS38.133 clause 8.2.1.2.12 and TS36.133 clause 7.32.2.13. The general test parameters are given in Table A.5.5.2.8.1-2, and NR cell specific test parameters are given in Table A.5.5.2.8.1-3. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1.

In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 is NR FR2 PSCell and Cell3 is NR FR2 SCell. Cell3 is not configured with PUCCH/PUSCH transmission. The test consists of two time periods, with duration of T1 and T2, respectively. During T1 and T2, Cell1, Cell2 and Cell3 are continuously scheduled in DL. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR SCell.

At the beginning of T2, TE shall trigger aperiodic SRS transmission on Cell3.

**Table A.5.5.2.8.1-1: Interruption at transitions between active and non-active during DRX supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.2.8.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter                  | Unit | Value  | Comment  |
|----------------------------|------|--------|--|
| RF Channel Number          |      | 1, 2   | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell               |      | Cell1  | PCell on E-UTRAN RF channel number 1.                    |
| Configured PSCell          |      | Cell2  | PSCell on NR RF channel number 2.                        |
| Configured SCell           |      | Cell3  | SCell on NR RF channel number 3.                         |
| CP length                  |      | Normal | Applicable to cell1 and cell 2                           |
| DRX                        |      | OFF    |  |
| Measurement gap pattern Id |      | OFF    |  |
| T1                         | s    | 5      |  |
| T2                         | s    | 0.1    |  |

**Table A.5.5.2.8.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter  |            | Unit    | Cell 2 | Cell 3                      |
|--|------------|---------|--------|-----------------------------|
| Frequency Range  |            |         |        | FR2                         |
| Duplex mode  | Config 1,2 |         |        | TDD                         |
| TDD configuration  | Config 1,2 |         |        | TDDConf.3.1                 |
| BW <sub>channel</sub>  | Config 1,2 | MHz     |        | 100: N <sub>RB,c</sub> = 66 |
| Downlink initial BWP Configuration   | Config 1,2 |         |        | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1,2 |         |        | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1,2 |         |        | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1,2 |         |        | ULBWP.1.1                   |
| TRS configuration  | Config 1,2 |         |        | TRS.2.1 TDD                 |
| SRS configuration  | Config 1,2 |         |        | SRS.3 TDD                   |
| TCI state  | Config 1,2 |         |        | TCI.State.0                 |
| PDSCH Reference measurement channel  | Config 1,2 |         |        | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | Config 1,2 |         |        | CR.3.1 TDD                  |
| RMC CORESET Reference Channel  | Config 1,2 |         |        | CCR.3.1 TDD                 |
| OCNG Patterns  |            |         |        | OP.1                        |
| SSB Configuration  |            |         |        | SSB.1 FR2                   |
| SMTTC Configuration  | Config 1,2 |         |        | SMTTC.1                     |
| EPRE ratio of PSS to SSS   |            | dB      |        | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |         |        |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |         |        |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |         |        |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |         |        |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |         |        |                             |
| EPRE ratio of PDSCH to PDSCH   |            |         |        |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |         |        |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |         |        |                             |
| $\bar{E}_s/N_{oc}$   |            | dB      |        | 17                          |
| Propagation Condition  |            |         |        | AWGN                        |
| Time offset to cell1 <sup>Note 2</sup>   |            | $\mu$ s |        | 33                          |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                                |            |         |        |                             |
| Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells |            |         |        |                             |

Table A.5.5.2.8.1-3A: OTA related test parameters

| Parameter   | Unit                           | Test 1                               |    |
|---|--------------------------------|--------------------------------------|----|
|   |                                | T1                                   | T2 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |    |
| Assumption for UE beams <sup>Note 6</sup>   |                                | Fine                                 |    |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -112                                 |    |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -103                                 |    |
| $\hat{E}_s / N_{oc}$  | dB                             | 4                                    |    |
| SS-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -99                                  |    |
| $\hat{E}_s / I_{ot}$  | dB                             | 4                                    |    |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -68.5                                |    |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |    |

Table A.5.5.2.8.1-4: Void

### A.5.5.2.8.3 Test Requirements

In T2 UE shall transmit SRS on Cell3 as requested. During T2 interruption on Cell2 due to SRS carrier based switching from Cell2 to Cell3 shall not exceed the requirements defined in TS38.133 clause 8.2.1.2.12.

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

## A.5.5.3 SCell Activation and Deactivation Delay

### A.5.5.3.1 SCell Activation and deactivation of SCell in FR2 intra-band

#### A.5.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1 except the SCell is in FR2 intra-band.

The supported test configurations are shown in table A.5.5.3.1.1-1 below. The general and cell specific test parameters are the same except those described in the following clause. The listed parameter values in Tables A.5.5.3.1.1-2 and A.5.5.3.1.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2 and A.4.5.3.1.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.1.1-4 below.

In this test it is assumed that the UE is receiving RRC messages pertaining to the SCell in SCG via signaling on SRB3.

**Table A.5.5.3.1.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell**

| Configuration   | Description   |
|---|---|
| 1   | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations |   |

**Table A.5.5.3.1.1-2: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter    | Unit | Value  | Comment  |
|--------------|------|--------|--|
| Active PCell |      | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.2 |

**Table A.5.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter <sup>Note 5</sup>   | Unit | Cell 2                      |      |    | Cell 3                      |    |    |
|---|------|-----------------------------|------|----|-----------------------------|----|----|
|   |      | T1                          | T2   | T3 | T1                          | T2 | T3 |
| SSB ARFCN   |      | freq1                       |      |    | freq2                       |    |    |
| Duplex mode   |      | TDD                         |      |    | TDD                         |    |    |
| TDD configuration   |      | TDDConf.3.1                 |      |    | TDDConf.3.1                 |    |    |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |      |    | 100: N <sub>RB,c</sub> = 66 |    |    |
| Data RBs allocated  |      | 66                          |      |    | 66                          |    |    |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  |      |    | SR.3.1 TDD                  |    |    |
| RMSI CORESET Reference Channel  |      | CR.3.1 TDD                  |      |    | CR.3.1 TDD                  |    |    |
| RMC CORESET Reference Channel   |      | CCR.3.1 TDD                 |      |    | CCR.3.1 TDD                 |    |    |
| DL initial BWP configuration  |      | DLBWP.0.1                   |      |    |                             |    |    |
| DL dedicated BWP configuration  |      | DLBWP.1.1                   |      |    |                             |    |    |
| UL initial BWP configuration  |      | ULBWP.0.1                   |      |    |                             |    |    |
| UL dedicated BWP configuration  |      | ULBWP.1.1                   |      |    |                             |    |    |
| OCNG Patterns   |      | OP.1                        |      |    |                             |    |    |
| SMTc configuration  |      | SMTc.1                      |      |    |                             |    |    |
| SSB configuration   |      | SSB.1 FR2                   |      |    |                             |    |    |
| TCI state   |      | TCI.State.0                 |      |    |                             |    |    |
| TRS configuration   |      | TRS.2.1 TDD                 |      |    |                             |    |    |
| CSI-RS configuration for CSI reporting  |      | CSI-RS.3.1 TDD              |      |    |                             |    |    |
| reportConfigType  |      | periodic                    |      |    | N/A                         |    |    |
| reportQuantity  |      | cri-RI-PMI-CQI              |      |    | N/A                         |    |    |
| CSI reporting periodicity   | slot | 40                          |      |    | N/A                         |    |    |
| CSI reporting offset  | slot | 4                           |      |    | N/A                         |    |    |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         |      |    |                             |    |    |
| EPRE ratio of PSS to SSS  | dB   | 0                           |      |    |                             |    |    |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |      |    |                             |    |    |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |      |    |                             |    |    |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |      |    |                             |    |    |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |      |    |                             |    |    |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |      |    |                             |    |    |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |      |    |                             |    |    |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |      |    |                             |    |    |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |      |    |                             |    |    |
| Propagation conditions  |      |                             | AWGN |    |                             |    |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |      |    |                             |    |    |
| Note 2: Void  |      |                             |      |    |                             |    |    |
| Note 3: Void  |      |                             |      |    |                             |    |    |
| Note 4: Void  |      |                             |      |    |                             |    |    |
| Note 5: All parameters apply for configuration 1 and 2.   |      |                             |      |    |                             |    |    |

**Table A.5.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter <sup>Note 6</sup>               | Unit   | Cell 2                        |    |    | Cell 3 |    |    |
|---|--|-------------------------------|----|----|--------|----|----|
|   |  | T1                            | T2 | T3 | T1     | T2 | T3 |
| Angle of arrival configuration            |  | Setup 1 according to A.3.15.1 |    |    |        |    |    |
| Assumption for UE beams <sup>Note 7</sup> |  | Rough                         |    |    | Rough  |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sup>Note4</sup>   | -104.7                        |    |    | -104.7 |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sup>Note3</sup>   | -95.7                         |    |    | -95.7  |    |    |
| $\hat{E}_s / N_{oc}$                      | dB   | 7                             |    |    | 7      |    |    |
| SSB_RP <sup>Note2</sup>                   | dBm/SCS <sup>Note4</sup>   | -88.7                         |    |    | -88.7  |    |    |
| $\hat{E}_s / I_{ot}$                      | dB   | 7                             |    |    | 7      |    |    |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sup>Note4</sup>   | -58.92                        |    |    | -58.92 |    |    |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                               |    |    |        |    |    |
| Note 2:                                   | Es/lot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |    |    |        |    |    |
| Note 3:                                   | Void   |                               |    |    |        |    |    |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                               |    |    |        |    |    |
| Note 5:                                   | Void   |                               |    |    |        |    |    |
| Note 6:                                   | All parameters apply for configuration 1 and 2   |                               |    |    |        |    |    |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                               |    |    |        |    |    |

### A.5.5.3.1.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, with the following exception:

- Placement of interruptions is only verified in NR PSCell.

### A.5.5.3.2 SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle

#### A.5.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1, except PSCell is in FR2.

The supported test configurations are shown in table A.5.5.3.2.1-1 below. The general test parameters are the same in Tables A.4.5.3.1.1-2. The cell specific test parameters are given in Tables A.5.5.3.2.1-2. In this case, OTA related test parameters are the same as in table A.5.5.3.2.1-3.

**Table A.5.5.3.2.1-1: Supported test configurations for FR1 SCell activation case with PSCell is FR2**

| Configuration | Description   |
|---------------|---|
| 1             | FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4             | TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5             | TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6             | TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:         | The UE is only required to pass in one of the supported test configurations   |



**Table A.5.5.3.2.1-2: Cell specific test parameters for FR1 SCell activation case with FR2 PSCell**

| Parameter   |                    | Unit | Cell 2                      |      |    | Cell 3                      |                                    |    |
|---|--------------------|------|-----------------------------|------|----|-----------------------------|------------------------------------|----|
|   |                    |      | T1                          | T2   | T3 | T1                          | T2                                 | T3 |
| SSB ARFCN   |                    |      | freq2                       |      |    | freq1                       |                                    |    |
| Duplex mode   | Config 1,4         |      | TDD                         |      |    | FDD                         |                                    |    |
|   | Config 2,3,5,6     |      | TDD                         |      |    | TDD                         |                                    |    |
| TDD configuration   | Config 1,4         |      | TDDConf.3.1                 |      |    | Not Applicable              |                                    |    |
|   | Config 2,5         |      |                             |      |    | TDDConf.1.1                 |                                    |    |
|   | Config 3,6         |      |                             |      |    | TDDConf.2.1                 |                                    |    |
| BW <sub>channel</sub>   | Config 1,4         | MHz  | 100: N <sub>RB,c</sub> = 66 |      |    | 10: N <sub>RB,c</sub> = 52  |                                    |    |
|   | Config 2,5         |      |                             |      |    | 10: N <sub>RB,c</sub> = 52  |                                    |    |
|   | Config 3,6         |      |                             |      |    | 40: N <sub>RB,c</sub> = 106 |                                    |    |
| Data RBs allocated  | Config 1,4         |      | 66                          |      |    | 52                          |                                    |    |
|   | Config 2,5         |      |                             |      |    | 52                          |                                    |    |
|   | Config 3,6         |      |                             |      |    | 106                         |                                    |    |
| DL initial BWP configuration  | Config 1,2,3,4,5,6 |      | DLBWP.0.1                   |      |    |                             |                                    |    |
| DL dedicated BWP configuration  | Config 1,2,3,4,5,6 |      | DLBWP.1.1                   |      |    |                             |                                    |    |
| UL initial BWP configuration  | Config 1,2,3,4,5,6 |      | ULBWP.0.1                   |      |    |                             |                                    |    |
| UL dedicated BWP configuration  | Config 1,2,3,4,5,6 |      | ULBWP.1.1                   |      |    |                             |                                    |    |
| DRX Cycle   |                    | ms   | Not Applicable              |      |    |                             |                                    |    |
| PDSCH Reference measurement channel   | Config 1,4         |      | SR.3.1 TDD                  |      |    | SR.1.1 FDD                  |                                    |    |
|   | Config 2,5         |      |                             |      |    | SR.1.1 TDD                  |                                    |    |
|   | Config 3,6         |      |                             |      |    | SR.2.1 TDD                  |                                    |    |
| RMSI CORESET Reference Channel  | Config 1,4         |      | CR.3.1 TDD                  |      |    | CR.1.1 FDD                  |                                    |    |
|   | Config 2,5         |      |                             |      |    | CR.1.1 TDD                  |                                    |    |
|   | Config 3,6         |      |                             |      |    | CR.2.1 TDD                  |                                    |    |
| RMC CORESET Reference Channel   | Config 1,4         |      | CCR.3.1 TDD                 |      |    | CCR.1.1 FDD                 |                                    |    |
|   | Config 2,5         |      |                             |      |    | CCR.1.1 TDD                 |                                    |    |
|   | Config 3,6         |      |                             |      |    | CCR.2.1 TDD                 |                                    |    |
| OCNG Patterns   |                    |      | OP.1                        |      |    |                             |                                    |    |
| SMTC configuration  |                    |      | SMTC.1                      |      |    |                             |                                    |    |
| TCI state   |                    |      | TCI.State.0                 |      |    | NA                          |                                    |    |
| TRS configuration   | Config 1,4         |      | TRS.2.1 TDD                 |      |    | TRS.1.1 FDD                 |                                    |    |
|   | Config 2,5         |      |                             |      |    | TRS.1.1 TDD                 |                                    |    |
|   | Config 3,6         |      |                             |      |    | TRS.1.2 TDD                 |                                    |    |
| SSB configuration   | Config 1,2,4,5     |      | SSB.1 FR2                   |      |    | SSB.1 FR1                   |                                    |    |
|   | Config 3,6         |      |                             |      |    | SSB.2 FR1                   |                                    |    |
| CSI-RS configuration for CSI reporting  | Config 1,4         |      | CSI-RS.3.1 TDD              |      |    | CSI-RS.1.1 FDD              |                                    |    |
|   | Config 2,5         |      |                             |      |    | CSI-RS.1.1 TDD              |                                    |    |
|   | Config 3,6         |      |                             |      |    | CSI-RS.2.1 TDD              |                                    |    |
| PDSCH/PDCCH subcarrier spacing  | Config 1,2,4,5     | kHz  | 120kHz                      |      |    | 15kHz                       |                                    |    |
|   | Config 3,6         |      |                             |      |    | 30kHz                       |                                    |    |
| reportConfigType  | Config 1-6         |      | periodic                    |      |    | N/A                         |                                    |    |
| reportQuantity  | Config 1-6         |      | cri-RI-PMI-CQI              |      |    | N/A                         |                                    |    |
| CSI reporting periodicity   | Config 1,2,3,4,5,6 | slot | 40                          |      |    | N/A                         |                                    |    |
| CSI reporting offset  | Config 1,2,3,4,5,6 | slot | 4                           |      |    | N/A                         |                                    |    |
| EPRE ratio of PSS to SSS  |                    | dB   | 0                           |      |    |                             |                                    |    |
| EPRE ratio of PBCH DMRS to SSS  |                    |      |                             |      |    |                             |                                    |    |
| EPRE ratio of PBCH to PBCH DMRS   |                    |      |                             |      |    |                             |                                    |    |
| EPRE ratio of PDCCH DMRS to SSS   |                    |      |                             |      |    |                             |                                    |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |                    |      |                             |      |    |                             |                                    |    |
| EPRE ratio of PDSCH DMRS to SSS   |                    |      |                             |      |    |                             |                                    |    |
| EPRE ratio of PDSCH to PDSCH  |                    |      |                             |      |    |                             |                                    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                    |      |                             |      |    |                             |                                    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                    |      |                             |      |    |                             |                                    |    |
| Propagation condition   |                    |      |                             | AWGN |    |                             | NA<br>Link only, see clause A.3.7A |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                    |      |                             |      |    |                             |                                    |    |

Note 2: Void  
 Note 3: Void  
 Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]

**Table A.5.5.3.2.1-3: OTA related test parameters for FR1 SCell activation case with FR2 PSCell**

| Parameter                                 | Unit           | Cell 2                               |    |    | Cell 3                             |    |    |
|---|----------------|--------------------------------------|----|----|------------------------------------|----|----|
|   |                | T1                                   | T2 | T3 | T1                                 | T2 | T3 |
| Angle of arrival configuration            |                | Setup 1 according to clause A.3.15.1 |    |    | NA<br>Link only, see clause A.3.7A |    |    |
| Assumption for UE beams <sup>Note 7</sup> |                | Rough                                |    |    |                                    |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz      | -104.7                               |    |    |                                    |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | Config 1,2,4,5 | -95.7                                |    |    |                                    |    |    |
|   | Config 3,6     |                                      |    |    |                                    |    |    |
| SSB_RP <sup>Note2</sup>                   | Config 1,2,4,5 | -88.7                                |    |    |                                    |    |    |
|   | Config 3,6     |                                      |    |    |                                    |    |    |
| $\hat{E}_s / N_{oc}$                      | dB             | 7                                    |    |    |                                    |    |    |
| $\hat{E}_s / I_{ot}$                      | dB             | 7                                    |    |    |                                    |    |    |
| $I_o$ <sup>Note2</sup>                    | Config 1,2,4,5 | -58.92                               |    |    |                                    |    |    |
|   | Config 3,6     |                                      |    |    |                                    |    |    |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.  
 Note 2:  $E_s/I_{ot}$ , SSB\_RP and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  
 Note 3: Void  
 Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  
 Note 5: Void  
 Note 6: ChBW is 94.04 MHz for Cell2, 9.36 MHz for Cell 3 in configurations 1,2,4,5, 38.1 MHz in configurations 3,6  
 Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**A.5.5.3.2.2 Test Requirements**

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case.

**A.5.5.3.3 Void**

**A.5.5.3.4 Void**

**A.5.5.3.5 SCell Activation and deactivation of SCell in FR2**

**A.5.5.3.5.1 Test Purpose and Environment**

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell is in FR2.

The supported test configurations are shown in table A.5.5.3.5.1-1 below. The test parameters are the same as in clause A.4.5.3.3.1 except those described in the following clause. The listed parameter values in Tables A.5.5.3.5.1-2 will replace the values of corresponding parameters in Tables A.4.5.3.3.1-2. The listed parameter values in Tables A.5.5.3.5.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.3.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.5.1-4 below.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell (Cell 1), NR has two cells, PSCell (Cell 2) in FR1 and SCell (Cell 3) in FR2. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment 100ms after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2.

During T2, the test equipment monitors the L1-RSRP measurement reporting for the SCell. The time when test equipment receives a valid L1-RSRP report is denoted as slot  $m+T_{L1-RSRP}$ . In the next DL slot after slot  $m+T_{L1-RSRP}$ , the test equipment sends a MAC message for the activation of the TCI state of the RMC CORESET of the SCell. In the same slot, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell and PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

**Table A.5.5.3.5.1-1: FR2 SCell activation in non-DRX test configurations with FR1 PSCell**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3             | LTE FDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4             | LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5             | LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 6             | LTE TDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.3.5.1-2: General test parameters for FR2 SCell activation case with FR1 PSCell**

| Parameter    | Unit | Value  | Comment  |
|--------------|------|--------|--|
| Active PCell |      | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.2 |
| T2           | s    | 2      | During this time the UE shall activate the SCell.                                |

**Table A.5.5.3.5.1-3: Cell specific test parameters for FR2 SCell activation case with FR1 PSCell**

| Parameter             | Unit           | Cell 2                     |    |    | Cell 3                      |    |    |
|-----------------------|----------------|----------------------------|----|----|-----------------------------|----|----|
|                       |                | T1                         | T2 | T3 | T1                          | T2 | T3 |
| SSB ARFCN             |                | freq1                      |    |    | freq2                       |    |    |
| Duplex mode           | Config 1,4     | FDD                        |    |    | TDD                         |    |    |
|                       | Config 2,3,5,6 | TDD                        |    |    | TDD                         |    |    |
| TDD configuration     | Config 1,4     | Not Applicable             |    |    | TDDConf.3.1                 |    |    |
|                       | Config 2,5     | TDDConf.1.1                |    |    |                             |    |    |
|                       | Config 3,6     | TDDConf.2.1                |    |    |                             |    |    |
| BW <sub>channel</sub> | Config 1,4     | 10: N <sub>RB,c</sub> = 52 |    |    | 100: N <sub>RB,c</sub> = 66 |    |    |
|                       | Config 2,5     | 10: N <sub>RB,c</sub> = 52 |    |    |                             |    |    |

|   |   |      |                                     |  |
|---|---|------|-------------------------------------|--|
|   | Config 3,6  |      | 40: $N_{RB,c} = 106$                |  |
| Data RBs allocated                              | Config 1,4  |      | 52                                  | 66   |
|   | Config 2,5  |      | 52                                  |  |
|   | Config 3,6  |      | 106                                 |  |
| BWP BW  | Config 1,4  |      | 10: $N_{RB,c} = 52$                 | 100: $N_{RB,c} = 66$                         |
|   | Config 2,5  |      | 10: $N_{RB,c} = 52$                 |  |
|   | Config 3,6  |      | 40: $N_{RB,c} = 106$                |  |
| DRx Cycle                                       |   | ms   | Not Applicable                      |  |
| PDSCH Reference measurement channel             | Config 1,4  |      | SR.1.1 FDD                          | SR.3.1 TDD                                   |
|   | Config 2,5  |      | SR.1.1 TDD                          |  |
|   | Config 3,6  |      | SR.2.1 TDD                          |  |
| RMSI CORESET Reference Channel                  | Config 1,4  |      | CR.1.1 FDD                          | CR.3.1 TDD                                   |
|   | Config 2,5  |      | CR.1.1 TDD                          |  |
|   | Config 3,6  |      | CR.2.1 TDD                          |  |
| RMC CORESET Reference Channel                   | Config 1,4  |      | CCR.1.1 FDD                         | CCR.3.1 TDD                                  |
|   | Config 2,5  |      | CCR.1.1 TDD                         |  |
|   | Config 3,6  |      | CCR.2.1 TDD                         |  |
| OCNG Patterns                                   |   |      | OP.1                                |  |
| SMTC configuration                              |   |      | SMTC.1                              |  |
| TCI state                                       |   |      | NA                                  | TCI.State.0                                  |
| TRS configuration                               | Config 1,4  |      | TRS.2.1 TDD                         | TRS.2.1 TDD                                  |
|   | Config 2,5  |      | TRS.1.1 TDD                         |  |
|   | Config 3,6  |      | TRS.1.2 TDD                         |  |
| SSB configuration                               | Config 1,2,4,5  |      | SSB.1 FR1                           | SSB.1 FR2                                    |
|   | Config 3,6  |      | SSB.2 FR1                           |  |
| PDSCH/PDCCH subcarrier spacing                  | Config 1,2,4,5  | kHz  | 15 kHz                              | 120 kHz                                      |
|   | Config 3,6  |      | 30 kHz                              |  |
| CSI-RS configuration                            | Config 1~6  |      | NA                                  | NA   CSI-RS.3.1 TDD<br><small>Note 5</small> |
| reportConfigType                                | Config 1~6  |      | periodic                            | NA   |
| reportQuantity                                  | Config 1~6  |      | cri-RI-PMI-CQI                      | NA   |
| CSI reporting periodicity <small>Note 6</small> | Config 1~6  | slot | 40                                  | NA   |
| CSI reporting offset                            | Config 1~6  | slot | 4                                   | NA   |
| EPRE ratio of PSS to SSS                        |   | dB   | 0                                   |  |
| EPRE ratio of PBCH DMRS to SSS                  |   |      |                                     |  |
| EPRE ratio of PBCH to PBCH DMRS                 |   |      |                                     |  |
| EPRE ratio of PDCCH DMRS to SSS                 |   |      |                                     |  |
| EPRE ratio of PDCCH to PDCCH DMRS               |   |      |                                     |  |
| EPRE ratio of PDSCH DMRS to SSS                 |   |      |                                     |  |
| EPRE ratio of PDSCH to PDSCH                    |   |      |                                     |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1)         |   |      |                                     |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)        |   |      |                                     |  |
| Propagation condition                           |   | -    | N/A<br>Link only, see clause A.3.7A | AWGN   |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                     |  |
| Note 2:   | Void  |      |                                     |  |
| Note 3:   | Void  |      |                                     |  |
| Note 4:   | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.   |      |                                     |  |
| Note 5:   | CSI-RS for CSI measurement is (re)configured in the next DL slot after slot $m+T_{L1-RSRP}$ during T2.  |      |                                     |  |
| Note 6:   | L1-RSRP measurement and reporting are configured to the the UE prior to the start of time period T1.  |      |                                     |  |

Table A.5.5.3.5.1-4: OTA related test parameters for FR2 SCell activation case with FR1 PSCell

| Parameter   |                    | Unit                     | Cell 2                       |        |        | Cell 3                               |       |       |
|---|--------------------|--------------------------|------------------------------|--------|--------|--------------------------------------|-------|-------|
|   |                    |                          | T1                           | T2     | T3     | T1                                   | T2    | T3    |
| Angle of arrival configuration  |                    |                          | NA                           |        |        | Setup 1 according to clause A.3.15.1 |       |       |
| Assumption for UE beams <sup>Note 7</sup>   |                    |                          | NA                           |        |        | Rough                                |       |       |
| $N_{oc}$ <sup>Note1</sup>   |                    | dBm/15kHz                | Link only, see clause A.3.7A |        |        | -104.7                               |       |       |
| $N_{oc}$ <sup>Note1</sup>   | Config 1,2,4,5     | dBm/SCS                  |                              |        |        | -95.7                                |       |       |
|   | Config 3,6         |                          |                              |        |        |                                      |       |       |
| SSB_RP <sup>Note2</sup>   | Config 1,2,4,5     | dBm/SCS <sup>Note3</sup> |                              |        |        | -∞                                   | -88.7 | -88.7 |
|   | Config 3,6         |                          |                              |        |        |                                      |       |       |
| $\hat{E}_s / N_{oc}$  | Config 1,2,3,4,5,6 | dB                       |                              |        |        | -∞                                   | 7     | 7     |
| $\hat{E}_s / I_{ot}$  |                    | dB                       |                              |        |        | -∞                                   | 7     | 7     |
| $I_o$ <sup>Note2, Note 4</sup>  | Config 1,2,4,5     | dBm/95.04 MHz            | -66.68                       | -58.92 | -58.92 |                                      |       |       |
|   | Config 3,6         |                          |                              |        |        |                                      |       |       |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: Void</p> <p>Note 6: Void</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                    |                          |                              |        |        |                                      |       |       |

### A.5.5.3.5.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PSCell in the slot.

During T2 the UE shall start sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+ $T_{L1-RSRP}$ ), where  $T_{L1-RSRP}$  is no larger than

$$3\text{ms} + T_{\text{FirstSSB\_MAX}} + 15 * T_{\text{SMTC\_MAX}} + 8 * T_{\text{rs}} + T_{L1-RSRP, \text{measure}} + T_{L1-RSRP, \text{report}}$$

as defined in clause 8.3.2. For this test case,  $T_{\text{FirstSSB\_MAX}}=T_{\text{SMTC\_MAX}}=T_{\text{rs}}=20\text{ms}$ ;  $T_{L1-RSRP, \text{measure}}=480\text{ms}$  and  $T_{L1-RSRP, \text{measure}}=5\text{ms}$ , which allows  $T_{L1-RSRP}$  1000ms.

During T2 the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot  $m + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{NR \text{ slot length}}$ , where

-  $T_{\text{HARQ}}$  is defined in Table A.5.5.3.1.1-2

-  $T_{\text{activation\_time}} = 3\text{ms} + T_{\text{FirstSSB\_MAX}} + 15 * T_{\text{SMTC\_MAX}} + 8 * T_{\text{rs}} + T_{L1-RSRP, \text{measure}} + T_{L1-RSRP, \text{report}} + \max \{ (T_{\text{HARQ}} + T_{\text{uncertainty\_MAC}} + 5\text{ms} + T_{\text{FineTiming}}), (T_{\text{uncertainty\_RRC}} + T_{\text{RRC\_delay}}) \}$ , which allows 1030ms

-  $T_{\text{CSI\_Reporting}} = 10\text{ms}$

- NR slot length is 0.125ms for this test case.

During T3 the UE shall stop sending CSI reports for both SCells no later than slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{NR \text{ slot length}}$ , as defined in clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{NR slot length}}$ , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe  $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$  to subframe  $m_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_X}{\text{EUTRA slot length}}$ , as defined in clause 8.3, where  $T_X = 20\text{ms}$ , and  $m_1$  and  $m_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $m$ .

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3 and the starting point of interruption of E-UTRA PCell during SCell deactivation shall not happen outside the subframe  $n_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA subframe length}}$  to subframe  $n_2 + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{EUTRA subframe length}}$ , where  $n_1$  and  $n_2$  are the index of the first and last subframe of E-UTRA PCell which overlaps with slot  $n$ .

The interruption of PSCell due to activation of SCell1 and SCell2 shall not be more than the values specified for EN-DC in Clause 8.2.1.2.10.

The interruption of PCell due to activation of SCell1 and SCell2 shall not be more than the values specified for EN-DC in Clause 7.3.2.2.5 of TS 36.133 [50].

### A.5.5.3.6 Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2

#### A.5.5.3.6.1 Test Purpose and Environment

The purpose of this test is to verify that the multiple SCell activation and deactivation delay and interruption are within the requirements stated in clause 8.3, when the two SCells to be activated are in FR2 and one SCell is known and the other SCell is unknown by the UE at the time of activation.

The supported test configurations are shown in Table A.5.5.3.6.1-1 below. The general test parameters are given in Table A.5.5.3.6.1-2 and cell-specific test parameters in Table A.5.5.3.6.1-3 below. OTA related test parameters are shown in table A.5.5.3.6.1-4.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are four carriers, one E-UTRA cell, and three NR cells. Before the test starts the UE is connected to Cell 1 (PCell) on the E-UTRA carrier and Cell 2 (PSCell) on the NR carrier in FR1, but is not aware of Cell 3 (SCell1) or Cell 4 (SCell2) on the NR carriers both in FR2. Cell 1, Cell 2 and Cell 3 have constant signal levels throughout the test. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the Cell 3 (SCell1) and Cell 4 (SCell2) are configured on NR. The test equipment sends a single MAC message for activation of both SCells within 3s for UE power class 2/3/4 or 4s for UE power class 1 after RRM reports is sent for SCell1.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted  $m$ , defines the start of time period T2. In the same MAC PDU, the test equipment activates the TCI state of RMC CORESET. In slot # $m$ , the test equipment also sends an RRC message to configure the CSI-RS resources for SCell1 and SCell2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted  $n$ , is received at the UE antenna connector.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for SCell is discontinued.

**Table A.5.5.3.6.1-1: Supported test configurations**

| Configuration  | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.5.3.6.1-2: General test parameters**

| Parameter                                | Unit | Value  | Comment   |
|--|------|--|---|
| RF Channel Number                        |      | 1,2,3,4  | One E-UTRAN radio channel (1) and three NR radio channels (2,3,4) are used for this test  |
| Active PCell                             |      | Cell 1   | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.2  |
| Active PSCell                            |      | Cell 2   | Primary secondary cell on NR RF channel number 2 in FR1.  |
| Configured deactivated SCells            |      | Cell 3, Cell 4   | Configured deactivated secondary cell on NR RF channel number 3 and RF channel number 4, both in FR2  |
| CP length                                |      | Normal   |   |
| DRX                                      |      | OFF  | Continuous monitoring of primary cell   |
| SCell measurement cycle (measCycleSCell) | ms   | 160  | For both Cell 3 and Cell 4  |
| T1                                       | s    | 7  | During this time the PSCell shall be known and the SCells configured, SCell1 detected but SCell2 not detected.  |
| T2                                       | s    | 1  | During this time the UE shall activate the SCell.   |
| T3                                       | s    | 1  | During this time the UE shall deactivate the SCell.   |
| $T_{\text{HARQ}}$                        | ms   | $k_1 \times \text{NR slot length}$                         | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by <i>dl-DataToUL-ACK</i> if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3] |
| k  | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe}, \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [3]   |



**Table A. 5.5.3.6.1-3: Cell specific test parameters**

| Parameter   |            | Unit | Cell 2                      |    |    | Cell 3       |                |    | Cell 4       |                |    |
|---|------------|------|-----------------------------|----|----|--------------|----------------|----|--------------|----------------|----|
|   |            |      | T1                          | T2 | T3 | T1           | T2             | T3 | T1           | T2             | T3 |
| <b>SSB ARFCN</b>  |            |      | <b>freq1</b>                |    |    | <b>freq2</b> |                |    | <b>freq3</b> |                |    |
| Duplex mode   | Config 1,2 |      | TDD                         |    |    |              |                |    |              |                |    |
| TDD configuration   | Config 1,2 |      | TDDConf.3.1                 |    |    |              |                |    |              |                |    |
| BW <sub>channel</sub>   | Config 1,2 | MHz  | 100: N <sub>RB,c</sub> = 66 |    |    |              |                |    |              |                |    |
| DL initial BWP configuration  | Config 1,2 |      | DLBWP.0.1                   |    |    |              |                |    |              |                |    |
| DL dedicated BWP configuration  | Config 1,2 |      | DLBWP.1.1                   |    |    |              |                |    |              |                |    |
| UL initial BWP configuration  | Config 1,2 |      | ULBWP.0.1                   |    |    |              |                |    |              |                |    |
| UL dedicated BWP configuration  | Config 1,2 |      | ULBWP.1.1                   |    |    |              |                |    |              |                |    |
| Timing offset to Cell 2   |            | ms   | Not Applicable              |    |    | 0            |                |    | 0            |                |    |
| PDSCH Reference measurement channel   | Config 1,2 |      | SR.3.1 TDD                  |    |    | SR.3.1 TDD   |                |    | SR.3.1 TDD   |                |    |
| RMSI CORESET Reference Channel  | Config 1,2 |      | CR.3.1 TDD                  |    |    | CR.3.1 TDD   |                |    | CR.3.1 TDD   |                |    |
| RMC CORESET Reference Channel   | Config 1,2 |      | CCR.3.1 TDD                 |    |    | CCR.3.1 TDD  |                |    | CCR.3.1 TDD  |                |    |
| TRS configuration   | Config 1,2 |      | TRS.2.1 TDD                 |    |    | TRS.2.1 TDD  |                |    | TRS.2.1 TDD  |                |    |
| CSI-RS configuration  | Config 1,2 |      | CSI-RS.3.1 TDD              |    |    | N/A          | CSI-RS.3.1 TDD |    | N/A          | CSI-RS.3.1 TDD |    |
| CSI reporting periodicity   | Config 1,2 | ms   | 5                           |    |    | 5            |                |    | 5            |                |    |
| OCNG Patterns   |            |      | OP.1                        |    |    |              |                |    |              |                |    |
| SMTC configuration  |            |      | SMTC.1                      |    |    |              |                |    |              |                |    |
| SSB configuration   | Config 1,2 |      | SSB.1 FR2                   |    |    | SSB.1 FR2    |                |    | N/A          | SSB.1 FR2      |    |
| EPRE ratio of PSS to SSS  |            | dB   | 0                           |    |    |              |                |    |              |                |    |
| EPRE ratio of PBCH DMRS to SSS  |            |      |                             |    |    |              |                |    |              |                |    |
| EPRE ratio of PBCH to PBCH DMRS   |            |      |                             |    |    |              |                |    |              |                |    |
| EPRE ratio of PDCCH DMRS to SSS   |            |      |                             |    |    |              |                |    |              |                |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |            |      |                             |    |    |              |                |    |              |                |    |
| EPRE ratio of PDSCH DMRS to SSS   |            |      |                             |    |    |              |                |    |              |                |    |
| EPRE ratio of PDSCH to PDSCH  |            |      |                             |    |    |              |                |    |              |                |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |            |      |                             |    |    |              |                |    |              |                |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |            |      |                             |    |    |              |                |    |              |                |    |
| Propagation condition   |            | -    | AWGN                        |    |    |              |                |    |              |                |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |            |      |                             |    |    |              |                |    |              |                |    |

Table A.5.5.3.6.1-4: OTA related test parameters

| Parameter <sup>Note 6</sup>               | Unit   | Cell 3                        |    |    | Cell 4  |        |        |
|---|--|-------------------------------|----|----|---------|--------|--------|
|   |  | T1                            | T2 | T3 | T1      | T2     | T3     |
| Angle of arrival configuration            |  | Setup 1 according to A.3.15.1 |    |    |         |        |        |
| Assumption for UE beams <sup>Note 7</sup> |  | Rough                         |    |    | Rough   |        |        |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sup>Note4</sup>   | -112                          |    |    | -112    |        |        |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sup>Note3</sup>   | -102.97                       |    |    | -102.97 |        |        |
| $\hat{E}_s / N_{oc}$                      | dB   | 14                            |    |    | N/A     | 14     | 14     |
| SS-RSRP <sup>Note2</sup>                  | dBm/SCS <sup>Note4</sup>   | -88.97                        |    |    | N/A     | -88.97 | -88.97 |
| $\hat{E}_s / I_{ot}$                      | dB   | 14                            |    |    | N/A     | 14     | 14     |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sup>Note4</sup>   | -59.81                        |    |    | -73.98  | -59.81 | -59.81 |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                               |    |    |         |        |        |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |    |    |         |        |        |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                               |    |    |         |        |        |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                               |    |    |         |        |        |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |                               |    |    |         |        |        |
| Note 6:                                   | All parameters apply for configuration 1 and 2   |                               |    |    |         |        |        |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                               |    |    |         |        |        |

### A.5.5.3.6.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PSCell in the slot.

During T2 the UE shall start sending CSI reports for SCell1 and SCell2 with non-zero CQI index in the configured slots for CSI reporting no later than slot  $m + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR\ slot\ length}$ , where

- $T_{HARQ}$  is defined in Table A.5.5.3.Y.1-2
- $T_{activation\_time} = 5ms + T_{FineTiming} = 25ms$ ,
- $T_{CSI\_Reporting} = 10ms$
- NR slot length is 0.125ms.

During T3 the UE shall stop sending CSI reports for both SCells no later than slot  $n + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$ , as defined in clause 8.3.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot  $m + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR\ slot\ length}$  as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### A.5.5.3.7 Direct SCell activation at SCell addition of known SCell in FR2

#### A.5.5.3.7.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.5 except the SCell is in FR2 intra-band.

The supported test configurations are shown in table A.5.5.3.7.1-1 below. The general and cell specific test parameters are the same except those described in the following clause. The listed parameter values in Tables A.5.5.3.7.1-2 and A.5.5.3.7.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.5.1-2 and A.4.5.3.5.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.7.1-4 below.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, each with one cell. Cell 1 operates in either FDD or TDD duplex mode according to test configuration. Cell 2 and Cell 3 operate in TDD duplex mode. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and Cell 2 (PSCell) on radio channel 2 (PSCC), but is not aware of Cell 3 (SCell1) on radio channel 3 (SCC). The UE is only monitoring the PCC/PSCC. The UE shall be continuously scheduled in the PCell/PSCell throughout the whole test.

At the beginning of T1, the UE is configured to measure radio channel 3 and starts detecting the Cell 3 (SCell) on radio channel 3 (SCC). During T1 Cell 3 is detected and measured and measurement report is sent by the UE to the test equipment.

Time period T2 starts when test equipment sends the *RRCCONNECTIONRECONFIGURATION* message for the activation of the SCell within time period specified in clause 8.3.2 for known cell definition to ensure the configured SCell is known. The NR shall be use an *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message with parameter *sCellState* set to *activated* for the SCell (Cell 3), which causes the SCell to become configured and activated on radio channel 3 (SCC). The message is sent from the test equipment to the UE and is received in a subframe # denoted *m* at the UE antenna connector. The UE shall accomplish the activation of the SCell no later than subframe  $(m + N_{direct})$ .

Time period T3 starts at  $(m + N_{direct})$ , at which point UE shall be reporting a valid CQI for PCell/PSCell and SCell.

During T3, the UE shall be continuously scheduled in the SCell.

The test equipment verifies the activation time by counting the subframes from the time when the direct SCell activation is sent and until a CSI report with other than CQI index 0 is received.

The test equipment verifies the CSI report from the direct activated SCell after the activation procedure is completed contains CQI index other than 0.

**Table A.5.5.3.7.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell**

| Configuration | Description   |
|---------------|---|
| 1             | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note:         | The UE is only required to pass in one of the supported test configurations |

**Table A.5.5.3.7.1-2: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter   | Unit | Value               | Comment   |
|---|------|---------------------|---|
| RF Channel Number   |      | 1, 2, 3             | Two radio channels are used for this test. One for E-UTRA cell and two for NR Cell  |
| Active PCell  |      | Cell1               | PCell on RF channel number 1. As specified in clause A.3.7.2.2  |
| Active PSCell   |      | Cell2               | PSCell on RF channel number 2.  |
| Deconfigured deactivated SCell                            |      | Cell3               | Deconfigured deactivated secondary cell on RF channel number 3  |
| DRX   |      | OFF                 | Continuous monitoring of PCell/PSCell   |
| PRACH configuration on cell2                              |      | FR2 configuration 2 | Captured in A.3.8.3.2   |
| PSCell CQI/PMI periodicity and offset configuration index |      | slot5               | CQI reporting for PSCell every uplink slot  |
| Cell-individual offset for cells on RF channel number 1   | dB   | 0                   | Individual offset for cells on carrier frequency of cell1.  |
| Cell-individual offset for cells on RF channel number 2   | dB   | 0                   | Individual offset for cells on carrier frequency of cell2.  |
| Cell-individual offset for cells on RF channel number 3   | dB   | 0                   | Individual offset for cells on carrier frequency of cell3.  |
| T1  | s    | 7                   | During this time the PCell/PSCell shall be known and cell3 is detected, and UE shall report a valid CQI for PCell/PSCell. |
| T2  | s    | $N_{direct}$        | During this time the UE shall be configured with directly activated SCell1.   |
| T3  | s    | 1                   | During this time the UE shall report a valid CQI for PCell/PSCell and SCell.  |

**Table A.5.5.3.7.1-3: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter <sup>Note 5</sup>                       | Unit   | Cell 2                      |    |    | Cell 3                      |      |    |
|---|--|-----------------------------|----|----|-----------------------------|------|----|
|   |  | T1                          | T2 | T3 | T1                          | T2   | T3 |
| SSB ARFCN   |  | freq1                       |    |    | freq2                       |      |    |
| Duplex mode                                       |  | TDD                         |    |    | TDD                         |      |    |
| TDD configuration                                 |  | TDDConf.3.1                 |    |    | TDDConf.3.1                 |      |    |
| BW <sub>channel</sub>                             | MHz  | 100: N <sub>RB,c</sub> = 66 |    |    | 100: N <sub>RB,c</sub> = 66 |      |    |
| PDSCH Reference measurement channel               |  | SR.3.1 TDD                  |    |    | SR.3.1 TDD                  |      |    |
| RMSI CORESET Reference Channel                    |  | CR.3.1 TDD                  |    |    | CR.3.1 TDD                  |      |    |
| RMC CORESET Reference Channel                     |  | CCR.3.1 TDD                 |    |    | CCR.3.1 TDD                 |      |    |
| DL initial BWP configuration                      |  |                             |    |    | DLBWP.0.1                   |      |    |
| DL dedicated BWP configuration                    |  |                             |    |    | DLBWP.1.1                   |      |    |
| UL initial BWP configuration                      |  |                             |    |    | ULBWP.0.1                   |      |    |
| UL dedicated BWP configuration                    |  |                             |    |    | ULBWP.1.1                   |      |    |
| OCNG Patterns                                     |  |                             |    |    | OP.1                        |      |    |
| SMTc configuration                                |  |                             |    |    | SMTc.1                      |      |    |
| SSB configuration                                 |  |                             |    |    | SSB.1 FR2                   |      |    |
| TCI state   |  |                             |    |    | TCI.State.0                 |      |    |
| TRS configuration                                 |  |                             |    |    | TRS.2.1 TDD                 |      |    |
| EPRE ratio of PSS to SSS                          | dB   |                             |    |    | 0                           |      |    |
| EPRE ratio of PBCH_DMRS to SSS                    |  |                             |    |    |                             |      |    |
| EPRE ratio of PBCH to PBCH_DMRS                   |  |                             |    |    |                             |      |    |
| EPRE ratio of PDCCH_DMRS to SSS                   |  |                             |    |    |                             |      |    |
| EPRE ratio of PDCCH to PDCCH_DMRS                 |  |                             |    |    |                             |      |    |
| EPRE ratio of PDSCH_DMRS to SSS                   |  |                             |    |    |                             |      |    |
| EPRE ratio of PDSCH to PDSCH_DMRS                 |  |                             |    |    |                             |      |    |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |                             |    |    |                             |      |    |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |                             |    |    |                             |      |    |
| Propagation conditions                            |  |                             |    |    |                             | AWGN |    |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                             |    |    |                             |      |    |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                             |    |    |                             |      |    |
| Note 3:   | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                             |    |    |                             |      |    |
| Note 4:   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                             |    |    |                             |      |    |
| Note 5:   | All parameters apply for configuration 1 and 2.  |                             |    |    |                             |      |    |

Table A.5.5.3.7.1-4: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

| Parameter <sup>Note 6</sup>               | Unit   | Cell 2                        |    |    | Cell 3 |    |    |
|---|--|-------------------------------|----|----|--------|----|----|
|   |  | T1                            | T2 | T3 | T1     | T2 | T3 |
| Angle of arrival configuration            |  | Setup 1 according to A.3.15.1 |    |    |        |    |    |
| Assumption for UE beams <sup>Note 7</sup> |  | Rough                         |    |    | Rough  |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sup>Note4</sup>   | -104.7                        |    |    | -104.7 |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sup>Note3</sup>   | -95.7                         |    |    | -95.7  |    |    |
| $\hat{E}_s / N_{oc}$                      | dB   | 7                             |    |    | 7      |    |    |
| SS-RSRP <sup>Note2</sup>                  | dBm/SCS <sup>Note4</sup>   | -88.7                         |    |    | -88.7  |    |    |
| $\hat{E}_s / I_{ot}$                      | dB   | 7                             |    |    | 7      |    |    |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sup>Note4</sup>   | -58.92                        |    |    | -58.92 |    |    |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                               |    |    |        |    |    |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |    |    |        |    |    |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                               |    |    |        |    |    |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                               |    |    |        |    |    |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |                               |    |    |        |    |    |
| Note 6:                                   | All parameters apply for configuration 1 and 2   |                               |    |    |        |    |    |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                               |    |    |        |    |    |

### A.5.5.3.7.2 Test Requirements

The UE shall accomplish the activation of the SCell no later than subframe  $m+N_{direct}$  as defined in clause 8.3.4.

Time period T3 starts at  $(m+N_{direct})$ , at which point UE shall be reporting a valid CQI for both PSCell and SCell.

During T3 the UE shall send CSI reports for SCell with non-zero CQI index and continue to send CSI reports for SCell 1 with non-zero CQI index until the end of T3. All of the above test requirements shall be fulfilled in order for the observed SCell1 direct activation delay to be counted as correct. The rate of correct observed SCell1 direct activation delay during repeated tests shall be at least 90%.

## A.5.5.4 Void

## A.5.5.5 Beam Failure Detection and Link recovery procedures

### A.5.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

#### A.5.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.1.1-1, A.5.5.5.1.1-2, A.5.5.5.1.1-3 and A.5.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate

beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

**Table A.5.5.5.1.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth                       |
| 2             | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth                       |
| 3             | LTE FDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth                       |
| 4             | LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth                       |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

**Table A.5.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter                                      | Test Config.   | Unit | Value                       | Comment   |  |
|--|--|------|-----------------------------|-----------|--|
|  |  |      | <b>Test 1</b>               |           |  |
| Active E-UTRA PCell                            | 1-4  |      | Cell 1                      |           |  |
| E-UTRA RF Channel Number                       | 1-4  |      | 1                           |           |  |
| Active PCell                                   | 1-4  |      | Cell 2                      |           |  |
| RF Channel Number                              | 1-4  |      | 2                           |           |  |
| Duplex mode                                    | 1-4  |      | TDD                         |           |  |
| TDD Configuration                              | 1-4  |      | TDDConf.3.1                 |           |  |
| BW <sub>channel</sub>                          | 1-4  | MHz  | 100: N <sub>RB,c</sub> = 66 |           |  |
| Data RBs allocated                             | 1-4  |      | 66                          |           |  |
| PDSCH/PDCCH subcarrier spacing                 | 1-4  | kHz  | 120                         |           |  |
| DL initial BWP configuration                   | 1-4  |      | DLBWP.0.1                   |           |  |
| DL dedicated BWP configuration                 | 1-4  |      | DLBWP.1.1                   |           |  |
| UL initial BWP configuration                   | 1-4  |      | ULBWP.0.1                   |           |  |
| UL dedicated BWP configuration                 | 1-4  |      | ULBWP.1.1                   |           |  |
| PDSCH Reference Channel                        | 1-2  |      | SR.3.2 TDD                  |           |  |
|  | 3-4  |      | SR.3.3 TDD                  |           |  |
| RMSI CORESET Reference Channel                 | 1-2  |      | CR.3.1 TDD                  |           |  |
|  | 3-4  |      | CR.3.2 TDD                  |           |  |
| Dedicated CORESET Reference Channel            | 1-2  |      | CCR.3.1 TDD                 |           |  |
|  | 3-4  |      | CCR.3.7 TDD                 |           |  |
| OCNG parameters                                | 1-4  |      | OP.1                        |           |  |
| CP length                                      | 1-4  |      | Normal                      |           |  |
| PDSCH/PDCCH TCI state                          | 1-4  |      | TCI.State.0                 |           |  |
| CSI-RS for tracking                            | 1-4  |      | TRS.2.1 TDD                 |           |  |
| SSB Configuration                              | 1-2  |      | SSB.1 FR2                   |           |  |
|  | 3-4  |      | SSB.2 FR2                   |           |  |
| SMTTC Configuration                            | 1-4  |      | SMTTC.3                     |           |  |
| PRACH Configuration                            | 1-4  |      | FR2 PRACH configuration 2   | A.3.8.3.2 |  |
| DRX configuration                              | 1-4  |      | OFF                         |           |  |
| SSB index assigned as BFD RS (q <sub>0</sub> ) | 1-4  |      | 0                           |           |  |
| SSB index assigned as CBD RS (q <sub>1</sub> ) | 1-4  |      | 1                           |           |  |
| SSB index assigned as RLM RS                   | 1-4  |      | 0,1                         |           |  |
| Beam failure detection transmission parameters | DCI format   | 1-4  | 1-0                         |           |  |
|  | Number of Control OFDM symbols                                   | 1-4  | 2                           |           |  |
|  | Aggregation level  | 1-4  | CCE                         | 8         |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-4  | dB                          | 0         |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4  | dB                          | 0         |  |

|   |                           |     |         |                 |  |
|---|---------------------------|-----|---------|-----------------|--|
|   | DMRS precoder granularity | 1-4 |         | REG bundle size |  |
|   | REG bundle size           | 1-4 |         | 6               |  |
| Gap pattern ID  |                           | 1-4 |         | gp0             |  |
| gapOffset   |                           | 1-4 | ms      | 0               |  |
| rlmInSyncOutOfSyncThreshold   |                           | 1-4 |         | absent          | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   |                           | 1-2 | dBm/SCS | -95             | Threshold used for $Q_{in\_LR\_SSB}$                   |
|   |                           | 3-4 |         | -92             |  |
| powerControlOffsetSS  |                           | 1-4 |         | db0             | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount   |                           | 1-4 |         | n1              | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer   |                           | 1-4 |         | pbfd4           | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting  |                           | 1-4 |         | CSI-RS.3.1 TDD  |  |
| reportConfigType  |                           | 1-4 |         | periodic        |  |
| reportQuantity  |                           | 1-4 |         | cri-RI-PMI-CQI  |  |
| CSI reporting periodicity   |                           | 1-4 | slot    | 40              |  |
| CSI reporting offset  |                           | 1-4 | slot    | 4               |  |
| T310  |                           | 1-4 | ms      | 1000            |  |
| N310  |                           | 1-4 |         | 2               |  |
| T1  |                           | 1-4 | s       | 1               | The UE shall be fully synchronized to cell 1 during T1 |
| T2  |                           | 1-4 | s       | 2.61            |  |
| T3  |                           | 1-4 | s       | 1.64            |  |
| T4  |                           | 1-4 | s       | 0               |  |
| T5  |                           | 1-4 | s       | 1.01            |  |
| D1  |                           | 1-4 | s       | 0.97            |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |                           |     |         |                 |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |                           |     |         |                 |  |

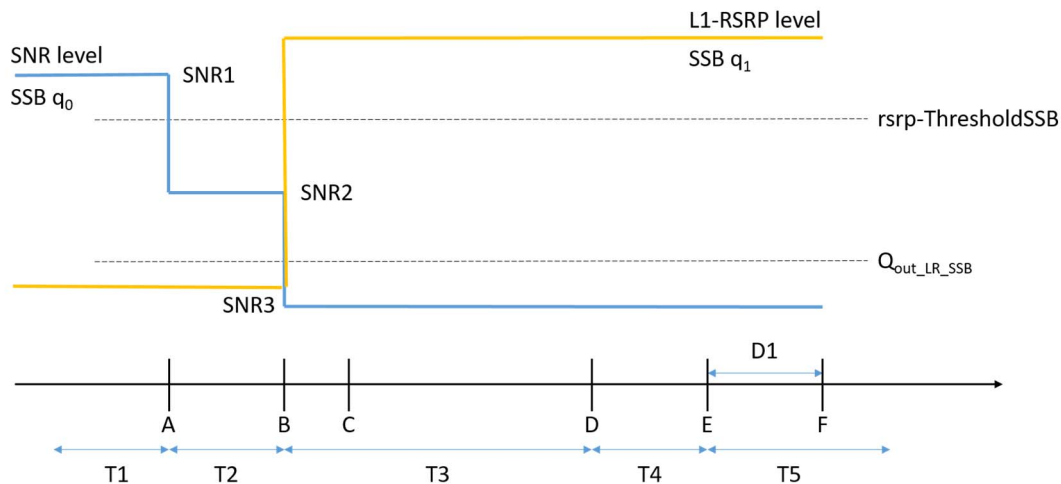
**Table A.5.5.1.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Unit | Test 1 |    |    |    |    |
|-----------|------|--------|----|----|----|----|
|           |      | T1     | T2 | T3 | T4 | T5 |
|           |      |        |    |    |    |    |



|   |            |             |                           |                       |       |       |       |
|---|------------|-------------|---------------------------|-----------------------|-------|-------|-------|
| AoA setup   |            |             | Setup 1 defined in A.3.15 |                       |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>  |            |             | Rough                     |                       |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS   | dB         |             | 0                         |                       |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS   | dB         |             |                           |                       |       |       |       |
| EPRE ratio of PBCH DMRS to SSS  | dB         |             |                           |                       |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS   | dB         |             |                           |                       |       |       |       |
| EPRE ratio of PSS to SSS  | dB         |             |                           |                       |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS   | dB         |             |                           |                       |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS   | dB         |             |                           |                       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS  | dB         |             |                           |                       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS   | dB         |             |                           |                       |       |       |       |
| SNR_SSB of set q <sub>0</sub>   | Config 1-4 | dB          | 5 <sup>Note 11</sup>      | -3 <sup>Note 11</sup> | -12   | -12   | -12   |
| SNR_SSB of set q <sub>1</sub>   | Config 1-4 | dB          | 0.2                       | 0.2                   | 20.2  | 20.2  | 20.2  |
| SSB_RP of set q <sub>1</sub>  | Config 1-2 | dBm/SCS     | -104.5                    | -104.5                | -84.5 | -84.5 | -84.5 |
|   | Config 3-4 |             | -101.5                    | -101.5                | -81.5 | -81.5 | -81.5 |
| $N_{oc}$  | Config 1-4 | dBm/120 KHz | -104.7                    |                       |       |       |       |
| Propagation condition   |            |             | TDL-A 30ns 75Hz           |                       |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |            |             |                           |                       |       |       |       |

Table A.5.5.5.1.1-4: Void



**Figure A.5.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.5.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 960 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.5.5.5.2 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in DRX mode

##### A.5.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.2.1-1, A.5.5.5.2.1-2, A.5.5.5.2.1-3, A.5.5.5.2.1-4 and A.5.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.5.5.2.1-1: Supported test configurations for FR2 PSCell

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth                       |
| 2             | LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth                       |
| 3             | LTE FDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth                       |
| 4             | LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth                       |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

Table A.5.5.2.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

| Parameter                                      | Test Config.   | Unit | Value                       | Comment         |  |
|--|--|------|-----------------------------|-----------------|--|
|  |  |      | <b>Test 1</b>               |                 |  |
| Active E-UTRA PCell                            | 1-4  |      | Cell 1                      |                 |  |
| E-UTRA RF Channel Number                       | 1-4  |      | 1                           |                 |  |
| Active PCell                                   | 1-4  |      | Cell 2                      |                 |  |
| RF Channel Number                              | 1-4  |      | 2                           |                 |  |
| Duplex mode                                    | 1-4  |      | TDD                         |                 |  |
| TDD Configuration                              | 1-4  |      | TDDConf.3.1                 |                 |  |
| BW <sub>channel</sub>                          | 1-4  | MHz  | 100: N <sub>RB,c</sub> = 66 |                 |  |
| Data RBs allocated                             | 1-4  |      | 66                          |                 |  |
| PDSCH/PDCCH subcarrier spacing                 | 1-4  | kHz  | 120                         |                 |  |
| DL initial BWP configuration                   | 1-4  |      | DLBWP.0.1                   |                 |  |
| DL dedicated BWP configuration                 | 1-4  |      | DLBWP.1.1                   |                 |  |
| UL initial BWP configuration                   | 1-4  |      | ULBWP.0.1                   |                 |  |
| UL dedicated BWP configuration                 | 1-4  |      | ULBWP.1.1                   |                 |  |
| PDSCH Reference Channel                        | 1-2  |      | SR.3.2 TDD                  |                 |  |
|  | 3-4  |      | SR.3.3 TDD                  |                 |  |
| RMSI CORESET Reference Channel                 | 1-2  |      | CR.3.1 TDD                  |                 |  |
|  | 3-4  |      | CR.3.2 TDD                  |                 |  |
| Dedicated CORESET Reference Channel            | 1-2  |      | CCR.3.1 TDD                 |                 |  |
|  | 3-4  |      | CCR.3.7 TDD                 |                 |  |
| OCNG parameters                                | 1-4  |      | OP.1                        |                 |  |
| CP length                                      | 1-4  |      | Normal                      |                 |  |
| PDSCH/PDCCH TCI state                          | 1-4  |      | TCI.State.0                 |                 |  |
| CSI-RS for tracking                            | 1-4  |      | TRS.2.1 TDD                 |                 |  |
| SSB Configuration                              | 1-2  |      | SSB.1 FR2                   |                 |  |
|  | 3-4  |      | SSB.2 FR2                   |                 |  |
| SMTc Configuration                             | 1-4  |      | SMTc.3                      |                 |  |
| PRACH Configuration                            | 1-4  |      | FR2 PRACH configuration 2   | A.3.8.3.2       |  |
| DRX configuration                              | 1-4  |      | DRX.3                       | A.3.3.3         |  |
| SSB index assigned as BFD RS (q <sub>0</sub> ) | 1-4  |      | 0                           |                 |  |
| SSB index assigned as CBD RS (q <sub>1</sub> ) | 1-4  |      | 1                           |                 |  |
| SSB index assigned as RLM RS                   | 1-4  |      | 0,1                         |                 |  |
| Beam failure detection transmission parameters | DCI format   | 1-4  | 1-0                         |                 |  |
|  | Number of Control OFDM symbols                                   | 1-4  | 2                           |                 |  |
|  | Aggregation level  | 1-4  | CCE                         | 8               |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-4  | dB                          | 0               |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4  | dB                          | 0               |  |
|  | DMRS precoder granularity  | 1-4  |                             | REG bundle size |  |
|  | REG bundle size  | 1-4  |                             | 6               |  |

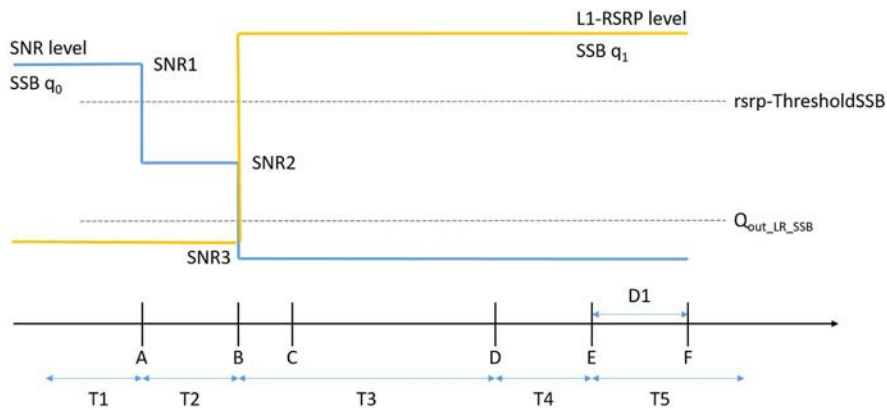
|   |     |         |                   |  |
|---|-----|---------|-------------------|--|
| Gap pattern ID  | 1-4 |         | N/A               |  |
| rimInSyncOutOfSyncThreshold                                   | 1-4 |         | absent            | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1-2 | dBm/SCS | -95               | Threshold used for $Q_{in\_LR\_SSB}$                   |
|   | 3-4 |         | -92               |  |
| powerControlOffsetSS  | 1-4 |         | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1-4 |         | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1-4 |         | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1-4 |         | CSI-RS.3.1<br>TDD |  |
| reportConfigType  | 1-4 |         | periodic          |  |
| reportQuantity  | 1-4 |         | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity                                     | 1-4 | slot    | 40                |  |
| CSI reporting offset  | 1-4 | slot    | 4                 |  |
| T310  | 1-4 | ms      | 1000              |  |
| N310  | 1-4 |         | 2                 |  |
| T1  | 1-4 | s       | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-4 | s       | 3.37              |  |
| T3  | 1-4 | s       | 2.8               |  |
| T4  | 1-4 | s       | 0                 |  |
| T5  | 1-4 | s       | 0.61              |  |
| D1  | 1-4 | s       | 0.57              |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |     |         |                   |  |

**Table A.5.5.2.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter  |            | Unit        | Test 1                    |                       |       |       |       |
|--|------------|-------------|---------------------------|-----------------------|-------|-------|-------|
|  |            |             | T1                        | T2                    | T3    | T4    | T5    |
| AoA setup  |            |             | Setup 1 defined in A.3.15 |                       |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |            |             | Rough                     |                       |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  |            | dB          | 0                         |                       |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PSS to SSS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |            | dB          |                           |                       |       |       |       |
| SNR_SSB of set q <sub>0</sub>  | Config 1-4 | dB          | 5 <sup>Note 11</sup>      | -3 <sup>Note 11</sup> | -12   | -12   | -12   |
| SNR_SSB of set q <sub>1</sub>  | Config 1-4 | dB          | 0.2                       | 0.2                   | 20.2  | 20.2  | 20.2  |
| SSB_RP of set q <sub>1</sub>   | Config 1-2 | dBm/        | -104.5                    | -104.5                | -84.5 | -84.5 | -84.5 |
|  | Config 3-4 | SCS         | -101.5                    | -101.5                | -81.5 | -81.5 | -81.5 |
| $N_{oc}$   | Config 1-4 | dBm/120 KHz | -104.7                    |                       |       |       |       |
| Propagation condition  |            |             | TDL-A 30ns 75Hz           |                       |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.2.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |            |             |                           |                       |       |       |       |

**Table A.5.5.2.1-4: Void**

**Table A.5.5.2.1-5: Void**



**Figure A.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### A.5.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 560 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.5.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.5.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.3.1-1, A.5.5.5.3.1-2, and A.5.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.3.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

Table A.5.5.3.1-1: Supported test configurations for FR2 PSCell

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2             | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Table A.5.5.3.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

| Parameter   | Test Config.   | Unit | Value                       | Comment         |  |
|---|--|------|-----------------------------|-----------------|--|
|   |  |      | <b>Test 1</b>               |                 |  |
| Active E-UTRA PCell                               | 1-2  |      | Cell 1                      |                 |  |
| E-UTRA RF Channel Number                          | 1-2  |      | 1                           |                 |  |
| Active PCell                                      | 1-2  |      | Cell 2                      |                 |  |
| RF Channel Number                                 | 1-2  |      | 2                           |                 |  |
| Duplex mode                                       | 1-2  |      | TDD                         |                 |  |
| TDD Configuration                                 | 1-2  |      | TDDConf.3.1                 |                 |  |
| BW <sub>channel</sub>                             | 1-2  |      | 100: N <sub>RB,c</sub> = 66 |                 |  |
| Data RBs allocated                                | 1-2  |      | 66                          |                 |  |
| PDSCH/PDCCH subcarrier spacing                    | 1-2  | kHz  | 120                         |                 |  |
| DL initial BWP configuration                      | 1-2  |      | DLBWP.0.1                   |                 |  |
| DL dedicated BWP configuration                    | 1-2  |      | DLBWP.1.1                   |                 |  |
| UL initial BWP configuration                      | 1-2  |      | ULBWP.0.1                   |                 |  |
| UL dedicated BWP configuration                    | 1-2  |      | ULBWP.1.1                   |                 |  |
| PDSCH Reference Channel                           | 1-2  |      | SR.3.2 TDD                  |                 |  |
| RMSI CORESET Reference Channel                    | 1-2  |      | CR.3.1 TDD                  |                 |  |
| Dedicated CORESET Reference Channel               | 1-2  |      | CCR.3.1 TDD                 |                 |  |
| OCNG parameters                                   | 1-2  |      | OP.1                        |                 |  |
| CP length   | 1-2  |      | Normal                      |                 |  |
| PDSCH/PDCCH TCI state                             | 1-2  |      | TCI.State.0                 |                 |  |
| CSI-RS for tracking                               | 1-2  |      | TRS.2.1 TDD                 |                 |  |
| SSB Configuration                                 | 1-2  |      | SSB.1 FR2                   |                 |  |
| SMTTC Configuration                               | 1-2  |      | SMTTC.3                     |                 |  |
| PRACH Configuration                               | 1-2  |      | FR2 PRACH configuration 4   | A.3.8.3.4       |  |
| DRX configuration                                 | 1-2  |      | OFF                         |                 |  |
| CSI-RS configuration for BFD/CBD/RLM              | 1-2  |      | CSI-RS.3.2 TDD              | A.3.14.2        |  |
| CSI-RS index assigned as BFD RS (q <sub>0</sub> ) | 1-2  |      | 0                           |                 |  |
| CSI-RS index assigned as CBD RS (q <sub>1</sub> ) | 1-2  |      | 1                           |                 |  |
| CSI-RS index assigned as RLM RS                   | 1-2  |      | 0,1                         |                 |  |
| Beam failure detection transmission parameters    | DCI format   | 1-2  | 1-0                         |                 |  |
|   | Number of Control OFDM symbols                                   | 1-2  | 2                           |                 |  |
|   | Aggregation level  | 1-2  | CCE                         | 8               |  |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-2  | dB                          | 0               |  |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2  | dB                          | 0               |  |
|   | DMRS precoder granularity  | 1-2  |                             | REG bundle size |  |
|   | REG bundle size  | 1-2  | 6                           |                 |  |

|   |     |         |                   |  |
|---|-----|---------|-------------------|--|
| Gap pattern ID  | 1-2 |         | N/A               |  |
| rimInSyncOutOfSyncThreshold                                   | 1-2 |         | absent            | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1-2 | dBm/SCS | -95               | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1-2 |         | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1-2 |         | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1-2 |         | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1-2 |         | CSI-RS.3.1<br>TDD | A.3.14.2   |
| reportConfigType  | 1-2 |         | periodic          |  |
| reportQuantity  | 1-2 |         | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity                                     | 1-2 | slot    | 40                |  |
| CSI reporting offset  | 1-2 | slot    | 4                 |  |
| T310  | 1-2 | ms      | 1000              |  |
| N310  | 1-2 |         | 2                 |  |
| T1  | 1-2 | s       | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-2 | s       | 1.17              |  |
| T3  | 1-2 | s       | 0.9               |  |
| T4  | 1-2 | s       | 0                 |  |
| T5  | 1-2 | s       | 0.31              |  |
| D1  | 1-2 | s       | 0.27              |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |     |         |                   |  |

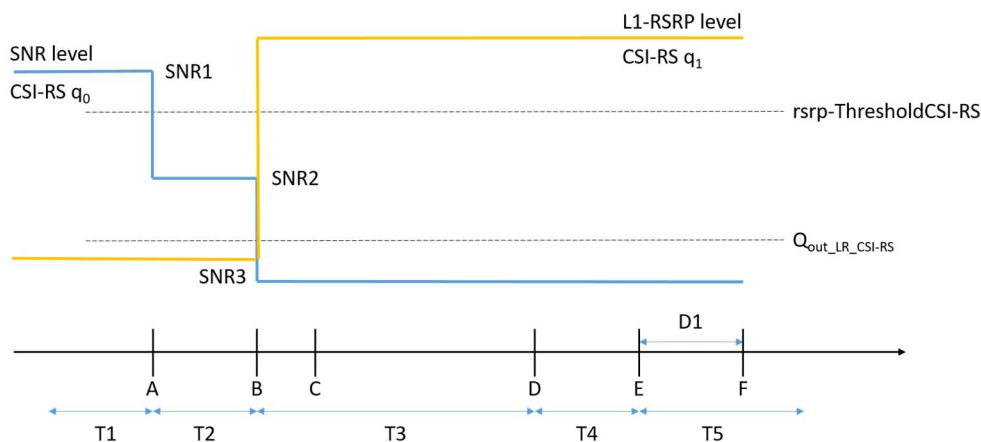


**Table A.5.5.3.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |            | Unit        | Test 1                    |        |       |       |       |
|--|------------|-------------|---------------------------|--------|-------|-------|-------|
|  |            |             | T1                        | T2     | T3    | T4    | T5    |
| AoA setup  |            |             | Setup 1 defined in A.3.15 |        |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |            |             | Rough                     |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  |            | dB          | 0                         |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |            | dB          |                           |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   |            | dB          |                           |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  |            | dB          |                           |        |       |       |       |
| EPRE ratio of PSS to SSS   |            | dB          |                           |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  |            | dB          |                           |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  |            | dB          |                           |        |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |            | dB          |                           |        |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |            | dB          |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>0</sub>   | Config 1-2 | dB          |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>1</sub>   | Config 1-2 | dB          | 0.2                       | 0.2    | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set q <sub>1</sub>  | Config 1-2 | dBm/SCS     | -104.5                    | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$   | Config 1-2 | dBm/120 KHz | -104.7                    |        |       |       |       |
| Propagation condition  |            |             | TDL-A 30ns 75Hz           |        |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.3.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |            |             |                           |        |       |       |       |

**Table A.5.5.3.1-4: Void**

**Table A.5.5.3.1-5: Void**



**Figure A.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode**

### A.5.5.5.3.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.5.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.5.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.4.1-1, A.5.5.5.4.1-2, A.5.5.5.4.1-3, and A.5.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.4.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.5.5.5.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2             | LTE TDD, FDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.5.5.5.4.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter | Test Config. | Unit | Value         | Comment |
|-----------|--------------|------|---------------|---------|
|           |              |      | <b>Test 1</b> |         |

|   |  |     |                             |                 |  |
|---|--|-----|-----------------------------|-----------------|--|
| Active E-UTRA PCell                               | 1-2  |     | Cell 1                      |                 |  |
| E-UTRA RF Channel Number                          | 1-2  |     | 1                           |                 |  |
| Active PCell                                      | 1-2  |     | Cell 2                      |                 |  |
| RF Channel Number                                 | 1-2  |     | 2                           |                 |  |
| Duplex mode                                       | 1-2  |     | TDD                         |                 |  |
| TDD Configuration                                 | 1-2  |     | TDDConf.3.1                 |                 |  |
| BW <sub>channel</sub>                             | 1-2  |     | 100: N <sub>RB,c</sub> = 66 |                 |  |
| Data RBs allocated                                | 1-2  |     | 66                          |                 |  |
| PDSCH/PDCCH subcarrier spacing                    | 1-2  | kHz | 120                         |                 |  |
| DL initial BWP configuration                      | 1-2  |     | DLBWP.0.1                   |                 |  |
| DL dedicated BWP configuration                    | 1-2  |     | DLBWP.1.1                   |                 |  |
| UL initial BWP configuration                      | 1-2  |     | ULBWP.0.1                   |                 |  |
| UL dedicated BWP configuration                    | 1-2  |     | ULBWP.1.1                   |                 |  |
| PDSCH Reference Channel                           | 1-2  |     | SR.3.2 TDD                  |                 |  |
| RMSI CORESET Reference Channel                    | 1-2  |     | CR.3.1 TDD                  |                 |  |
| Dedicated CORESET Reference Channel               | 1-2  |     | CCR.3.1 TDD                 |                 |  |
| OCNG parameters                                   | 1-2  |     | OP.1                        |                 |  |
| CP length   | 1-2  |     | Normal                      |                 |  |
| PDSCH/PDCCH TCI state                             | 1-2  |     | TCI.State.0                 |                 |  |
| CSI-RS for tracking                               | 1-2  |     | TRS.2.1 TDD                 |                 |  |
| SSB Configuration                                 | 1-2  |     | SSB.1 FR2                   |                 |  |
| SMTTC Configuration                               | 1-2  |     | SMTTC.3                     |                 |  |
| PRACH Configuration                               | 1-2  |     | FR2 PRACH configuration 4   | A.3.8.3.4       |  |
| DRX configuration                                 | 1-2  |     | DRX.3                       | A.3.3.3         |  |
| CSI-RS configuration for BFD/CBD/RLM              | 1-2  |     | CSI-RS.3.2 TDD              | A.3.14.2        |  |
| CSI-RS index assigned as BFD RS (q <sub>0</sub> ) | 1-2  |     | 0                           |                 |  |
| CSI-RS index assigned as CBD RS (q <sub>1</sub> ) | 1-2  |     | 1                           |                 |  |
| CSI-RS index assigned as RLM RS                   | 1-2  |     | 0,1                         |                 |  |
| Beam failure detection transmission parameters    | DCI format   | 1-2 | 1-0                         |                 |  |
|   | Number of Control OFDM symbols                                   | 1-2 | 2                           |                 |  |
|   | Aggregation level  | 1-2 | CCE                         | 8               |  |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-2 | dB                          | 0               |  |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB                          | 0               |  |
|   | DMRS precoder granularity  | 1-2 |                             | REG bundle size |  |
|   | REG bundle size  | 1-2 |                             | 6               |  |

|   |     |         |                   |  |
|---|-----|---------|-------------------|--|
| Gap pattern ID  | 1-2 |         | N/A               |  |
| rimInSyncOutOfSyncThreshold                                   | 1-2 |         | absent            | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1-2 | dBm/SCS | -95               | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1-2 |         | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1-2 |         | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1-2 |         | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1-2 |         | CSI-RS.3.1<br>TDD | A.3.14.2   |
| reportConfigType  | 1-2 |         | periodic          |  |
| reportQuantity  | 1-2 |         | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity                                     | 1-2 | slot    | 40                |  |
| CSI reporting offset  | 1-2 | slot    | 4                 |  |
| T310  | 1-2 | ms      | 1000              |  |
| N310  | 1-2 |         | 2                 |  |
| T1  | 1-2 | s       | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-2 | s       | 5.43              |  |
| T3  | 1-2 | s       | 5.16              |  |
| T4  | 1-2 | s       | 0                 |  |
| T5  | 1-2 | s       | 0.31              |  |
| D1  | 1-2 | s       | 0.27              |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |     |         |                   |  |

**Table A.5.5.4.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter  |            | Unit            | Test 1                     |        |       |       |       |
|--|------------|-----------------|----------------------------|--------|-------|-------|-------|
|  |            |                 | T1                         | T2     | T3    | T4    | T5    |
| AoA setup  |            |                 | Setup 1 defined in A.3.155 |        |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |            |                 | Rough                      |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  |            | dB              | 0                          |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |            | dB              |                            |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   |            | dB              |                            |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  |            | dB              |                            |        |       |       |       |
| EPRE ratio of PSS to SSS   |            | dB              |                            |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  |            | dB              |                            |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  |            | dB              |                            |        |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |            | dB              |                            |        |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |            | dB              |                            |        |       |       |       |
| SNR_CSI-RS of set $q_0$  | Config 1-2 | dB              |                            |        |       |       |       |
| SNR_CSI-RS of set $q_1$  | Config 1-2 | dB              | 0.2                        | 0.2    | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set $q_1$   | Config 1-2 | dBm/S<br>CS     | -104.5                     | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$   | Config 1-2 | dBm/12<br>0 KHz | -104.7                     |        |       |       |       |
| Propagation condition  |            |                 | TDL-A 30ns 75Hz            |        |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.4.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |            |                 |                            |        |       |       |       |

Table A.5.5.5.4.1-4: Void

Table A.5.5.5.4.1-5: Void

Table A.5.5.5.4.1-6: Void

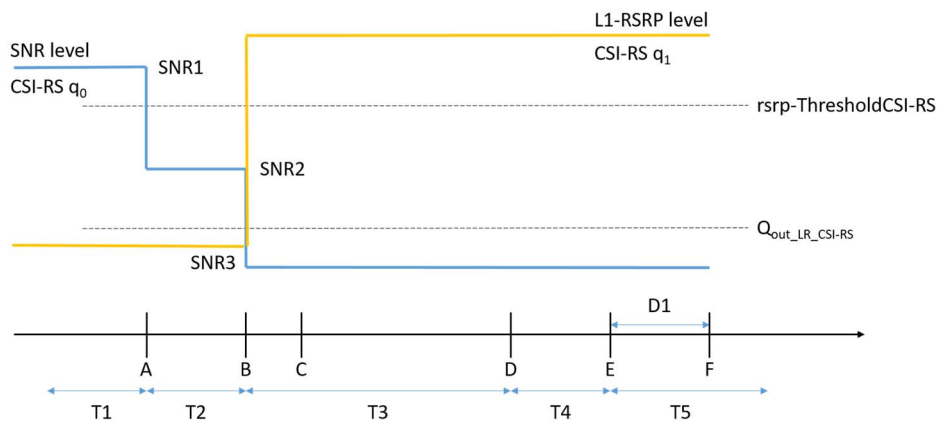


Figure A.5.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

#### A.5.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.5.5.5.5 EN-DC scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

##### A.5.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.5.5.5.5.1-1, A.5.5.5.5.1-2 and A.5.5.5.5.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.5.1-3 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.5.1-3 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam

detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

**Table A.5.5.5.1-1: Supported test configurations for FR2 PSCell**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3  | LTE FDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 4  | LTE TDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.5.5.5.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

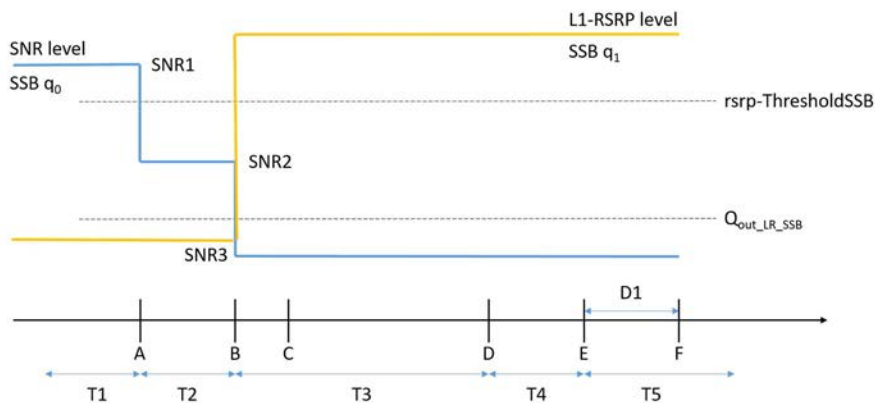
| Parameter                                      | Test Config.   | Unit | Value                     | Comment         |  |
|--|--|------|---------------------------|-----------------|--|
| <b>Test 1</b>                                  |  |      |                           |                 |  |
| Active E-UTRA PCell                            | 1-4  |      | Cell 1                    |                 |  |
| E-UTRA RF Channel Number                       | 1-4  |      | 1                         |                 |  |
| Active PCell                                   | 1-4  |      | Cell 2                    |                 |  |
| RF Channel Number                              | 1-4  |      | 2                         |                 |  |
| Duplex mode                                    | 1-4  |      | TDD                       |                 |  |
| TDD Configuration                              | 1-4  |      | TDDConf.3.1               |                 |  |
| $BW_{channel}$                                 | 1-4  |      | 100: $N_{RB,c} = 66$      |                 |  |
| Data RBs allocated                             | 1-4  |      | 66                        |                 |  |
| PDSCH/PDCCH subcarrier spacing                 | 1-4  | kHz  | 120                       |                 |  |
| DL initial BWP configuration                   | 1-4  |      | DLBWP.0.1                 |                 |  |
| DL dedicated BWP configuration                 | 1-4  |      | DLBWP.1.1                 |                 |  |
| UL initial BWP configuration                   | 1-4  |      | ULBWP.0.1                 |                 |  |
| UL dedicated BWP configuration                 | 1-4  |      | ULBWP.1.1                 |                 |  |
| PDSCH Reference Channel                        | 1-2  |      | SR.3.2 TDD                |                 |  |
|  | 3-4  |      | SR.3.3 TDD                |                 |  |
| RMSI CORESET Reference Channel                 | 1-2  |      | CR.3.1 TDD                |                 |  |
|  | 3-4  |      | CR.3.2 TDD                |                 |  |
| Dedicated CORESET Reference Channel            | 1-2  |      | CCR.3.1 TDD               |                 |  |
|  | 3-4  |      | CCR.3.7 TDD               |                 |  |
| OCNG parameters                                | 1-4  |      | OP.1                      |                 |  |
| CP length                                      | 1-4  |      | Normal                    |                 |  |
| PDSCH/PDCCH TCI state                          | 1-4  |      | TCI.State.0               |                 |  |
| CSI-RS for tracking                            | 1-4  |      | TRS.2.1 TDD               |                 |  |
| SSB Configuration                              | 1-2  |      | SSB.1 FR2                 |                 |  |
|  | 3-4  |      | SSB.2 FR2                 |                 |  |
| SMTc Configuration                             | 1-4  |      | SMTc.1                    |                 |  |
| PRACH Configuration                            | 1-4  |      | FR2 PRACH configuration 2 | A.3.8.3.2       |  |
| DRX configuration                              | 1-4  |      | OFF                       |                 |  |
| SSB index assigned as BFD RS ( $q_0$ )         | 1-4  |      | 0                         |                 |  |
| SSB index assigned as CBD RS ( $q_1$ )         | 1-4  |      | 1                         |                 |  |
| Beam failure detection transmission parameters | DCI format   | 1-4  | 1-0                       |                 |  |
|  | Number of Control OFDM symbols                                   | 1-4  | 2                         |                 |  |
|  | Aggregation level  | 1-4  | CCE                       | 8               |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-4  | dB                        | 0               |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4  | dB                        | 0               |  |
|  | DMRS precoder granularity  | 1-4  |                           | REG bundle size |  |
| REG bundle size                                | 1-4  |      | 6                         |                 |  |

|   |     |         |                   |  |
|---|-----|---------|-------------------|--|
| Gap pattern ID  | 1-4 |         | N/A               | No measurement gap is configured                       |
| rlmInSyncOutOfSyncThreshold   | 1-4 |         | absent            | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1-2 | dBm/SCS | -95               | Threshold used for $Q_{in\_LR\_SSB}$                   |
|   | 3-4 |         | -92               |  |
| powerControlOffsetSS  | 1-4 |         | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount   | 1-4 |         | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer   | 1-4 |         | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting  | 1-4 |         | CSI-RS.3.1<br>TDD |  |
| reportConfigType  | 1-4 |         | periodic          |  |
| reportQuantity  | 1-4 |         | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity   | 1-4 | slot    | 40                |  |
| CSI reporting offset  | 1-4 | slot    | 4                 |  |
| T310  | 1-4 | ms      | 1000              |  |
| N310  | 1-4 |         | 2                 |  |
| T1  | 1-4 | s       | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-4 | s       | 2.6               |  |
| T3  | 1-4 | s       | 1.64              |  |
| T4  | 1-4 | s       | 0                 |  |
| T5  | 1-4 | s       | 1.01              |  |
| D1  | 1-4 | s       | 0.97              |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |     |         |                   |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |     |         |                   |  |



**Table A.5.5.5.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |            | Unit        | Test 1                    |                       |       |       |       |
|--|------------|-------------|---------------------------|-----------------------|-------|-------|-------|
|  |            |             | T1                        | T2                    | T3    | T4    | T5    |
| AoA setup  |            |             | Setup 1 defined in A.3.15 |                       |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |            |             | Rough                     |                       |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  |            | dB          | 0                         |                       |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PSS to SSS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |            | dB          |                           |                       |       |       |       |
| SNR_SSB of set q <sub>0</sub>  | Config 1-4 | dB          | 5 <sup>Note 11</sup>      | -3 <sup>Note 11</sup> | -12   | -12   | -12   |
| SNR_SSB of set q <sub>1</sub>  | Config 1-4 | dB          | 0.2                       | 0.2                   | 20.2  | 20.2  | 20.2  |
| SSB_RP of set q <sub>1</sub>   | Config 1-2 | dBm/        | -104.5                    | -104.5                | -84.5 | -84.5 | -84.5 |
|  | Config 3-4 | SCS         | -101.5                    | -101.5                | -81.5 | -81.5 | -81.5 |
| $N_{oc}$   | Config 1-4 | dBm/120 kHz | -104.7                    |                       |       |       |       |
| Propagation condition  |            |             | TDL-A 30ns 75Hz           |                       |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |            |             |                           |                       |       |       |       |



**Figure A.5.5.5.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### A.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

### A.5.5.5.6 EN-DC Beam Failure Detection and Link Recovery Test for FR2 SCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.5.5.5.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.6.1-1, A.5.5.5.6.1-2 and A.5.5.5.6.1-3. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PCell, and cell 3 is the SCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.6.1-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate CSI-RS based beam failure. Figure A.5.5.5.6.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2, and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is not enabled.

**Table A.5.5.5.6.1-1: Supported test configurations for FR2 PCell and SCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2             | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.5.5.5.6.1-2: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

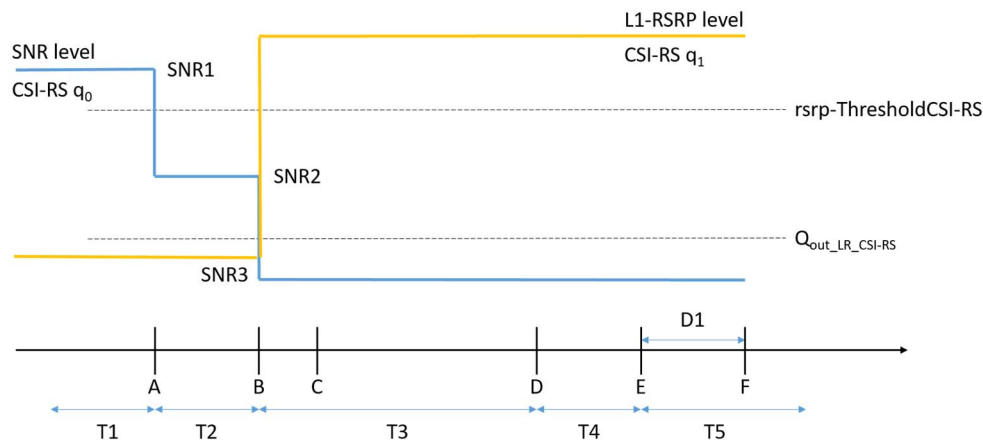
| Parameter | Test Config. | Unit | Value  | Comment |
|-----------|--------------|------|--------|---------|
|           |              |      | Test 1 |         |

|  |  |     |                           |                   |  |
|--|--|-----|---------------------------|-------------------|--|
| Active E-UTRA PCell  | 1-2  |     | Cell 1                    |                   |  |
| E-UTRA RF Channel Number                                     | 1-2  |     | 1                         |                   |  |
| Active PCell   | 1-2  |     | Cell 2                    |                   |  |
| RF Channel Number for PSCell                                 | 1-2  |     | 2                         |                   |  |
| Active SCell   | 1-2  |     | Cell 3                    |                   |  |
| RF Channel Number for SCell                                  | 1-2  |     | 3                         |                   |  |
| Duplex mode  | 1-2  |     | TDD                       |                   |  |
| TDD Configuration  | 1-2  |     | TDDConf.3.1               |                   |  |
| $BW_{channel}$   | 1-2  | MHz | 100: $N_{RB,c} = 66$      |                   |  |
| Data RBs allocated   | 1-2  |     | 66                        |                   |  |
| PDSCH/PDCCH subcarrier spacing                               | 1-2  | kHz | 120                       |                   |  |
| DL initial BWP configuration                                 | 1-2  |     | DLBWP.0.1                 |                   |  |
| DL dedicated BWP configuration                               | 1-2  |     | DLBWP.1.1                 |                   |  |
| UL initial BWP configuration                                 | 1-2  |     | ULBWP.0.1                 |                   |  |
| UL dedicated BWP configuration                               | 1-2  |     | ULBWP.1.1                 |                   |  |
| PDSCH Reference Channel                                      | 1-2  |     | SR.3.2 TDD                |                   |  |
| RMSI CORESET Reference Channel                               | 1-2  |     | CR.3.1 TDD                | A.3.1.2           |  |
| Dedicated CORESET Reference Channel                          | 1-2  |     | CCR.3.1 TDD               |                   |  |
| OCNG parameters  | 1-2  |     | OP.1                      | A.3.2.1           |  |
| CP length  | 1-2  |     | Normal                    |                   |  |
| PDSCH/PDCCH TCI state  | 1-2  |     | TCI.State.0               |                   |  |
| CSI-RS for tracking  | 1-2  |     | TRS.2.1 TDD               |                   |  |
| SSB Configuration  | 1-2  |     | SSB.3 FR2                 | A.3.10            |  |
| SMTC Configuration   | 1-2  |     | SMTC.3                    | A.3.11            |  |
| PRACH Configuration  | 1-2  |     | FR2 PRACH configuration 4 | Table A.3.8.3.4-1 |  |
| DRX configuration  | 1-2  |     | OFF                       |                   |  |
| CSI-RS configuration for BFD/CBD in activated SCell          | 1-2  |     | CSI-RS.3.2 TDD            | A.3.14.2          |  |
| CSI-RS index assigned as BFD RS ( $q_0$ ) in activated SCell | 1-2  |     | 0                         |                   |  |
| CSI-RS index assigned as CBD RS ( $q_1$ ) in activated SCell | 1-2  |     | 1                         |                   |  |
| CSI-RS configuration for RLM in PSCell                       | 1-2  |     | CSI-RS.3.2 TDD            | A.3.14.2          |  |
| Beam failure detection transmission parameters               | DCI format   | 1-2 | 1-0                       |                   |  |
|  | Number of Control OFDM symbols                                   | 1-2 | 2                         |                   |  |
|  | Aggregation level  | 1-2 | CCE                       | 8                 |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-2 | dB                        | 0                 |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB                        | 0                 |  |
|  | DMRS precoder granularity  | 1-2 |                           | REG bundle size   |  |
| REG bundle size  | 1-2  |     | 6                         |                   |  |

|   |     |         |                           |  |
|---|-----|---------|---------------------------|--|
| Gap pattern ID  | 1-2 |         | N/A                       |  |
| schedulingRequestID-BFR-SCell-r16                             | 1-2 |         | Configured                |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell    | 1-2 | slot    | 40                        | 5ms  |
| Offset of PUCCH for SR configuration for BFR on SCell         | 1-2 | slot    | 4                         |  |
| PUCCH parameters for SR configuration for BFR on SCell        | 1-2 |         | Table 8.3.3.1.2-1 in [13] |  |
| rlmInSyncOutOfSyncThreshold                                   | 1-2 |         | absent                    | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1-2 | dBm/SCS | -95                       | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1-2 |         | db0                       | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1-2 |         | n1                        | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1-2 |         | pbfd4                     | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1-2 |         | CSI-RS.3.1 TDD            | A.3.14.2   |
| reportConfigType  | 1-2 |         | periodic                  |  |
| reportQuantity  | 1-2 |         | cri-RI-PMI-CQI            |  |
| CSI reporting periodicity                                     | 1-2 | slot    | 40                        |  |
| CSI reporting offset  | 1-2 | slot    | 4                         |  |
| T310  | 1-2 | ms      | 1000                      |  |
| N310  | 1-2 |         | 2                         |  |
| T1  | 1-2 | s       | 1                         | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-2 | s       | 1.17                      |  |
| T3  | 1-2 | s       | 0.9                       |  |
| T4  | 1-2 | s       | 0                         |  |
| T5  | 1-2 | s       | 0.31                      |  |
| D1  | 1-2 | s       | 0.27                      |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |     |         |                           |  |

**Table A.5.5.6.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |            | Unit         | Cell2<br>T1 to T5         | Cell3<br>Test 1           |        |       |       |       |
|--|------------|--------------|---------------------------|---------------------------|--------|-------|-------|-------|
|  |            |              |                           | T1                        | T2     | T3    | T4    | T5    |
| AoA setup  |            |              | Setup 1 defined in A.3.15 | Setup 1 defined in A.3.15 |        |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |            |              | Rough                     | Rough                     |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  |            | dB           | 0                         | 0                         |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |            | dB           |                           |                           |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   |            | dB           |                           |                           |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  |            | dB           |                           |                           |        |       |       |       |
| EPRE ratio of PSS to SSS   |            | dB           |                           |                           |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  |            | dB           |                           |                           |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  |            | dB           |                           |                           |        |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |            | dB           |                           |                           |        |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |            | dB           |                           |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>0</sub>   | Config 1,2 | dB           |                           |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>1</sub>   | Config 1,2 | dB           | 0.2                       | 0.2                       | 0.2    | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set q <sub>1</sub>  | Config 1,2 | dBm/S CS kHz | -104.5                    | -104.5                    | -104.5 | -84.5 | -84.5 | -84.5 |
| N <sub>oc</sub>  | Config 1,2 | dBm/12 0kHz  | -104.7                    | -104.7                    |        |       |       |       |
| Propagation condition  |            |              | TDL-A 30ns 75Hz           | TDL-A 30ns 75Hz           |        |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.6.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |            |              |                           |                           |        |       |       |       |



**Figure A.5.5.5.6.1-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode**

### A.5.5.5.6.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.5.5.5.6.1 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260 + 10$  ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit PUCCH with an LRR with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.5.5.5.7 EN-DC Beam Failure Detection and Link Recovery Test for FR2 SCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.5.5.5.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UE's active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.7.1-1, A.5.5.5.7.1-2 and A.5.5.5.7.1-3. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell, and cell 3 is the SCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.7.1-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate CSI-RS based beam failure. Figure A.5.5.5.7.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2, and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.5.5.7.1-1: Supported test configurations for FR2 PSCell and SCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2             | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.5.5.7.1-2: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

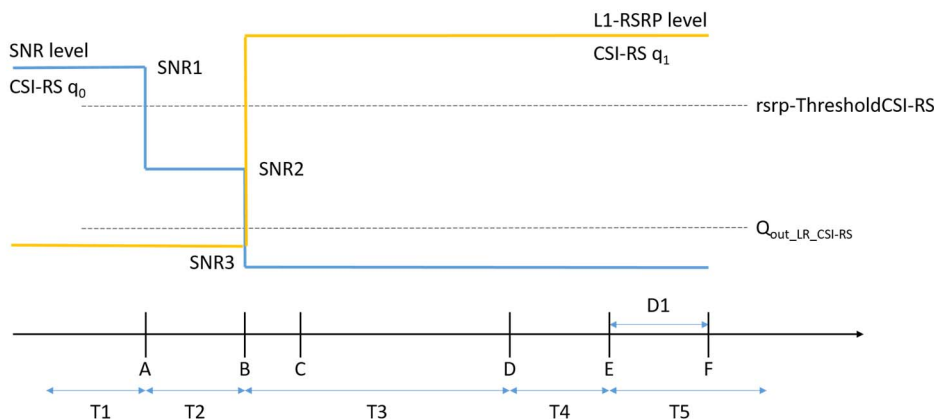
| Parameter  |  | Test Config. | Unit | Value                       | Comment           |
|--|--|--------------|------|-----------------------------|-------------------|
|  |  |              |      | Test 1                      |                   |
| Active E-UTRA PCell  |  | 1-2          |      | Cell 1                      |                   |
| E-UTRA RF Channel Number   |  | 1-2          |      | 1                           |                   |
| Active PCell   |  | 1-2          |      | Cell 2                      |                   |
| RF Channel Number for PSCell   |  | 1-2          |      | 2                           |                   |
| Active SCell   |  | 1-2          |      | Cell 3                      |                   |
| RF Channel Number for SCell  |  | 1-2          |      | 3                           |                   |
| Duplex mode  |  | 1-2          |      | TDD                         |                   |
| TDD Configuration  |  | 1-2          |      | TDDConf.3.1                 |                   |
| BW <sub>channel</sub>  |  | 1-2          | MHz  | 100: N <sub>RB,c</sub> = 66 |                   |
| Data RBs allocated   |  | 1-2          |      | 66                          |                   |
| PDSCH/PDCCH subcarrier spacing                                       |  | 1-2          | kHz  | 120                         |                   |
| DL initial BWP configuration   |  | 1-2          |      | DLBWP.0.1                   |                   |
| DL dedicated BWP configuration                                       |  | 1-2          |      | DLBWP.1.1                   |                   |
| UL initial BWP configuration   |  | 1-2          |      | ULBWP.0.1                   |                   |
| UL dedicated BWP configuration                                       |  | 1-2          |      | ULBWP.1.1                   |                   |
| PDSCH Reference Channel  |  | 1-2          |      | SR.3.2 TDD                  |                   |
| RMSI CORESET Reference Channel                                       |  | 1-2          |      | CR.3.1 TDD                  | A.3.1.2           |
| Dedicated CORESET Reference Channel                                  |  | 1-2          |      | CCR.3.1 TDD                 |                   |
| OCNG parameters  |  | 1-2          |      | OP.1                        | A.3.2.1           |
| CP length  |  | 1-2          |      | Normal                      |                   |
| PDSCH/PDCCH TCI state  |  | 1-2          |      | TCI.State.0                 |                   |
| CSI-RS for tracking  |  | 1-2          |      | TRS.2.1 TDD                 |                   |
| SSB Configuration  |  | 1-2          |      | SSB.3 FR2                   | A.3.10            |
| SMTC Configuration   |  | 1-2          |      | SMTC.3                      | A.3.11            |
| PRACH Configuration  |  | 1-2          |      | FR2 PRACH configuration 4   | Table A.3.8.3.4-1 |
| DRX configuration  |  | 1-2          |      | DRX.3                       | A.3.3.3           |
| CSI-RS configuration for BFD/CBD in activated SCell                  |  | 1-2          |      | CSI-RS.3.2 TDD              | A.3.14.2          |
| CSI-RS index assigned as BFD RS (q <sub>0</sub> ) in activated SCell |  | 1-2          |      | 0                           |                   |
| CSI-RS index assigned as CBD RS (q <sub>1</sub> ) in activated SCell |  | 1-2          |      | 1                           |                   |
| CSI-RS configuration for RLM in PSCell                               |  | 1-2          |      | CSI-RS.3.2 TDD              | A.3.14.2          |
| Beam failure detection transmission parameters                       | DCI format   | 1-2          |      | 1-0                         |                   |
|  | Number of Control OFDM symbols                                   | 1-2          |      | 2                           |                   |
|  | Aggregation level  | 1-2          | CCE  | 8                           |                   |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-2          | dB   | 0                           |                   |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2          | dB   | 0                           |                   |
|  | DMRS precoder granularity  | 1-2          |      | REG bundle size             |                   |
|  | REG bundle size  | 1-2          |      | 6                           |                   |

|   |     |         |                           |  |
|---|-----|---------|---------------------------|--|
| Gap pattern ID  | 1-2 |         | N/A                       |  |
| schedulingRequestID-BFR-SCell-r16                             | 1-2 |         | Configured                |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell    | 1-2 | slot    | 40                        | 5ms  |
| Offset of PUCCH for SR configuration for BFR on SCell         | 1-2 | slot    | 4                         |  |
| PUCCH parameters for SR configuration for BFR on SCell        | 1-2 |         | Table 8.3.3.1.2-1 in [13] |  |
| rlmInSyncOutOfSyncThreshold                                   | 1-2 |         | absent                    | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1-2 | dBm/SCS | -95                       | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1-2 |         | db0                       | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1-2 |         | n1                        | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1-2 |         | pbfd4                     | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1-2 |         | CSI-RS.3.1 TDD            | A.3.14.2   |
| reportConfigType  | 1-2 |         | periodic                  |  |
| reportQuantity  | 1-2 |         | cri-RI-PMI-CQI            |  |
| CSI reporting periodicity                                     | 1-2 | slot    | 40                        |  |
| CSI reporting offset  | 1-2 | slot    | 4                         |  |
| T310  | 1-2 | ms      | 1000                      |  |
| N310  | 1-2 |         | 2                         |  |
| T1  | 1-2 | s       | 1                         | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-2 | s       | 5.43                      |  |
| T3  | 1-2 | s       | 5.16                      |  |
| T4  | 1-2 | s       | 0                         |  |
| T5  | 1-2 | s       | 0.31                      |  |
| D1  | 1-2 | s       | 0.27                      |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |     |         |                           |  |



**Table A.5.5.7.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter  | Unit       | Cell2                      | Cell3 Test 1               |        |        |       |       |       |
|--|------------|----------------------------|----------------------------|--------|--------|-------|-------|-------|
|  |            |                            | T1                         | T2     | T3     | T4    | T5    |       |
| AoA setup  |            | Setup 1 defined in A.3.155 | Setup 1 defined in A.3.155 |        |        |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |            | Rough                      | Rough                      |        |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  | dB         | 0                          | 0                          |        |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  | dB         |                            |                            |        |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   | dB         |                            |                            |        |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  | dB         |                            |                            |        |        |       |       |       |
| EPRE ratio of PSS to SSS   | dB         |                            |                            |        |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  | dB         |                            |                            |        |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  | dB         |                            |                            |        |        |       |       |       |
| EPRE ratio of OCNB DMRS to SSS   | dB         |                            |                            |        |        |       |       |       |
| EPRE ratio of OCNB to OCNB DMRS  | dB         |                            |                            |        |        |       |       |       |
| SNR_CSI-RS of set $q_0$  | Config 1,2 | dB                         | 5                          | 5      | -3     | -12   | -12   | -12   |
| SNR_CSI-RS of set $q_1$  | Config 1,2 | dB                         | 0.2                        | 0.2    | 0.2    | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set $q_1$   | Config 1,2 | dBm/SCS kHz                | -104.5                     | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$   | Config 1,2 | dBm/120 kHz                | -104.7                     | -104.7 |        |       |       |       |
| Propagation condition  |            | TDL-A 30ns 75Hz            | TDL-A 30ns 75Hz            |        |        |       |       |       |
| <p>Note 1: OCNB shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNB.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.7.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |            |                            |                            |        |        |       |       |       |



**Figure A.5.5.7.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing for SCell in DRX mode**

### A.5.5.5.7.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.5.5.5.7.1 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260 + 10$  ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit PUCCH with an LRR with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.5.5.6 Active BWP switch

### A.5.5.6.1 DCI-based and Timer-based Active BWP Switch

#### A.5.5.6.1.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

##### A.5.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.5.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.6.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.6.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $i$ . The UE should switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot ( $i+T_{BWPswitchDelay}$ ).

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ( $j+T_{BWPswitchDelay}$ ).

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

**Table A.5.5.6.1.1-1: DL BWP switch supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations                 |   |
| Note 2: A UE which fulfils the requirements in test case A.5.5.2.2 can skip the test cases in A.5.5.2.1. |   |

**Table A.5.5.6.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2      | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    | For both PCell and PSCell                      |
| <i>bwp-InactivityTimer</i>                              | ms   | [200]  |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| T1  | s    | [0.2]  |  |
| T2  | s    | [0.2]  |  |
| T3  | s    | [0.2]  |  |

Table A.5.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter   | Unit | Cell 2                          |
|---|------|---------------------------------|
| Frequency Range   |      | FR2                             |
| Duplex mode   |      | TDD                             |
| TDD configuration   |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Active BWP ID   |      | 1, 2                            |
| Initial DL BWP Configuration  |      | DLBWP.0.2 <sup>Note 2</sup>     |
| Active DL BWP-1 Configuration   |      | DLBWP.1.1 <sup>Note 2</sup>     |
| Active DL BWP-2 Configuration   |      | DLBWP.1.3 <sup>Note 2</sup>     |
| Initial UL BWP Configuration  |      | ULBWP.0.2 <sup>Note 2</sup>     |
| Active UL BWP-1 Configuration   |      | ULBWP.1.1 <sup>Note 2</sup>     |
| Active UL BWP-2 Configuration   |      | ULBWP.1.3 <sup>Note 2</sup>     |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |      | CCR.3.1 TDD                     |
| OCNG Patterns   |      | OP.1                            |
| SSB Configuration   |      | SSB.1 FR2                       |
| SMTC Configuration  |      | SMTC.1                          |
| TCI State   |      | TCI.State.0                     |
| TRS Configuration   |      | TRS.2.1 TDD                     |
| Correlation Matrix and Antenna Configuration  |      | 1x2 Low                         |
| EPRE ratio of PSS to SSS  | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                                 |
| Propagation Condition   |      |                                 |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |      |                                 |

**Table A.5.5.6.1.1.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit                            | Cell 2                               |
|---|---------------------------------|--------------------------------------|
| Angle of arrival configuration  |                                 | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams <sup>Note 6</sup>   |                                 | Fine                                 |
| $N_{oc}$ <sup>Note 1</sup>  | dBm/15 kHz                      | -112                                 |
| $N_{oc}$ <sup>Note 1</sup>  | dBm/SCS                         | -103                                 |
| SS-RSRP <sup>Note 2</sup>   | dBm/120 kHz <sup>Note 3</sup>   | -85                                  |
| $\bar{E}_s/I_{ot}$  | dB                              | 18                                   |
| $I_o$ <sup>Note 2</sup>   | dBm/95.04 MHz <sup>Note 4</sup> | -56                                  |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                 |                                      |

#### A.5.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+kI$ ).

During T3, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot ( $j+T_{BWPswitchDelay}+kI$ ).

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot ( $i+YI$ ), ( $j+Y2$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.5.5.6.1.2 E-UTRAN – NR PSCell FR2 with FR2 SCell DL active BWP switch in non-DRX in synchronous EN-DC

##### A.5.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6.2, and interruption requirements for NR victim cell defined in clause 8.2.1.2.7 . Supported test configurations are shown in Table A.5.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one PSCell (Cell 2) and one SCell (Cell 3) as given in Table A.5.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of PSCell and SCell are specified in Table A.5.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot ( $i+T_{BWPswitchDelay}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-2 starting from the beginning of the DL slot right after slot ( $i+T_{BWPswitchDelay}$ ).

PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

PSCell(Cell 2) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on SCell(Cell 3).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of SCell's DL slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-1 starting from the first DL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}$ ).

PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

PSCell(Cell 2) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during BWP switch of SCell.

**Table A.5.5.6.1.2.1-1: DL BWP switch supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations                     |   |
| Note 2: A UE which fulfils the requirements in test case A.5.5.6.1.2 can skip the test cases in A.5.5.6.1.1. |   |
| Note 3: NR configuration is the same for PSCell and SCells.  |   |

**Table A.5.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2, 3   | Two NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| Active SCell  |      | Cell 3 | SCell on RF channel number 3.                  |
| CP length   |      | Normal |  |
| DRX   |      | OFF    |  |
| <i>bwp-InactivityTimer</i>                              | ms   | [200]  |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell-individual offset for cells on RF channel number 3 | dB   | 0      | Individual offset for cells on SCC.            |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| Cell3 timing offset to cell2                            | μs   | 3      | Synchronous cells                              |
| T1  | s    | 0.2    |  |
| T2  | s    | 0.2    |  |
| T3  | s    | 0.2    |  |

Table A.5.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter                                | Unit  | Cell 2                          | Cell 3    |
|--|---|---------------------------------|-----------|
| Frequency Range                          |   | FR2                             |           |
| Duplex mode                              |   | TDD                             |           |
| TDD configuration                        |   | TDDConf.3.1                     |           |
| BW <sub>channel</sub>                    |   | 100 MHz: N <sub>RB,c</sub> = 66 |           |
| Active BWP ID                            |   | 0                               | 1,2       |
| Initial DL BWP Configuration             |   | DLBWP.0.2                       | DLBWP.0.2 |
| Active DL BWP-0 Configuration            |   | DLBWP.0.2                       | N.A.      |
| Active DL BWP-1 Configuration            |   | N.A.                            | DLBWP.1.3 |
| Active DL BWP-2 Configuration            |   | N.A.                            | DLBWP.1.1 |
| Initial UL BWP Configuration             |   | ULBWP.0.2                       | N.A.      |
| Active UL BWP-0 Configuration            |   | ULBWP.0.2                       | N.A.      |
| Active UL BWP-1 Configuration            |   | N.A.                            | N.A.      |
| Active UL BWP-2 Configuration            |   | N.A.                            | N.A.      |
| PDSCH Reference measurement channel      |   | SR.3.1 TDD                      |           |
| RMSI CORESET parameters                  |   | CR.3.1 TDD                      |           |
| Dedicated CORESET parameters             |   | CCR.3.1 TDD                     |           |
| OCNG Patterns                            |   | OP.1                            |           |
| SSB Configuration                        |   | SSB.1 FR2                       |           |
| SMTC Configuration                       |   | SMTC.1                          |           |
| TCI State                                |   | TRS.2.1 TDD                     |           |
| TRS Configuration                        |   | TCI.State.0                     |           |
| Antenna Configuration                    |   | 1x2                             |           |
| Propagation Condition                    |   | AWGN                            |           |
| EPRE ratio of PSS to SSS                 | dB  | 0                               | 0         |
| EPRE ratio of PBCH DMRS to SSS           |   |                                 |           |
| EPRE ratio of PBCH to PBCH DMRS          |   |                                 |           |
| EPRE ratio of PDCCH DMRS to SSS          |   |                                 |           |
| EPRE ratio of PDCCH to PDCCH DMRS        |   |                                 |           |
| EPRE ratio of PDSCH DMRS to SSS          |   |                                 |           |
| EPRE ratio of PDSCH to PDSCH             |   |                                 |           |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |   |                                 |           |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |   |                                 |           |
| Note 1:                                  | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                                 |           |
| Note 2:                                  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                                 |           |
| Note 3:                                  | SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                 |           |
| Note 4:                                  | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3.   |                                 |           |



Table A.5.5.6.1.2.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC

| Parameter                                 | Unit   | Cell 2                             | Cell 3 |
|---|--|------------------------------------|--------|
| Angle of arrival configuration            |  | Setup 1 according to clause A.3.15 |        |
| Assumption for UE beams <sup>Note 6</sup> |  | Fine                               | Fine   |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/15 kHz   | -112                               | -112   |
| SS-RSRP <sup>Note 2</sup>                 | dBm/120 kHz <sup>Note 3</sup>  | -85                                | -85    |
| $\hat{E}_s/I_{ot}$                        | dB   | 18                                 | 18     |
| $I_o$ <sup>Note 2</sup>                   | dBm/95.04 MHz <sup>Note 4</sup>  | -56                                | -56    |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                    |        |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                    |        |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                    |        |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                                    |        |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone.  |                                    |        |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                    |        |

#### A.5.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL after slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL after slot  $(j+T_{BWPswitchDelay}+kI)$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

During T1, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in Clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

*Editor's note: FFS value of  $kI$  for type 1 and type 2 UE.*

## A.5.5.6.2 RRC-based Active BWP Switch

### A.5.5.6.2.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

#### A.5.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.5.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.5.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.5.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

If the *RRCReconfiguration* is embedded in E-UTRA RRC message, time period T1 starts when a E-UTRA RRC message *RRCConnectionReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side from PCell in PSCell's slot # denoted *i*. Otherwise, i.e., if the *RRCReconfiguration* is not embedded in E-UTRA RRC message, time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in from PSCell in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to completely receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ).

$T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.5.5.6.2.1.1-1: DL BWP switch supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2      | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| T1  | s    | [0.2]  |  |

Table A.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter   |                               | Unit | Cell 2                          |
|---|-------------------------------|------|---------------------------------|
| Frequency Range   |                               |      | FR2                             |
| Duplex mode   |                               |      | TDD                             |
| TDD configuration   |                               |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |                               |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Active BWP ID   |                               |      | 1                               |
| Initial DL BWP Configuration  |                               |      | DLBWP.0.2                       |
| Initial UL BWP Configuration  |                               |      | ULBWP.0.2                       |
| Initial Condition   | Active DL BWP-1 Configuration |      | DLBWP.1.3                       |
|   | Active UL BWP-1 Configuration |      | ULBWP.1.3                       |
| Final Condition   | Active DL BWP-1 Configuration |      | DLBWP.1.1                       |
|   | Active UL BWP-1 Configuration |      | ULBWP.1.1                       |
| PDSCH Reference measurement channel   |                               |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |                               |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |                               |      | CCR.3.1 TDD                     |
| OCNG Patterns   |                               |      | OP.1                            |
| SSB Configuration   |                               |      | SSB.1 FR2                       |
| SMTc Configuration  |                               |      | SMTc.1                          |
| TCI State   |                               |      | TCI.State.0                     |
| TRS Configuration   |                               |      | TRS.2.1 TDD                     |
| Antenna Configuration   |                               |      | 1x2                             |
| Propagation Condition   |                               |      | AWGN                            |
| EPRE ratio of PSS to SSS  |                               | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |                               |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |                               |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |                               |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |                               |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                               |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                               |      |                                 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                               |      |                                 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                               |      |                                 |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |      |                                 |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].           |                               |      |                                 |

Table A.5.5.6.2.1.1-4: OTA related test parameters for BWP switching test case

| Parameter   |              | Unit                           | Cell 2                            |
|---|--------------|--------------------------------|-----------------------------------|
| Angle of arrival configuration  |              |                                | Setup 1 according to table A.3.15 |
| Assumption for UE beams <sup>Note 5</sup>   |              |                                | Fine                              |
| $N_{oc}$ <sup>Note1</sup>   | NR_TDD_FR2_A | dBm/15kHz                      | -112                              |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| $N_{oc}$ <sup>Note1</sup>   | NR_TDD_FR2_A | dBm/SCS                        | -103                              |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| SS-RSRP <sup>Note2</sup>  | NR_TDD_FR2_A | dBm/SCS <sup>Note3</sup>       | -85                               |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| $\hat{E}_s/I_{ot}$  |              | dB                             | 18                                |
| $I_o$ <sup>Note2</sup>  | NR_TDD_FR2_A | dBm/95.04 MHz <sup>Note4</sup> | -56                               |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |              |                                |                                   |

#### A.5.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ).

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

#### A.5.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

##### A.5.5.6.3.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs in synchronous EN-DC

###### A.5.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch on multiple CCs delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.5.5.6.3.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.3.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and NR SCell is specified in Table A.5.5.6.3.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.6.3.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and Cell 3 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell and SCell, BWP-1 and BWP-2, in Cell 2 and Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell and SCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell and SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch and a DCI format 1\_1 command for SCell DL BWP switch, sent from the test equipment to the UE simultaneously, are received at the UE side in PSCell and SCell slot # denoted  $i$ . The UE should switch its bandwidth part from BWP-1 to BWP-2 in PSCell and SCell.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i + T_{MultipleBWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot ( $i + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot ( $i + T_{MultipleBWPswitchDelay}$ ).

The UE shall be able to receive PDSCH at the beginning of the DL slot right after SCell's DL slot ( $i + T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot ( $i + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot ( $i + T_{MultipleBWPswitchDelay}$ ).

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell (Cell 2) and SCell (Cell 3).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires in PSCell and SCell. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1 in both PSCell and SCell.

The UE shall be able to receive PDSCH on PSCell at the beginning of the DL slot right after PSCell's DL slot ( $j + T_{MultipleBWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot ( $j + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ( $j + T_{MultipleBWPswitchDelay}$ ).

The UE shall be able to receive PDSCH on SCell at the beginning of the DL slot right after SCell's DL slot ( $j + T_{MultipleBWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell at latest at the beginning of the DL slot right after slot ( $j + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on SCell's BWP-1 starting from the beginning of the DL slot right after slot ( $j + T_{MultipleBWPswitchDelay}$ ).

The test equipment verifies the DL BWP switch time in PSCell and SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

**Table A.5.5.6.3.1.1-1: DL BWP switch supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.6.3.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment   |
|---|------|--------|---|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test                  |
| NR RF Channel Number                                    |      | 2, 3   | Two NR radio channel is used for this test for PSCell and SCell |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                                   |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                                  |
| Active SCell  |      | Cell 3 | SCell on RF channel number 3.                                   |
| CP length   |      | Normal |   |
| DRX   |      | OFF    | For both PCell, PSCell and SCell                                |
| <i>bwp-InactivityTimer</i>                              | ms   | 200    |   |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.                             |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.                            |
| Cell-individual offset for cells on RF channel number 3 | dB   | 0      | Individual offset for cells on SCC.                             |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC   |
| Cell3 timing offset to cell2                            | μs   | 3      | Synchronous Cells   |
| T1  | s    | 0.2    |   |
| T2  | s    | 0.2    |   |
| T3  | s    | 0.2    |   |

Table A.5.5.6.3.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter                                    | Unit  | Cell 2                          | Cell 3                          |
|--|---|---------------------------------|---------------------------------|
| Frequency Range                              |   | FR2                             | FR2                             |
| Duplex mode                                  |   | TDD                             | TDD                             |
| TDD configuration                            |   | TDDConf.3.1                     | TDDConf.3.1                     |
| BW <sub>channel</sub>                        |   | 100 MHz: N <sub>RB,c</sub> = 66 | 100 MHz: N <sub>RB,c</sub> = 66 |
| Active BWP ID                                |   | 1, 2                            | 1, 2                            |
| Initial DL BWP Configuration                 |   | DLBWP.0.2 <sup>Note 2</sup>     | DLBWP.0.2 <sup>Note 2</sup>     |
| Active DL BWP-1 Configuration                |   | DLBWP.1.1 <sup>Note 2</sup>     | DLBWP.1.1 <sup>Note 2</sup>     |
| Active DL BWP-2 Configuration                |   | DLBWP.1.3 <sup>Note 2</sup>     | DLBWP.1.3 <sup>Note 2</sup>     |
| Initial UL BWP Configuration                 |   | ULBWP.0.2 <sup>Note 2</sup>     | ULBWP.0.2 <sup>Note 2</sup>     |
| Active UL BWP-1 Configuration                |   | ULBWP.1.1 <sup>Note 2</sup>     | ULBWP.1.1 <sup>Note 2</sup>     |
| Active UL BWP-2 Configuration                |   | ULBWP.1.3 <sup>Note 2</sup>     | ULBWP.1.3 <sup>Note 2</sup>     |
| PDSCH Reference measurement channel          |   | SR.3.1 TDD                      | SR.3.1 TDD                      |
| RMSI CORESET parameters                      |   | CR.3.1 TDD                      | CR.3.1 TDD                      |
| Dedicated CORESET parameters                 |   | CCR.3.1 TDD                     | CCR.3.1 TDD                     |
| OCNG Patterns                                |   | OP.1                            | OP.1                            |
| SSB Configuration                            |   | SSB.1 FR2                       | SSB.1 FR2                       |
| SMTC Configuration                           |   | SMTC.1                          | SMTC.1                          |
| TCI State                                    |   | TCI.State.0                     | TCI.State.0                     |
| TRS Configuration                            |   | TRS.2.1 TDD                     | TRS.2.1 TDD                     |
| Correlation Matrix and Antenna Configuration |   | 1x2 Low                         | 1x2 Low                         |
| EPRE ratio of PSS to SSS                     | dB  | 0                               | 0                               |
| EPRE ratio of PBCH DMRS to SSS               |   |                                 |                                 |
| EPRE ratio of PBCH to PBCH DMRS              |   |                                 |                                 |
| EPRE ratio of PDCCH DMRS to SSS              |   |                                 |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS            |   |                                 |                                 |
| EPRE ratio of PDSCH DMRS to SSS              |   |                                 |                                 |
| EPRE ratio of PDSCH to PDSCH                 |   |                                 |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |   |                                 |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |   |                                 |                                 |
| Propagation Condition                        |   |                                 |                                 |
| Note 1:                                      | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                                 |                                 |
| Note 2:                                      | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. |                                 |                                 |



Table A.5.5.6.3.1.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC

| Parameter                                 | Unit   | Cell 2                               | Cell 3                               |
|---|--|--------------------------------------|--------------------------------------|
| Angle of arrival configuration            |  | Setup 1 according to clause A.3.15.1 | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams <sup>Note 6</sup> |  | Fine                                 | Fine                                 |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/15 kHz   | -112                                 | -112                                 |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/SCS  | -103                                 | -103                                 |
| SS-RSRP <sup>Note 2</sup>                 | dBm/120 kHz <sup>Note 3</sup>  | -85                                  | -85                                  |
| $\bar{E}_s/I_{ot}$                        | dB   | 18                                   | 18                                   |
| $I_o$ <sup>Note 2</sup>                   | dBm/95.04 MHz <sup>Note 4</sup>  | -56                                  | -56                                  |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                      |                                      |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |                                      |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                      |                                      |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                      |                                      |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone.  |                                      |                                      |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                      |                                      |

#### A.5.5.6.3.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ( $i+T_{MultipleBWPswitchDelay}+kI$ ).

During T3, the UE shall start to send the ACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ( $j+T_{MultipleBWPswitchDelay}+kI$ ).

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* and *bwp-SwitchingMultiCCs-r16* [2], UE shall finish BWP switch within the time duration  $T_{MultipleBWPswitchDelay}$  defined in TS 38.133 clause 8.6.2A and 8.6.2B

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot ( $i+Y1$ ), ( $j+Y2$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.5.5.6.4 SCell dormancy switch

##### A.5.5.6.4.1 E-UTRAN – NR FR2 PSCell SCell dormancy switch of single FR2 SCell inside active time

###### A.5.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify

- 1) the interruption due to RRM and CSI measurement during SCell dormancy on spCell is within the limits specified in clause 8.2.1.2.15.2 and 8.2.1.2.15.3 for NR victim cell, and
- 2) the SCell dormancy switch delay is within the requirement defined in clause 8.6.2, and the SCell dormancy switch interruption is within the limits defined in clause 8.2.1.2.15.1 for NR victim cell.

Supported test configurations are shown in Table A.5.5.6.4.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.4.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.5.5.6.4.1.1-3 below.

The tests consist of three consecutive time periods T1, T2, and T3, respectively. All cells have constant signal levels throughout the test. The UE is continuously scheduled in PCell and PSCell throughout the test

Before the test starts,

- UE is connected to Cell 1 (PCell), Cell 2 (PSCell) and Cell 3 (SCell).
- UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for Cell 2. BWP-0 includes the bandwidth of the initial DL BWP and SSB.
- UE is configured with one non-dormant and one dormant UE-specific downlink bandwidth part, BWP-0 and BWP-1, respectively, for Cell 3. BWP-0 includes the bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 3 is BWP-0.
- UE is indicated that *firstOutsideActiveTimeBWP-Id* that the active DL BWP after when switching from dormant BWP in Cell 3 is BWP-0

T1 starts at the point in time at which the UE receives a DCI with dormancy indication on PDCCH in PSCell at the antenna connector, in a slot # denoted  $m$ , pertaining to dormancy indication for switching SCell from non-dormancy to dormancy. The UE shall complete switching of the SCells to dormancy by the end of slot  $m + \text{ceil}(T_{\text{BWPswitchDelay}}/\text{NR slot length}) + 1$  in Test1, and slot  $m + \text{ceil}(T_{\text{BWPswitchDelay}}/\text{NR slot length}) + 2$  in Test2, as specified in clause 8.6.2. Any PSCell interruptions due to the switching between non-dormant and dormant BWPs shall fulfill requirements in clause 8.2.1.2.15.1 for NR victim cell. The test equipment verifies that interruptions due to switching from non-dormancy to dormancy are within the requirements by analysing HARQ feedback transmitted in PSCell for PSCell.

During T2, the UE is carrying out CSI and RRM measurements on dormant SCell. Any interruptions due to CSI and RRM measurements shall fulfill requirements in clause 8.2.1.2.15.2 and 8.2.1.2.15.3 for NR victim cell. The test equipment verifies that the interruptions are within the allowed percentages by counting ACK/NACKs in PSCell. At the end of T2, the test equipment transmits a DCI with dormancy indication on PDCCH in PSCell carrying a dormancy indication for switching SCell from dormancy to non-dormancy.

T3 starts at the point in time at which the UE receives a DCI with dormancy indication on PDCCH in PSCell at the antenna connector, in a slot # denoted  $n$ , pertaining to dormancy indication for switching SCell from dormancy to non-dormancy. The UE shall complete switching of the SCell to non-dormancy by the end of slot  $n + \text{ceil}(T_{\text{BWPswitchDelay}}/\text{NR slot length}) + 1$  in Test1, and slot  $n + \text{ceil}(T_{\text{BWPswitchDelay}}/\text{NR slot length}) + 2$  in Test2, as specified in clause 8.6.2. Any PSCell interruptions due to the switching between non-dormant and dormant BWPs shall fulfill requirements in clause 8.2.1.2.15.1 for NR victim cell. The test equipment verifies that interruptions due to switching from dormancy to non-dormancy are within the requirements by analysing HARQ feedback transmitted in PSCell for PSCell. PDCCHs indicating new transmissions shall be sent continuously on SCell from the slot right after  $n + \text{ceil}(T_{\text{BWPswitchDelay}}/\text{NR slot length}) + 1$  in Test1, and slot  $n + \text{ceil}(T_{\text{BWPswitchDelay}}/\text{NR slot length}) + 2$  in Test2. The test equipment verifies the SCell dormancy switch delay by counting the slots from slot  $n$  till an ACK/NACK for SCell is received.

There are two subtests in this test. In Subtest 1 the DCI format 1\_1 command for SCell dormancy switch is transmitted within the first 3 OFDM symbols in a slot, and in Subtest 2 the DCI format 1\_1 command for SCell dormancy switch is transmitted after the first 3 OFDM symbols in a slot. A UE that only supports triggering during within the first three OFDM symbols of a slot shall only undergo Test1, whereas a UE that supports triggering also in remaining OFDM symbols of a slot shall undergo Test1 and Test2.

**Table A.5.5.6.4.1.1-1: Dormancy switch supported test configurations**

| Config  | Description   |
|---------|---|
| 1       | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 2       | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| Note 1: | The UE is only required to be tested in one of the supported test configurations  |
| Note 2: | A UE which fulfils the requirements in test case in clause A.5.5.6.4.2 can skip the test cases in current clause A.5.5.6.4.1. |
| Note 3: | NR configuration is the same for PSCell and SCells.   |

Table A.5.5.6.4.1.1-2: General test parameters for Dormancy switch in synchronous EN-DC

| Parameter  | Unit | Value     |           | Comment  |
|--|------|-----------|-----------|--|
|  |      | Subtest 1 | Subtest 2 |  |
| E-UTRA RF Channel Number   |      | 1         |           | One E-UTRA radio channel is used for this test   |
| NR RF Channel Number   |      | 2, 3      |           | Two NR radio channel is used for this test   |
| Active PCell   |      | Cell 1    |           | PCell on RF channel number 1.  |
| Active PSCell  |      | Cell 2    |           | PSCell on RF channel number 2.   |
| Active SCell   |      | Cell 3    |           | SCell on RF channel number 3.  |
| CP length  |      | Normal    |           |  |
| DRX  |      | OFF       |           |  |
| Measurement gap pattern Id   |      | OFF       |           |  |
| <i>bwp-InactivityTimer</i>   | ms   | 500       |           |  |
| Cell-individual offset for cells on RF channel number 1                    | dB   | 0         |           | Individual offset for cells on PCC.  |
| Cell-individual offset for cells on RF channel number 2                    | dB   | 0         |           | Individual offset for cells on PSCC.   |
| Cell-individual offset for cells on RF channel number 3                    | dB   | 0         |           | Individual offset for cells on SCC.  |
| Cell2 timing offset to cell1   | μs   | 3         |           | Synchronous EN-DC  |
| Cell3 timing offset to cell2   | μs   | 0         |           | Synchronous cells  |
| Triggering DCI format  |      | DCI 1_1   |           | Triggering DCI format for triggering during active time  |
| OFDM symbol range in slot for transmission of DCI with dormancy indication |      | 0 – 2     | 3 – 11    | Test1 is based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 is based on that the triggering DCI is received later than within the first three OFDM symbols of a slot. |
| T1   | s    | 0.2       |           |  |
| T2   | s    | 5         |           |  |
| T3   | s    | 0.2       |           |  |

Table A.5.5.6.4.1.1-3: NR Cell specific test parameters for Dormancy switch in synchronous EN-DC

| Parameter                                | Unit  | Subtest 1                       |           | Subtest 2                       |             |
|--|---|---------------------------------|-----------|---------------------------------|-------------|
|  |   | Cell 2                          | Cell 3    | Cell 2                          | Cell 3      |
| Frequency Range                          |   | FR2                             |           | FR2                             |             |
| Duplex mode                              |   | TDD                             |           | TDD                             |             |
| TDD configuration                        |   | TDDConf.3.1                     |           | TDDConf.3.1                     |             |
| BW <sub>channel</sub>                    |   | 100 MHz: N <sub>RB,c</sub> = 66 |           | 100 MHz: N <sub>RB,c</sub> = 66 |             |
| Active BWP ID                            |   | 0                               | 0         | 0                               | 0           |
| Initial DL BWP Configuration             |   | DLBWP.0.2                       | DLBWP.0.2 | DLBWP.0.2                       | DLBWP.0.2   |
| Active DL BWP-0 Configuration            |   | DLBWP.1.1                       | DLBWP.1.1 | DLBWP.1.1                       | DLBWP.1.1   |
| Active DL BWP-1 Configuration            |   | NA                              | DLBWP.1.2 | NA                              | DLBWP.1.2   |
| Initial UL BWP Configuration             |   | ULBWP.0.2                       | ULBWP.0.2 | ULBWP.0.2                       | ULBWP.0.2   |
| Active UL BWP-0 Configuration            |   | ULBWP.1.1                       | ULBWP.1.1 | ULBWP.1.1                       | ULBWP.1.1   |
| Active UL BWP-1 Configuration            |   | NA                              | ULBWP.1.2 | NA                              | ULBWP.1.2   |
| PDSCH Reference measurement channel      |   | SR.3.1 TDD                      |           | SR.3.1 TDD                      |             |
| RMSI CORESET parameters                  |   | CR.3.1 TDD                      |           | CR.3.1 TDD                      |             |
| Dedicated CORESET parameters             |   | CCR.3.1 TDD                     |           | CCR.3.2 TDD                     | CCR.3.1 TDD |
| OCNG Patterns                            |   | OP.1                            |           | OP.1                            |             |
| SSB Configuration                        |   | SSB.1 FR2                       |           | SSB.1 FR2                       |             |
| SMTC Configuration                       |   | SMTC.1                          |           | SMTC.1                          |             |
| TCI State                                |   | TCI.State.0                     |           | TCI.State.0                     |             |
| TRS Configuration                        |   | TRS.2.1 TDD                     |           | TRS.2.1 TDD                     |             |
| CSI-RS for CSI reporting                 |   | CSI-RS.3.1 TDD                  |           | CSI-RS.3.1 TDD                  |             |
| CSI reporting periodicity                | slots   | 640                             |           | 640                             |             |
| SCell measurement cycle (measCycleSCell) | ms  | 640                             |           | 640                             |             |
| Antenna Configuration                    |   | 1x2                             |           | 1x2                             |             |
| Propagation Condition                    |   | AWGN                            |           | AWGN                            |             |
| EPRE ratio of PSS to SSS                 | dB  | 0                               | 0         | 0                               | 0           |
| EPRE ratio of PBCH DMRS to SSS           |   |                                 |           |                                 |             |
| EPRE ratio of PBCH to PBCH DMRS          |   |                                 |           |                                 |             |
| EPRE ratio of PDCCH DMRS to SSS          |   |                                 |           |                                 |             |
| EPRE ratio of PDCCH to PDCCH DMRS        |   |                                 |           |                                 |             |
| EPRE ratio of PDSCH DMRS to SSS          |   |                                 |           |                                 |             |
| EPRE ratio of PDSCH to PDSCH DMRS        |   |                                 |           |                                 |             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |   |                                 |           |                                 |             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |   |                                 |           |                                 |             |
| Note 1:                                  | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                                 |           |                                 |             |
| Note 2:                                  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                                 |           |                                 |             |
| Note 3:                                  | SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                 |           |                                 |             |
| Note 4:                                  | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3.   |                                 |           |                                 |             |

**Table A.5.5.6.4.1.1-4: OTA related test parameters for Dormancy switch in synchronous EN-DC**

| Parameter                      | Unit   | Cell 2                             | Cell 3 |
|--------------------------------|--|------------------------------------|--------|
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15 |        |
| $N_{oc}$ <sup>Note 1</sup>     | dBm/15<br>kHz  | -112                               | -112   |
| SS-RSRP <sup>Note 2</sup>      | dBm/120<br>kHz <sup>Note3</sup>  | -85                                | -85    |
| $\tilde{E}_s/I_{ot}$           | dB   | 18                                 | 18     |
| $I_o$ <sup>Note2</sup>         | dBm/95.04<br>MHz <sup>Note4</sup>  | -56                                | -56    |
| Note 1:                        | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                    |        |
| Note 2:                        | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                    |        |
| Note 3:                        | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                    |        |
| Note 4:                        | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                                    |        |
| Note 5:                        | As observed with 0dBi gain antenna at the centre of the quiet zone.  |                                    |        |

#### A.5.5.6.4.1.2 Test Requirements

During T1, any interruption on PSCell due to dormancy switching of SCell shall be within the requirement specified in clause 8.2.1.2.15.1 for NR victim cell.

During T2, interruptions on PSCell due to CSI and RRM measurements on dormant SCell shall be within the interruption rate requirements specified in 8.2.1.2.15.1 for NR victim cell.

During T3, any interruption on PSCell due to dormancy switching of SCell shall be within the requirement specified in clause 8.2.1.2.15.1 for NR victim cell. Monitoring of PDCCH for SCell in PSCell shall be resumed within the dormancy switching time specified in clause 8.6.2A.

For an event to be considered to be correct, all requirements above have to be fulfilled.

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

#### A.5.5.6.4.2 E-UTRAN – NR FR1 PSCell SCell dormancy switch of two FR2 SCells outside active time

##### A.5.5.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify the NR SCell dormant BWP switch delay requirement defined in clause 8.6.2A.1, interruption requirements due to the NR SCell dormant BWP switch defined in clause 8.2.1.2.15.1 for NR victim cells and in clause 7.32.2.14.1 of TS36.133 for E-UTRA victim cell, respectively, and interruption requirements due to CSI and RRM measurements on the NR dormant SCells defined in clauses 8.2.1.2.15.2 and 8.2.1.2.15.3 for NR victim cells and in clause 7.32.2.14.2 of TS36.133 for E-UTRA victim cell, respectively. Supported test configurations are shown in Table Table A.5.5.6.4.2.1-1.

The general test parameters are given in Table A.5.5.6.4.2.1-2, and NR cell specific test parameters are given in Table A.5.5.6.4.2.1-3 and Table A.5.5.6.4.2.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR FR1 PSCell (Cell 2), and three NR FR2 SCells (Cell 3-5) as given in Table A.5.5.6.4.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.5.5.6.4.2.1-3 and Table A.5.5.6.4.2.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1), PSCell (Cell 2), and SCell (Cell 5) to ensure that the UE will have ACK/NACK sending except the time before T1 and during T3. PDCCHs indicating new transmissions shall be sent continuously on SCells (Cell 3,4) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on the cells and the time duration of when active BWP of the cell is dormant.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC), and Cell 3-5 (SCells) on radio channels 3-5 (SCCs), respectively.
- UE is configured with 2 different UE-specific downlink BWPs for Cell 3 and Cell 4, BWP-1 and BWP-2. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB. Here, BWP-2 on Cell 3 and Cell 4 is configured as dormant BWP.
- UE is configured with 1 UE-specific downlink BWP the same as initial BWP for Cell 3 and Cell 4.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in Cell 3 and Cell 4.
- UE is configured with DRX.
- UE is configured to monitor PDCCH for DCI format 2\_6 from Cell 2 at *ps-Offset* before the start of *onDuration*. *ps-Offset* is selected to correspond to the dormancy switching time specified in clause 8.6.2A.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, T3, and T4, respectively.

During T1,

Time period T1 starts when a DCI format 2\_6 command for Cell 3 and Cell 4 DL BWP switch to BWP-2, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i + T_{\text{MultipleBWPswitchDelay}} + X$ ) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cell starting from the beginning of the DL slot right after slot ( $i + T_{\text{MultipleBWPswitchDelay}} + X$ ).

The UE shall be able to receive PDSCH at the beginning of the DL slot right after SCell(Cell 5)'s DL slot ( $i + T_{\text{MultipleBWPswitchDelay}} + X$ ) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cell starting from the beginning of the DL slot right after slot ( $i + T_{\text{MultipleBWPswitchDelay}} + X$ ).

PCell(Cell 1) interruption due to dormant BWP switch on PSCell shall occur within the dormant BWP switch delay.

SCell(Cell 5) interruption due to dormant BWP switch on SCell(Cell 5) shall occur within the dormant BWP switch delay.

During T2,

Time period T2 starts when dormant BWP switch latency requirement test is completed. The test equipment shall schedule PDSCH every slot.

The UE shall be able to report ACK/NACK corresponding to the scheduled PDSCH to PSCell except for the allowed times as defined in clauses 8.2.1.2.15.2 and 8.2.1.2.15.3.

The UE shall be able to report ACK/NACK corresponding to the scheduled PDSCH to PCell except for the allowed times as defined in clause 7.32.2.14.2 of TS36.133.

During T3,

Time period T3 starts when interruption due to SSB based RRM measurement and CSI measurement requirements test is completed. Test equipment shall not transmit PDCCH, hence, the UE doesn't monitor PDCCH except DCI format 2\_6 based PDCCH.

During T4,

Time period T4 starts when a DCI format 2\_6 command for Cell 3 and Cell 4 DL BWP switch to BWP-1, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $j$ . The UE shall switch its bandwidth part from BWP-2 to BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $j + T_{\text{MultipleBWPswitchDelay}} + X$ ) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cell starting from the beginning of the DL slot right after slot ( $j + T_{\text{MultipleBWPswitchDelay}} + X$ ).

The UE shall be able to receive PDSCH at the beginning of the DL slot right after all SCell's (Cell 3,4,5) DL slot ( $j + T_{\text{MultipleBWPswitchDelay}} + X$ ) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cells starting from the beginning of the DL slot right after slot ( $j + T_{\text{MultipleBWPswitchDelay}} + X$ ).

PCell(Cell 1) interruption due to dormant BWP switch on PSCell shall occur within the dormant BWP switch delay.

SCell(Cell 5) interruption due to dormant BWP switch on SCell(Cell 5) shall occur within the dormant BWP switch delay.

**Table A.5.5.6.4.2.1-1: Supported test configurations for EN-DC DCI 2\_6 based Domant BWP Switch on Multiple NR FR2 SCells**

| Config | Cell 1  | Cell 2             | Cell 3, Cell 4, Cell 5 | DCI 2_6 of Cell 2     |
|--------|---------|--------------------|------------------------|-----------------------|
| 1      | LTE FDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD    | within 3 OFDM symbols |
| 2      | LTE FDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | within 3 OFDM symbols |
| 3      | LTE FDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | within 3 OFDM symbols |
| 4      | LTE TDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD    | within 3 OFDM symbols |
| 5      | LTE TDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | within 3 OFDM symbols |
| 6      | LTE TDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | within 3 OFDM symbols |
| 7      | LTE FDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD    | after 3 OFDM symbols  |
| 8      | LTE FDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | after 3 OFDM symbols  |
| 9      | LTE FDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | after 3 OFDM symbols  |
| 10     | LTE TDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD    | after 3 OFDM symbols  |
| 11     | LTE TDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | after 3 OFDM symbols  |
| 12     | LTE TDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD    | after 3 OFDM symbols  |

Note 1: 10 MHz bandwidth for Cell 2 with 15kHz SSB SCS.

Note 2: 40 MHz bandwidth for Cell 2 with 30kHz SSB SCS.

Note 3: 100 MHz bandwidth for Cell 3,4,5.

Note 4: The UE is only required to be tested in one of the supported test configurations.

**Table A.5.5.6.4.2.1-2: General test parameters for EN-DC DCI 2\_6 based Domant BWP Switch on Multiple NR FR2 SCells**

| Parameter                                | Unit | Value                      | Comment   |
|--|------|----------------------------|---|
| E-UTRA RF Channel Number                 |      | 1                          | One E-UTRAN carrier frequency is used.  |
| NR RF Channel Number                     |      | 2,3,4,5                    | Four NR radio channels are used for this test. RF channel number 2 is in FR 1 and RF channel numbers 3,4,5 are in a band where intra-band FR2 CA is allowed.  |
| Active PCell                             |      | Cell 1                     | Primary cell on NR RF channel number 1.   |
| Active PSCell                            |      | Cell 2                     | Primary SCG cell on NR RF channel number 2.   |
| Configured activated SCell               |      | Cell 3,4,5                 | Configured activated secondary cell on NR RF channel numbers 3,4,5.   |
| CP length                                |      | Normal                     |   |
| DRX                                      |      | DRX.3                      | As specified in clause A.3.3  |
| ps-Offset                                |      | Depending on UE capability | Monitoring of DCI 2_6 ahead of start of drx-onDurationTimer. Value of ps-Offset shall correspond to SCell dormancy switching time for switching of two SCells, as specified in clause 8.6.2A. Actual value depends on reported UE capabilities. |
| ps-WakeUp                                |      | true                       | Wake up for onDuration in case DCI format 2_6 is not detected.  |
| SCell measurement cycle (measCycleSCell) | ms   | 160                        |   |
| Cell2 timing offset to cell1             | μs   | 3                          |   |
| Cell3,4,5 timing offset to cell1         | μs   | 3                          |   |
| Timing offset among cell3,4,5            | μs   | 0                          |   |
| T1                                       | s    | 0.2                        | During this time cell 3,4 switch to dormancy from non-dormancy.   |
| T2                                       | s    | 10                         | During this time cell 3,4 are dormant.  |
| T3                                       | S    | 0.1                        | During this time PDCCH is not transmitted from all cells.   |
| T4                                       | s    | 0.2                        | During this time cell 3,4 switch to non-dormancy from dormancy.   |



**Table A.5.5.6.4.2.1-3: Cell specific test parameters for EN-DC DCI 2\_6 based Domant BWP Switch on Multiple NR FR2 SCells**

| Parameter   | Unit                     | Cell 2                             | Cell 3,4                    | Cell 5                      |
|---|--------------------------|------------------------------------|-----------------------------|-----------------------------|
| Frequency range                                   |                          | FR1                                | FR2                         | FR2                         |
| Duplex mode                                       |                          | FDD                                | TDD                         | TDD                         |
| TDD configuration                                 | Config 1,4,7,10          | NA                                 | TDDConf.3.1                 | TDDConf.3.1                 |
|   | Config 2,5,8,11          | TDDConf.1.1                        | TDDConf.3.1                 | TDDConf.3.1                 |
|   | Config 3,6,9,12          | TDDConf.2.1                        | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>                             | Config 1,2,4,5,7,8,10,11 | MHz<br>10: N <sub>RB,c</sub> = 52  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
|   | Config 3,6,9,12          | MHz<br>40: N <sub>RB,c</sub> = 106 | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| SSB Configuration                                 | Config 1,2,4,5,7,8,10,11 | SSB.1 FR1                          | SSB.1 FR2                   | SSB.1 FR2                   |
|   | Config 3,6,9,12          | SSB.2 FR1                          | SSB.1 FR2                   | SSB.1 FR2                   |
| Downlink initial BWP Configuration                |                          | DLBWP.0.2                          | DLBWP.0.2                   | DLBWP.0.2                   |
| Active (non-dormant) DL BWP-1 Configuration       |                          | NA                                 | DLBWP.1.1                   | NA                          |
| Active (dormant) DL BWP-2 Configuration           |                          | NA                                 | DLBWP.1.1                   | NS                          |
| Uplink initial BWP Configuration                  |                          | ULBWP.0.2                          | ULBWP.0.2                   | ULBWP.0.2                   |
| Active Uplink BWP-1 Configuration                 |                          | NA                                 | ULBWP.1.1                   | NA                          |
| Active Uplink BWP-2 Configuration                 |                          | NA                                 | ULBWP.1.1                   | NA                          |
| SMTC Configuration                                |                          | SMTC.1                             | SMTC.1                      | SMTC.1                      |
| TRS configuration                                 | Config 1,4,7,10          | TRS.1.1 FDD                        | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
|   | Config 2,5,8,11          | TRS.1.1 TDD                        | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
|   | Config 3,6,9,12          | TRS.1.2 TDD                        | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| TCI state   |                          | TCI.State.0                        | TCI.State.0                 | TCI.State.0                 |
| PDSCH Reference measurement channel               | Config 1,4,7,10          | SR.1.1 FDD                         | SR.3.1 TDD                  | SR.3.1 TDD                  |
|   | Config 2,5,8,11          | SR.1.1 TDD                         | SR.3.1 TDD                  | SR.3.1 TDD                  |
|   | Config 3,6,9,12          | SR.2.1 TDD                         | SR.3.1 TDD                  | SR.3.1 TDD                  |
| RMSI CORESET Parameters                           | Config 1,4,7,10          | CR.1.1 FDD                         | CR.3.1 TDD                  | CR.3.1 TDD                  |
|   | Config 2,5,8,11          | CR.1.1 TDD                         | CR.3.1 TDD                  | CR.3.1 TDD                  |
|   | Config 3,6,9,12          | CR.2.1 TDD                         | CR.3.1 TDD                  | CR.3.1 TDD                  |
| Dedicated CORESET Parameters for scheduling PDCCH | Config 1,4               | CCR.1.1 FDD                        | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|   | Config 7,10              | CCR.1.5 FDD                        | CCR.3.1 TDD                 | CCR.3.1 TDD<br>CCR.3.1 TDD  |
|   | Config 2,5               | CCR.1.1 TDD                        | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|   | Config 8,11              | CCR.1.5 TDD                        | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|   | Config 3,6               | CCR.2.1 TDD                        | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
| Dedicated CORESET Parameters for DCI 2_6          | Config 9,12              | CCR.2.3 TDD                        | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|   | Config 1,4               | CCR.1.1 FDD                        | NA                          | NA                          |
|   | Config 7,10              | CCR.1.5 FDD                        | NA                          | NA                          |
|   | Config 2,5               | CCR.1.1 TDD                        | NA                          | NA                          |
|   | Config 8,11              | CCR.1.5 TDD                        | NA                          | NA                          |
| CSI-RS configuration                              | Config 3,6               | CCR.2.1 TDD                        | NA                          | NA                          |
|   | Config 9,12              | CCR.2.3 TDD                        | NA                          | NA                          |
| OCNG Patterns                                     |                          | NA                                 | CSI-RS.3.1 TDD              | NA                          |
|   |                          |                                    | OP.1                        |                             |

|   |  |    |                                     |      |   |
|---|--|----|-------------------------------------|------|---|
| EPRE ratio of PSS to SSS  |  | dB | 0                                   | 0    | 0 |
| EPRE ratio of PBCH_DMRS to SSS  |  |    |                                     |      |   |
| EPRE ratio of PBCH to PBCH_DMRS   |  |    |                                     |      |   |
| EPRE ratio of PDCCH_DMRS to SSS   |  |    |                                     |      |   |
| EPRE ratio of PDCCH to PDCCH_DMRS   |  |    |                                     |      |   |
| EPRE ratio of PDSCH_DMRS to SSS   |  |    |                                     |      |   |
| EPRE ratio of PDSCH to PDSCH_DMRS   |  |    |                                     |      |   |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |    |                                     |      |   |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |  |    |                                     |      |   |
| Propagation conditions  |  |    | N/A<br>Link only, see clause A.3.7A | AWGN |   |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |  |    |                                     |      |   |

**Table A.5.5.6.4.2.1-4: OTA related test parameters for EN-DC DCI 2\_6 based Domant BWP Switch on Multiple NR FR2 SCeLLs**

| Parameter <sup>Note 6</sup>   | Unit                           | Cell 2                              | Cell 3,4                           | Cell 5 |
|---|--------------------------------|-------------------------------------|------------------------------------|--------|
| Angle of arrival configuration  |                                | N/A<br>Link only, see clause A.3.7A | Setup 1 defined in clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 7</sup>   |                                |                                     | Fine                               | Fine   |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     |                                     | -111.7                             | -111.7 |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       |                                     | -102.7                             | -102.7 |
| $\hat{E}_s / N_{oc}$  | dB                             |                                     | 7                                  | 7      |
| SS-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       |                                     | -95.7                              | -95.7  |
| $\hat{E}_s / I_{ot}$  | dB                             |                                     | 7                                  | 7      |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> |                                     | -65.9                              | -65.9  |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: All parameters apply for configuration 1 and 2</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |                                |                                     |                                    |        |

**A.5.5.6.4.2.2 Test Requirements**

During T1, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of PSCell’s DL slot ( $i + T_{MultipleBWPswitchDelay} + X$ ) as defined in clause 8.6.2A.2.

During T2, the UE shall transmit at least 98.5% of ACK/NACK on NR PCell.

During T4, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of PSCell’s DL slot ( $j + T_{MultipleBWPswitchDelay} + X$ ) as defined in clause 8.6.2A.2.

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

During T1, the start of the interruption of PCell and SCell (Cell 5) during dormant BWP switch on SCells (Cell 3,4) shall not happen outside the dormant BWP switch delay.

During T1, the start of the interruption of PCell and SCells (Cell 3,4,5) during dormant BWP switch on SCells (Cell 3,4) shall not happen outside the dormant BWP switch delay.

### A.5.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

A.5.5.6.5.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs with non-DRX in synchronous EN-DC

A.5.5.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for simultaneous RRC-based BWP switch on multiple CCs defined in clause 8.6.3A. Supported test configurations are shown in Table A.5.5.6.5.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.5.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and NR SCell are specified in Table A.5.5.6.5.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), to Cell 2 (PSCell) on radio channel 2 (PSCC) and to Cell 3 (SCell) on radio channel 3.
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell) and Cell 3 (SCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in Cell 2 (PSCell) and Cell 3 (SCell).

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration in Cell 2 and Cell3, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition in Cell 2 and Cell 3.

The UE shall be able to completely receive PDSCH on Cell 2 and Cell 3 at the beginning of the DL slot right after PSCell's DL slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ) as defined in clause 8.6.3A and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ). The UE shall be continuously scheduled on Cell 2's BWP-1 and Cell 3's BWP-1 starting from the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ).

$T_{RRCprocessingDelay}$ ,  $T_{BWPswitchDelayRRC}$  and  $D_{RRC}$  are defined in clause 8.6.3A.

The test equipment verifies the DL BWP switch time in Cell 2 and Cell 3 by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.5.5.6.5.1.1-1: DL BWP switch supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.6.5.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2, 3   | Two NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1                   |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2                  |
| Active SCell  |      | Cell 3 | SCell on RF channel number 3                   |
| CP length   |      | Normal |  |
| DRX   |      | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell-individual offset for cells on RF channel number 3 | dB   | 0      | Individual offset for cells on SCC.            |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| Cell3 timing offset to cell2                            | μs   | 3      | Synchronous Cells                              |
| T1  | s    | [0.2]  |  |

**Table A.5.6.5.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter  |                               | Unit | Cell 2                   | Cell 3                   |
|--|-------------------------------|------|--------------------------|--------------------------|
| Frequency Range  |                               |      | FR2                      | FR2                      |
| Duplex mode  |                               |      | TDD                      | TDD                      |
| TDD configuration  |                               |      | TDDConf.3.1              | TDDConf.3.1              |
| $BW_{\text{channel}}$  |                               |      | 100 MHz: $N_{RB,c} = 66$ | 100 MHz: $N_{RB,c} = 66$ |
| Active BWP ID  |                               |      | 1                        | 1                        |
| Initial DL BWP Configuration   |                               |      | DLBWP.0.2                | DLBWP.0.2                |
| Initial UL BWP Configuration   |                               |      | ULBWP.0.2                | ULBWP.0.2                |
| Initial Condition  | Active DL BWP-1 Configuration |      | DLBWP.1.3                | DLBWP.1.3                |
|  | Active UL BWP-1 Configuration |      | ULBWP.1.3                | ULBWP.1.3                |
| Final Condition  | Active DL BWP-1 Configuration |      | DLBWP.1.1                | DLBWP.1.1                |
|  | Active UL BWP-1 Configuration |      | ULBWP.1.1                | ULBWP.1.1                |
| PDSCH Reference measurement channel  |                               |      | SR.3.1 TDD               | SR.3.1 TDD               |
| RMSI CORESET parameters  |                               |      | CR.3.1 TDD               | CR.3.1 TDD               |
| Dedicated CORESET parameters   |                               |      | CCR.3.1 TDD              | CCR.3.1 TDD              |
| OCNG Patterns  |                               |      | OP.1                     | OP.1                     |
| SSB Configuration  |                               |      | SSB.1 FR2                | SSB.1 FR2                |
| SMTc Configuration   |                               |      | SMTc.1                   | SMTc.1                   |
| TCI State  |                               |      | TCI.State.0              | TCI.State.0              |
| TRS Configuration  |                               |      | TRS.2.1 TDD              | TRS.2.1 TDD              |
| Antenna Configuration  |                               |      | 1x2                      | 1x2                      |
| Propagation Condition  |                               |      | AWGN                     | AWGN                     |
| EPRE ratio of PSS to SSS   |                               | dB   | 0                        | 0                        |
| EPRE ratio of PBCH DMRS to SSS   |                               |      |                          |                          |
| EPRE ratio of PBCH to PBCH DMRS  |                               |      |                          |                          |
| EPRE ratio of PDCCH DMRS to SSS  |                               |      |                          |                          |
| EPRE ratio of PDCCH to PDCCH DMRS  |                               |      |                          |                          |
| EPRE ratio of PDSCH DMRS to SSS  |                               |      |                          |                          |
| EPRE ratio of PDSCH to PDSCH   |                               |      |                          |                          |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                               |      |                          |                          |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                               |      |                          |                          |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |                               |      |                          |                          |

Table A.5.5.6.5.1.1-4: OTA related test parameters for BWP switching test case

| Parameter   | Unit                           | Cell 2                            | Cell 3                            |
|---|--------------------------------|-----------------------------------|-----------------------------------|
| Angle of arrival configuration  |                                | Setup 1 according to table A.3.15 | Setup 1 according to table A.3.15 |
| Assumption for UE beams <sup>Note 5</sup>   |                                | Fine                              | Fine                              |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz                      | -112                              | -112                              |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS                        | -103                              | -103                              |
| SS-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note3</sup>       | -85                               | -85                               |
| $\hat{E}_s/I_{ot}$  | dB                             | 18                                | 18                                |
| $I_0$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -56                               | -56                               |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_0</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                   |                                   |

#### A.5.5.6.5.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell and SCell in the beginning of the DL slot right after slot  $(i + \frac{T_{RRC\ processing\ Delay} + T_{BWP\ switch\ Delay} + T_{RRC} + D_{RRC}}{NR\ slot\ length})$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

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

### A.5.5.7 PSCell addition and release delay

#### A.5.5.7.1 Addition and Release Delay of NR PSCell

##### A.5.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in clause 7.31.2 of TS 36.133 [15] for the case when the PSCell is unknown by the UE at the time of addition.

Supported test configurations are shown in A.5.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.2-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.5.5.7.1.1-2, cell-specific parameters in A.5.5.7.1.1-3 and OTA parameters in A.5.5.7.1.1-4 below. The test consists of four successive time periods with duration of T1, T2, T3 and T4. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on

radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T1. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T2.

The test system shall observe the periodic reporting of CSI for PSCell during T3. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T3.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T3, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

**Table A.5.5.7.1.1-1: Supported test configurations for FR2 PSCell**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2  | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.5.5.7.1.1-2: General Test Parameters for PSCell Addition and Release**

| Parameter   | Unit            | Value               | Comment   |  |
|---|-----------------|---------------------|---|--|
| RF Channel Number                                       |                 | 1, 2                | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |  |
| Initial Condition                                       | Active PCell    | Cell1               | PCell on RF channel number 1.   |  |
|   | Neighbour cell  | Cell2               | Neighbour cell on RF channel number 2.  |  |
| Final Condition   | Active PCell    | Cell1               | PCell on RF channel number 1.   |  |
|   | Neighbour Cell  | Cell2               | PSCell released on RF channel number 2.   |  |
| B1  | Hysteresis      | dB                  | 0   | Hysteresis for evaluation of event B1.   |
|   | Threshold RSRP  | dBm                 | -118  | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin. |
|   | Time to Trigger | s                   | 0   |  |
| DRX   |                 | OFF                 | Continuous monitoring of primary cell   |  |
| PRACH configuration on cell2                            |                 | FR2 configuration 2 | Captured in A.3.8.3.2   |  |
| Cell-individual offset for cells on RF channel number 1 | dB              | 0                   | Individual offset for cells on primary component carrier.                             |  |
| Cell-individual offset for cells on RF channel number 2 | dB              | 0                   | Individual offset for cells on carrier frequency of cell2.                            |  |
| T1  | s               | 1                   | During this time the PCell shall be known and cell2 shall be unknown.                 |  |
| T2  | s               | 1                   | During this time the UE adds the PSCell.  |  |
| T3  | s               | 1                   | During this time the UE sends CSI reports for PSCell.                                 |  |
| T4  | s               | 1                   | During this time the UE releases the PSCell.  |  |



Table A.5.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release

| Parameter                                | Unit | Config | Test                   |    |    |    |
|--|------|--------|------------------------|----|----|----|
|  |      |        | T1                     | T2 | T3 | T4 |
| E-UTRA Channel Number                    |      | 1,2    | 1                      |    |    |    |
| NR Channel Number                        |      | 1,2    | 2                      |    |    |    |
| Duplex Mode                              |      | 1,2    | TDD                    |    |    |    |
| TDD configuration                        |      | 1,2    | TDDConf.3.1            |    |    |    |
| BW <sub>channel</sub>                    | MHz  | 1,2    | 100: NRB,c = 66        |    |    |    |
| Data RBs allocated                       |      | 1,2    | 48                     |    |    |    |
| Initial BWP Configuration                |      | 1,2    | DLBWP.0.1<br>ULBWP.0.1 |    |    |    |
| Dedicated BWP Configuration              |      | 1,2    | DLBWP.1.1<br>ULBWP.1.1 |    |    |    |
| TRS Configuration                        |      | 1      | TRS.2.1 TDD            |    |    |    |
| PDSCH/PDCCH TCI state                    |      | 1      | TCI.State.2            |    |    |    |
| PDSCH Reference measurement channel      |      | 1,2    | SR.3.3 TDD             |    |    |    |
| RMSI CORESET Reference Channel           |      | 1,2    | CR.3.2 TDD             |    |    |    |
| Dedicated CORESET Reference Channel      |      | 1,2    | CCR.3.7 TDD            |    |    |    |
| OCNG Patterns                            |      | 1,2    | OP.3                   |    |    |    |
| SSB configuration                        |      | 1,2    | SSB.2 FR2              |    |    |    |
| SMTC configuration                       |      | 1,2    | SMTC.2                 |    |    |    |
| PDSCH/PDCCH subcarrier spacing           | kHz  | 1,2    | 120                    |    |    |    |
| TRS Configuration                        |      | 1,2    | TRS.2.1 TDD            |    |    |    |
| CSI-RS configuration for CSI reporting   |      | 1,2    | CSI-RS.3.1 TDD         |    |    |    |
| reportConfigType                         |      | 1,2    | periodic               |    |    |    |
| reportQuantity                           |      | 1,2    | cri-RI-PMI-CQI         |    |    |    |
| CSI reporting periodicity                | slot | 1,2    | 40                     |    |    |    |
| CSI reporting offset                     | slot | 1,2    | 4                      |    |    |    |
| EPRE ratio of PSS to SSS                 | dB   | 1,2    | 0                      |    |    |    |
| EPRE ratio of PBCH DMRS to SSS           |      |        |                        |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |      |        |                        |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |      |        |                        |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |      |        |                        |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |      |        |                        |    |    |    |
| EPRE ratio of PDSCH to PDSCH             |      |        |                        |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |      |        |                        |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |      |        |                        |    |    |    |
| Propagation condition                    |      |        |                        |    |    |    |

Table A.5.5.7.1.1-4: OTA related test parameters

| Parameter  | Unit  | Cell 2                                  |    |        |    |
|--|---|---|----|--------|----|
|  |   | T1                                      | T2 | T3     | T4 |
| Angle of arrival configuration                   |   | Setup 2a according to clause A.3.15.2.1 |    |        |    |
| Assumption for UE beams <sup>Note 6</sup>        |   | Rough                                   |    |        |    |
| $\hat{E}_s$ <sup>Note 2</sup>                    | dBm/SCS   | $-\infty$                               |    | -81    |    |
| SSB_RP <sup>Note 2, Note 4</sup>                 | dBm/SCS   | $-\infty$                               |    | -81    |    |
| $\hat{E}_s/I_{ot\ BB}$ <sup>Note 2, Note 7</sup> | dB  | $-\infty$                               |    | 4.88   |    |
| $I_o$ <sup>Note 2, Note 4</sup>                  | dBm/95.04 MHz   | N/A                                     |    | -56.41 |    |
| Note 1:  | Void  |   |    |        |    |
| Note 2:  | Es/lot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |   |    |        |    |
| Note 3:  | Void  |   |    |        |    |
| Note 4:  | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  |   |    |        |    |
| Note 5:  | Void  |   |    |        |    |
| Note 6:  | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |   |    |        |    |
| Note 7:  | Calculation of Es/Iot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_s$ from TS 38.101-2 [19] Table 6.2.1.3-4. |   |    |        |    |

### A.5.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 582 ms<sup>Note 1</sup> into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T3.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T3

The UE shall stop sending CSI reports for PSCell in at latest 20 ms into T4.

All the above test requirements shall be fulfilled for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 of TS 36.133 [15]:

$$T_{\text{config\_PSCell}} = T_{\text{RRC\_delay}} + T_{\text{processing}} + T_{\text{search}} + T_{\Delta} + T_{\text{PSCell\_DU}} + 2\text{ms}$$

Where:

$$T_{\text{RRC\_delay}} = 20\text{ms}$$

$$T_{\text{processing}} = 40\text{ms}$$

$$T_{\text{search}} = 8 \cdot 3 \cdot 20 = 480 \text{ ms}$$

$$T_{\Delta} = 20\text{ms}$$

$$T_{\text{PSCell\_DU}} = 1 \cdot 10 + 10 = 20 \text{ ms}$$

## A.5.5.8 Active TCI state switch delay

### A.5.5.8.1 MAC-CE based active TCI state switch

#### A.5.5.8.1.1 E-UTRAN – NR PSCell FR2 active TCI state switch for a known TCI state

##### A.5.5.8.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3. Supported test configurations are shown in Table A.5.5.8.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.8.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.8.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.8.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different TCI states for PSCell, PDCCH TCI state 0 (QCL'd to SSB0) and TCI state 1 (QCL'd to SSB1), in Cell 2 before starting the test.
- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. Figure A.5.5.8.1.1.1-1 and Figure A.5.5.8.1.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1. *tc-IndicationInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PSCell on TCI state 0 till  $n + T_{\text{HARQ}} + 3$  ms. The test equipment also verifies the TCI state switch time in PSCell by scheduling the UE on TCI state 1 after  $n + T_{\text{HARQ}} + 3$  ms +  $(T_{\text{first-SSB}} + T_{\text{SSB-proc}})$ .

**Table A.5.5.8.1.1.1-1: Supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.5.8.1.1-2: General test parameters for TCI state switch**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2      | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    | For both PCell and PSCell                      |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| T1  | s    | 0.2    |  |
| T2  | s    | 0.2    |  |

**Table A.5.5.8.1.1-3: NR Cell specific test parameters for TCI state switch**

| Parameter  | Unit | Cell 2                          |
|--|------|---------------------------------|
| Frequency Range  |      | FR2                             |
| Duplex mode  |      | TDD                             |
| TDD configuration  |      | TDDConf.3.1                     |
| BW <sub>channel</sub>  |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Initial DL BWP Configuration   |      | DLBWP.0.2                       |
| Dedicated DL BWP Configuration   |      | DLBWP.1.1                       |
| Initial UL BWP Configuration   |      | ULBWP.0.2                       |
| Dedicated UL BWP Configuration   |      | ULBWP.1.1                       |
| PDSCH Reference measurement channel  |      | SR.3.2 TDD                      |
| RMSI CORESET parameters  |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters   |      | CCR.3.1 TDD                     |
| OCNG Patterns  |      | OP.5                            |
| SSB Configuration  |      | SSB.1 FR2                       |
| SMTC Configuration   |      | SMTC.1                          |
| TCI State 0  |      | TCI.State.0                     |
| TCI State 1  |      | TCI.State.1                     |
| TRS Configuration  |      | TRS.2.1 TDD                     |
| Correlation Matrix and Antenna Configuration   |      | 1x2 Low                         |
| EPRE ratio of PSS to SSS   | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS   |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS  |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS  |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS  |      |                                 |
| EPRE ratio of PDSCH to PDSCH   |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |      |                                 |
| Propagation Condition  |      | AWGN                            |
| Note 1: OCNG shall be used such that and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                 |

Table A.5.5.8.1.1-4: OTA related test parameters for TCI state switch

| Parameter   | Unit                            | Cell 2                               |       |           |       |
|---|---------------------------------|--------------------------------------|-------|-----------|-------|
|   |                                 | SSB0                                 |       | SSB1      |       |
|   |                                 | T1                                   | T2    | T1        | T2    |
| Angle of arrival configuration  |                                 | Setup 3 according to clause A.3.15.3 |       |           |       |
| Assumption for UE beams <sup>Note 6</sup>   |                                 | AoA1                                 |       | AoA2      |       |
|   |                                 | Rough                                |       | Rough     |       |
| $\hat{E}_s$   | dBm/SCS                         | -80.6                                | -80.6 | -Infinity | -80.6 |
| SS B <sub>RP</sub> <sup>Note 2</sup>  | dBm/SCS                         | -80.6                                | -80.6 | -Infinity | -80.6 |
| $\hat{E}_i / I_{otBB}$ <sup>Note 7</sup>  | dB                              | 8.3                                  | 8.3   | -Infinity | 8.3   |
| $I_o$ <sup>Note 2</sup>   | dBm/95.04 MHz <sup>Note 4</sup> | -56.0                                | -56.0 | -Infinity | -56.0 |
| <p>Note 1: Void</p> <p>Note 2: SS B<sub>RP</sub> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 7: Calculation of <math>E_s/I_{otBB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                                 |                                      |       |           |       |

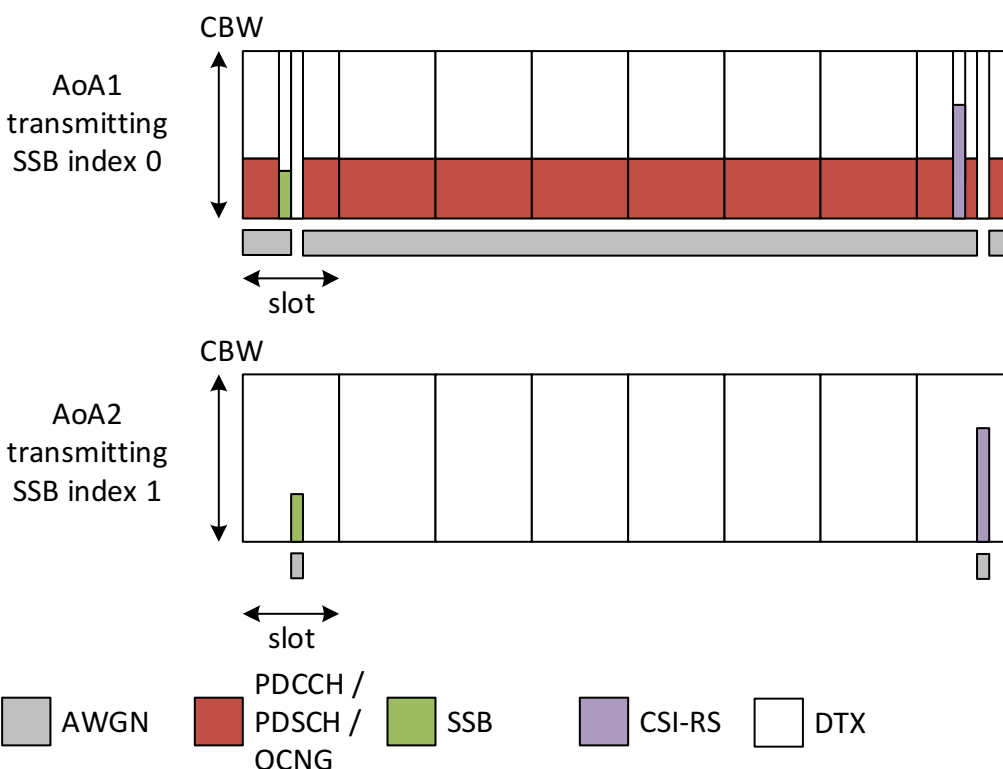
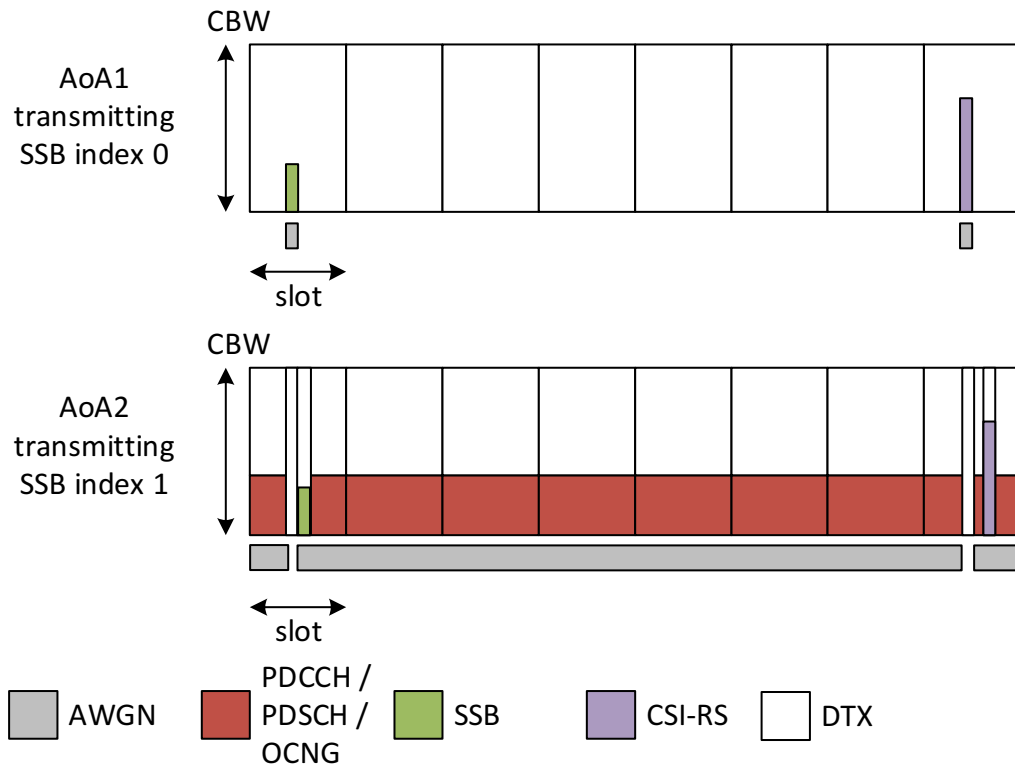


Figure A.5.5.8.1.1-1: Time multiplexed downlink transmissions during T1



**Figure A.5.5.8.1.1.1-2: Time multiplexed downlink transmissions during T2**

**A.5.5.8.1.1.2 Test Requirements**

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till  $n + T_{HARQ} + 3 \text{ ms}$
- be able to start receiving on TCI state 1 after  $n + T_{HARQ} + 5 \text{ ms} + T_{\text{first-SSB}}$

**A.5.5.8.2 RRC based active TCI state switch**

**A.5.5.8.2.1 E-UTRAN – NR PSCell FR2 active TCI state switch for a known TCI state**

**A.5.5.8.2.1.1 Test Purpose and Environment**

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3 Supported test configurations are shown in Table A.5.5.8.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.8.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.8.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.8.2.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 1 TCI state for PSCell, PDCCH-TCI-state0 (QCL'd to SSB0)
- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. Figure A.5.5.8.2.1.1-1 and Figure A.5.5.8.2.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI-state1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PSCell by scheduling the UE on TCI state 1 after  $n + T_{\text{RRC\_processing}} + T_{\text{first-SSB}} + 2\text{ms}$ .

**Table A.5.5.8.2.1.1-1: Supported test configurations**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.5.8.2.1.1-2: General test parameters for TCI state switch**

| Parameter   | Unit          | Value  | Comment  |
|---|---------------|--------|--|
| E-UTRA RF Channel Number                                |               | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |               | 2      | One NR radio channel is used for this test     |
| Active PCell  |               | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |               | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |               | Normal |  |
| DRX   |               | OFF    | For both PCell and PSCell                      |
| Cell-individual offset for cells on RF channel number 1 | dB            | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB            | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | $\mu\text{s}$ | 3      | Synchronous EN-DC                              |
| T1  | s             | 0.2    |  |
| T2  | s             | 0.2    |  |

**Table A.5.5.8.2.1.1-3: NR Cell specific test parameters for TCI state switch**

| Parameter  | Unit | Cell 2                   |
|--|------|--------------------------|
| Frequency Range  |      | FR2                      |
| Duplex mode  |      | TDD                      |
| TDD configuration  |      | TDDConf.3.1              |
| $BW_{channel}$   |      | 100 MHz: $N_{RB,c} = 66$ |
| Initial DL BWP Configuration   |      | DLBWP.0.2                |
| Dedicated DL BWP Configuration   |      | DLBWP.1.1                |
| Initial UL BWP Configuration   |      | ULBWP.0.2                |
| Dedicated UL BWP Configuration   |      | ULBWP.1.1                |
| PDSCH Reference measurement channel  |      | SR.3.2 TDD               |
| RMSI CORESET parameters  |      | CR.3.1 TDD               |
| Dedicated CORESET parameters   |      | CCR.3.1 TDD              |
| OCNG Patterns  |      | OP.5                     |
| SSB Configuration  |      | SSB.1 FR2                |
| SMTC Configuration   |      | SMTC.1                   |
| TCI State 0  |      | TC.State.0               |
| TCI State 1  |      | TCI.State.1              |
| TRS Configuration  |      | TRS.2.1 TDD              |
| reportConfigType   |      | ssb-Index-RSRP           |
| reportConfigType   |      | periodic                 |
| Number of reported RS  |      | 2                        |
| L1-RSRP reporting period   | slot | 640                      |
| timeRestrictionForChannelMeasurements  |      | configured               |
| Correlation Matrix and Antenna Configuration   |      | 1x2 Low                  |
| EPRE ratio of PSS to SSS   | dB   | 0                        |
| EPRE ratio of PBCH DMRS to SSS   |      |                          |
| EPRE ratio of PBCH to PBCH DMRS  |      |                          |
| EPRE ratio of PDCCH DMRS to SSS  |      |                          |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |                          |
| EPRE ratio of PDSCH DMRS to SSS  |      |                          |
| EPRE ratio of PDSCH to PDSCH   |      |                          |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |      |                          |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |      |                          |
| Propagation Condition  |      |                          |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                          |



Table A.5.5.8.2.1.1-4: OTA related test parameters for TCI state switch

| Parameter   | Unit                            | Cell 2                               |       |           |       |
|---|---------------------------------|--------------------------------------|-------|-----------|-------|
|   |                                 | SSB0                                 |       | SSB1      |       |
|   |                                 | T1                                   | T2    | T1        | T2    |
| Angle of arrival configuration  |                                 | Setup 3 according to clause A.3.15.3 |       |           |       |
| Assumption for UE beams <sup>Note 6</sup>   |                                 | AoA1                                 |       | AoA2      |       |
|   |                                 | Rough                                |       | Rough     |       |
| $\hat{E}_s$   | dBm/SCS                         | -80.6                                | -80.6 | -Infinity | -80.6 |
| SSB_RP <sup>Note 2</sup>  | dBm/SCS                         | -80.6                                | -80.6 | -Infinity | -80.6 |
| $\hat{E}_i/I_{otBB}$ <sup>Note 7</sup>  | dB                              | 8.3                                  | 8.3   | -Infinity | 8.3   |
| $I_o$ <sup>Note 2</sup>   | dBm/95.04 MHz <sup>Note 4</sup> | -56.0                                | -56.0 | -Infinity | -56.0 |
| Note 1: Void<br>Note 2: SS_B_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.<br>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>Note 7: Calculation of $E_s/I_{otBB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                                 |                                      |       |           |       |

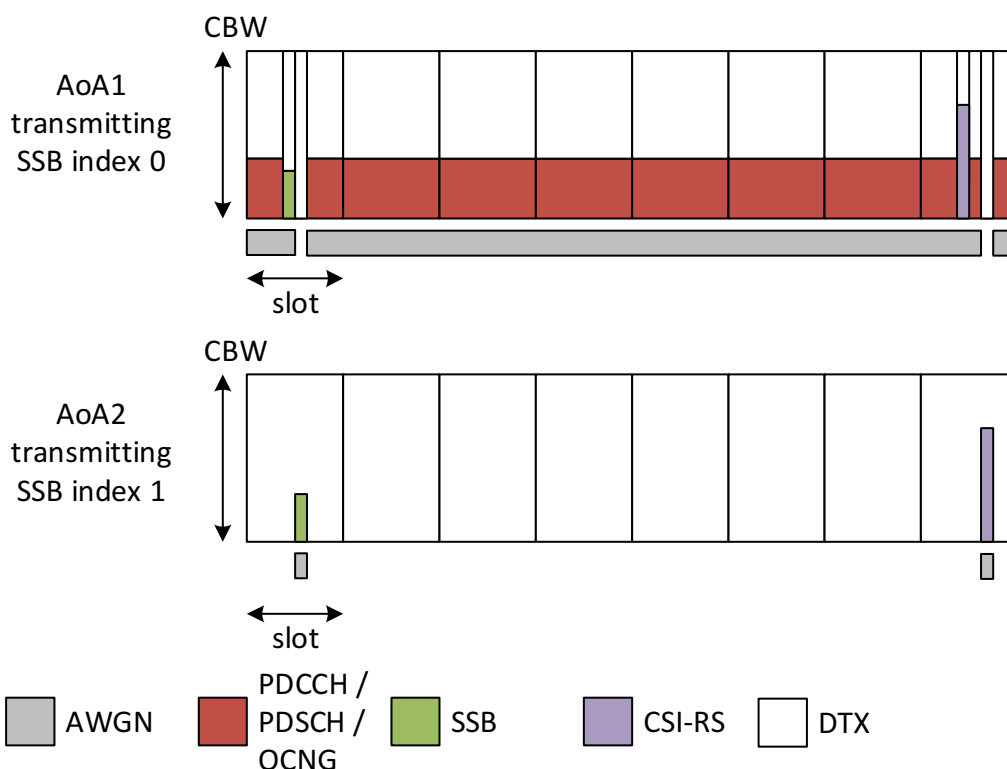
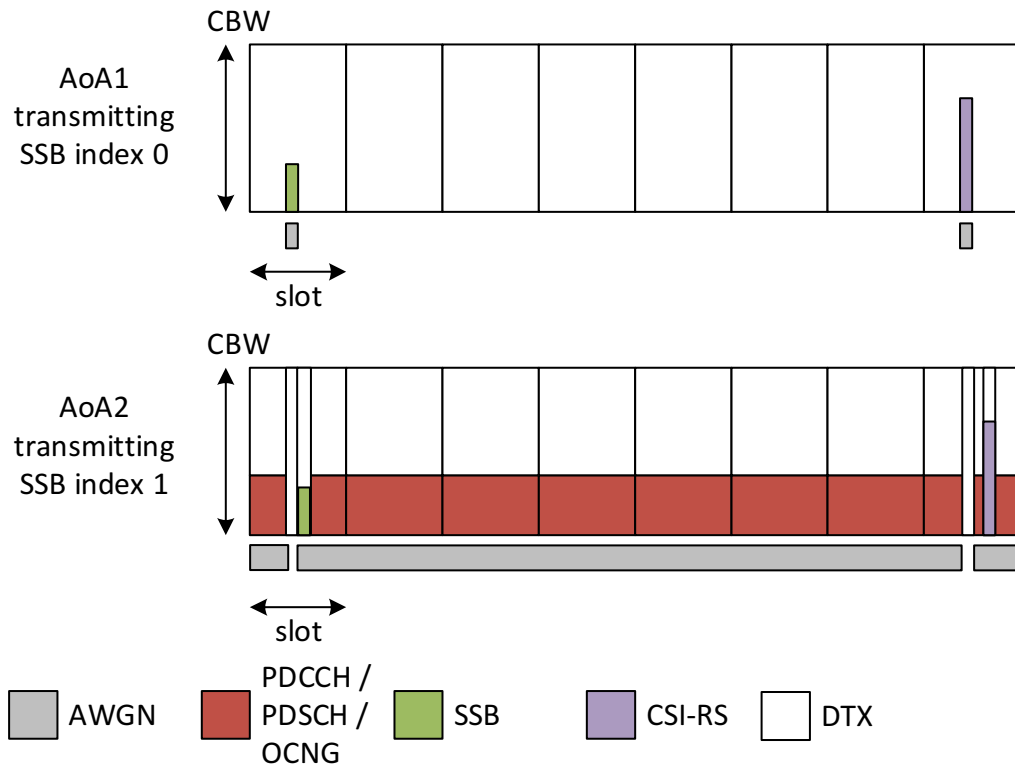


Figure A.5.5.8.2.1.1-1: Time multiplexed downlink transmissions during T1



**Figure A.5.5.8.2.1.1-2: Time multiplexed downlink transmissions during T2**

**A.5.5.8.2.1.2 Test Requirements**

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to start receiving on TCI state 1 after  $n + T_{RRC\_processing} + T_{first-SSB} + 2ms$ .

**A.5.5.9 Uplink spatial relation switch delay**

**A.5.5.9.1 MAC-CE based uplink spatial relation switch**

**A.5.5.9.1.1 E-UTRAN – NR PSCell FR2 uplink spatial relation switch for a known spatial relation**

**A.5.5.9.1.1.1 Test Purpose and Environment**

The purpose of this test is to verify the uplink spatial relation switch delay requirement defined in clause 8.12.3 by a UE capable of beam correspondence without the need for UL beam sweeping. Supported test configurations are shown in Table A.5.5.9.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.9.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.9.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.9.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have continuous ACK/NACK sending by PUCCH.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different spatial relations for PSCell, PUCCH spatial relation 0 (QCL'd to SSB0) and spatial relation 1 (QCL'd to SSB1), in Cell 2 before starting the test.
- UE is indicated in spatial relation 0 as the active PUCCH spatial relation

The test consists of two time periods, T1 and T2. During T1 only SSB to which PUCCH spatial relation 0 QCLed is transmitted. At the beginning of T2, the SSB corresponding to spatial relation 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured. In slot  $n$  which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to transmit PUCCH with spatial relation 1.

The test equipment verifies that UE can be scheduled on PSCell on spatial relation 0 till  $n + T_{\text{HARQ}}/\text{NR slot length} + 3N_{\text{slot}}^{\text{subframe},\mu}$ . The test equipment also verifies the spatial relation switch time in PSCell by scheduling the UE on spatial relation 1 from slot  $n + T_{\text{HARQ}}/\text{NR slot length} + 3N_{\text{slot}}^{\text{subframe},\mu} + 1$  and onwards.

**Table A.5.5.9.1.1-1: Supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.9.1.1-2: General test parameters for spatial relation switch**

| Parameter   | Unit          | Value      | Comment   |
|---|---------------|------------|---|
| E-UTRA RF Channel Number                                |               | 1          | One E-UTRA radio channel is used for this test      |
| NR RF Channel Number                                    |               | 2          | One NR radio channel is used for this test          |
| Active PCell  |               | Cell 1     | PCell on RF channel number 1.                       |
| Active PSCell   |               | Cell 2     | PSCell on RF channel number 2.                      |
| CP length   |               | Normal     |   |
| DRX   |               | OFF        | For both PCell and PSCell                           |
| Cell-individual offset for cells on RF channel number 1 | dB            | 0          | Individual offset for cells on PCC.                 |
| Cell-individual offset for cells on RF channel number 2 | dB            | 0          | Individual offset for cells on PSCC.                |
| Cell2 timing offset to cell1                            | $\mu\text{s}$ | 3          | Synchronous EN-DC                                   |
| L1-RSRP reporting period                                | slot          | 160        | Periodic L1-RSRP reporting configured               |
| L1-RSRP measured RS                                     |               | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1.              |
| Number of reported RS                                   |               | 2          | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1  | s             | 0.2        |   |
| T2  | s             | 2          |   |

**Table A.5.5.9.1.1-3: NR Cell specific test parameters for spatial relation switch**

| Parameter   | Unit | Cell 2                          |
|---|------|---------------------------------|
| Frequency Range   |      | FR2                             |
| Duplex mode   |      | TDD                             |
| TDD configuration   |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Initial DL BWP Configuration  |      | DLBWP.0.2                       |
| Dedicated DL BWP Configuration  |      | DLBWP.1.1                       |
| Initial UL BWP Configuration  |      | ULBWP.0.2                       |
| Dedicated UL BWP Configuration  |      | ULBWP.1.1                       |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |      | CCR.3.1 TDD                     |
| OCNG Patterns   |      | OP.1                            |
| SSB Configuration   |      | SSB.1 FR2                       |
| SMTC Configuration  |      | SMTC.1                          |
| Spatial Relation 0  |      | PUCCH.<br>SRI.0                 |
| Spatial Relation 1  |      | PUCCH.<br>SRI.1                 |
| TRS Configuration   |      | TRS.2.1 TDD                     |
| reportConfigType  |      | ssb-Index-RSRP                  |
| reportConfigType  |      | periodic                        |
| timeRestrictionForChannelMeasurements   |      | configured                      |
| Correlation Matrix and Antenna Configuration  |      | 1x2 Low                         |
| EPRE ratio of PSS to SSS  | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |      |                                 |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                                 |
| Propagation Condition   |      | AWGN                            |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                 |

Table A.5.5.9.1.1-4: OTA related test parameters for uplink spatial relation switch

| Parameter                                 | Unit   | Cell 2                               |       |           |       |
|---|--|--------------------------------------|-------|-----------|-------|
|   |  | SSB0                                 |       | SSB1      |       |
|   |  | T1                                   | T2    | T1        | T2    |
| Angle of arrival configuration            |  | Setup 3 according to clause A.3.15.3 |       |           |       |
|   |  | AoA1                                 |       | AoA2      |       |
| Assumption for UE beams <sup>Note 6</sup> |  | Rough                                |       |           |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/15 kHz   | -92.1                                |       |           |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/SCS  | -83.1                                |       |           |       |
| $\bar{E}_s/N_{oc}$                        | dB   | 1                                    | 1     | -Infinity | 1     |
| SS-RSRP <sup>Note 2</sup>                 | dBm/120 kHz <sup>Note 3</sup>  | -82.1                                | -82.1 | -Infinity | -82.1 |
| $I_o$ <sup>Note 2, Note 6</sup>           | dBm/95.04 MHz <sup>Note 4</sup>  | -50.6                                | -50.6 | -54.1     | -50.6 |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                      |       |           |       |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |       |           |       |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                      |       |           |       |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                      |       |           |       |
| Note 5:                                   | As observed with 0dBi gain antenna at the center of the quiet zone.  |                                      |       |           |       |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |                                      |       |           |       |

#### A.5.5.9.1.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with results for SSB1.

After receiving MAC-CE command in slot  $n$ , UE shall:

- be able to continue to transmit PUCCH on spatial relation 0 till  $n + T_{HARQ}/NR$  slot length +  $3N_{slot}^{subframe,\mu}$ ;
- be able to start transmitting PUCCH on spatial relation 1 from slot  $n + T_{HARQ}/NR$  slot length +  $3N_{slot}^{subframe,\mu} + 1$ .

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

#### A.5.5.9.2 RRC based spatial relation switch

##### A.5.5.9.2.1 E-UTRAN – NR PSCell FR2 spatial relation switch associated with a known DL-RS

###### A.5.5.9.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the RRC based spatial relation switch delay requirement defined in clause 8.12.5 by a UE capable of beam correspondence without the need for UL beam sweeping. Supported test configurations are shown in Table A.5.5.9.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.9.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.9.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.9.2.1.1-4.

Periodic SRS is transmitted on NR PSCell (Cell2), and the SRS configuration is SRSConf.1 given in Table A.5.4.1.1.1-3.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 1 SRS-SpatialRelation0 associated with SSB0.
- UE is indicated SRS-SpatialRelation0 as the active SRS spatial relation.

The test consists of two time periods, T1 and T2. During T1 only SSB0 to which SRS-SpatialRelation0 associated is transmitted. UE shall transmit periodic SRS with SRS-SpatialRelation0 of PSCell. At the beginning of T2, the SSB1 corresponding to SRS-SpatialRelation1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to transmit periodic SRS with target SRS-SpatialRelation1. The test equipment verifies that UE shall be able to transmit periodic SRS with target spatial relation (SRS-SpatialRelation1) on PSCell in the slot  $n + T_{\text{RRC\_processing}}/\text{NR slot length} + 1$ .

**Table A.5.5.9.2.1.1-1: Supported test configurations**

| Config  | Description   |
|---|---|
| 1   | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.5.5.9.2.1.1-2: General test parameters for spatial relation switch associated with a known DL-RS**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2      | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    | For both PCell and PSCell                      |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| T1  | s    | 0.2    |  |
| T2  | s    | 2      |  |

**Table A.5.5.9.2.1.1-3: NR Cell specific test parameters for spatial relation switch associated with a known DL-RS**

| Parameter   | Unit | Cell 2                          |
|---|------|---------------------------------|
| Frequency Range   |      | FR2                             |
| Duplex mode   |      | TDD                             |
| TDD configuration   |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Initial DL BWP Configuration  |      | DLBWP.0.2                       |
| Dedicated DL BWP Configuration  |      | DLBWP.1.1                       |
| Initial UL BWP Configuration  |      | ULBWP.0.2                       |
| Dedicated UL BWP Configuration  |      | ULBWP.1.1                       |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |      | CCR.3.1 TDD                     |
| OCNG Patterns   |      | OP.1                            |
| SSB Configuration   |      | SSB.1 FR2                       |
| SMTC Configuration  |      | SMTC.1                          |
| SRS-SpatialRelation0  |      | SRS.SRI0                        |
| SRS-SpatialRelation1  |      | SRS.SRI1                        |
| TRS Configuration   |      | TRS.2.1 TDD                     |
| reportConfigType  |      | ssb-Index-RSRP                  |
| reportConfigType  |      | periodic                        |
| Number of reported RS   |      | 2                               |
| L1-RSRP reporting period  | slot | 160                             |
| timeRestrictionForChannelMeasurements   |      | configured                      |
| Correlation Matrix and Antenna Configuration  |      | 1x2 Low                         |
| EPRE ratio of PSS to SSS  | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |      |                                 |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                                 |
| Propagation Condition   |      | AWGN                            |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                 |

**Table A.5.5.9.2.1.1-4: OTA related test parameters for spatial relation switch associated with a known DL-RS**

| Parameter                                 | Unit   | Cell 2                               |       |           |       |
|---|--|--------------------------------------|-------|-----------|-------|
|   |  | SSB0                                 |       | SSB1      |       |
|   |  | T1                                   | T2    | T1        | T2    |
| Angle of arrival configuration            |  | Setup 3 according to clause A.3.15.3 |       |           |       |
|   |  | AoA1                                 |       | AoA2      |       |
| Assumption for UE beams <sup>Note 6</sup> |  | Rough                                |       | Rough     |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/15 kHz   | -92.1                                |       |           |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/SCS  | -83.1                                |       |           |       |
| $\bar{E}_s/N_{oc}$                        | dB   | 1                                    | 1     | -Infinity | 1     |
| SS-RSRP <sup>Note 2</sup>                 | dBm/120 kHz <sup>Note 3</sup>  | -82.1                                | -82.1 | -Infinity | -82.1 |
| $I_o$ <sup>Note 2, Note 6</sup>           | dBm/95.04 MHz <sup>Note 4</sup>  | -50.6                                | -50.6 | -54.1     | -50.6 |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                      |       |           |       |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |       |           |       |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                      |       |           |       |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                      |       |           |       |
| Note 5:                                   | As observed with 0dBi gain antenna at the center of the quiet zone.  |                                      |       |           |       |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                      |       |           |       |

#### A.5.5.9.2.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with SSB1 to which SRS-SpatialRelation1 is associated.

After receiving RRC command in slot  $n$ , UE shall be able to transmit target periodic SRS with SRS-SpatialRelation1 on PSCell in the slot  $n + T_{RRC\_processing}/NR\ slot\ length + 1$ .

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

### A.5.5.10 UE specific CBW change

#### A.5.5.10.1 UE specific CBW change on FR2 NR PSCell

##### A.5.5.10.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13. Supported test configurations are shown in Table A.5.5.10.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.5.5.10.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.5.5.10.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PSCell.
- UE is indicated in *SCS-SpecificCarrier* that the active CBW is CBW-1 of initial condition in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.



During T1,

Time period T1 starts when a *RRCReconfiguration* which reconfigure the UE specific CBW parameter, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its UE specific CBW with the updated UE specific CBW of final condition.

The UE shall be able to completely receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ ) as defined in clause 8.13 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ ).

$T_{RRCprocessingDelay}$  and  $T_{CBWchangeDelayRRC}$  are defined in clause 8.13.

The test equipment verifies the UE specific CBW change switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated UE specific CBW configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.5.5.10.1.1-1: UE specific CBW change supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.5.5.10.1.1-2: General test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter   | Unit | Value  | Comment  |
|---|------|--------|--|
| E-UTRA RF Channel Number                                |      | 1      | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2      | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2 | PSCell on RF channel number 2.                 |
| CP length   |      | Normal |  |
| DRX   |      | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3      | Synchronous EN-DC                              |
| T1  | s    | [0.2]  |  |

**Table A.5.5.10.1.1-3: NR Cell specific test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter   |                               | Unit | Cell 2                          |
|---|-------------------------------|------|---------------------------------|
| Frequency Range   |                               |      | FR2                             |
| Duplex mode   |                               |      | TDD                             |
| TDD configuration   |                               |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |                               |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Active BWP ID   |                               |      | 1                               |
| Initial DL BWP Configuration  |                               |      | DLBWP.0.2                       |
| Initial UL BWP Configuration  |                               |      | ULBWP.0.2                       |
| Active DL BWP Configuration   |                               |      | DLBWP.1.3                       |
| Active UL BWP Configuration   |                               |      | DLBWP.1.3                       |
| Initial Condition   | Active DL CBW-1 Configuration |      | DLCBW.1.1                       |
|   | Active UL CBW-1 Configuration |      | ULCBW.1.1                       |
| Final Condition   | Active DL CBW-1 Configuration |      | DLCBW.1.2                       |
|   | Active UL CBW-1 Configuration |      | ULCBW.1.2                       |
| PDSCH Reference measurement channel   |                               |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |                               |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |                               |      | CCR.3.1 TDD                     |
| OCNG Patterns   |                               |      | OP.1                            |
| SSB Configuration   |                               |      | SSB.1 FR2                       |
| SMTC Configuration  |                               |      | SMTC.1                          |
| TCI State   |                               |      | TCI.State.0                     |
| TRS Configuration   |                               |      | TRS.2.1 TDD                     |
| Antenna Configuration   |                               |      | 1x2                             |
| Propagation Condition   |                               |      | AWGN                            |
| EPRE ratio of PSS to SSS  |                               | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |                               |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |                               |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |                               |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |                               |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                               |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                               |      |                                 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                               |      |                                 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                               |      |                                 |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |      |                                 |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].           |                               |      |                                 |

Table A.5.5.10.1.1-4: OTA related test parameters for UE specific CBW change test case

| Parameter   |              | Unit                           | Cell 2                            |
|---|--------------|--------------------------------|-----------------------------------|
| Angle of arrival configuration  |              |                                | Setup 1 according to table A.3.15 |
| Assumption for UE beams <sup>Note 5</sup>   |              |                                | Fine                              |
| $N_{oc}$ <sup>Note1</sup>   | NR_TDD_FR2_A | dBm/15kHz                      | -112                              |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| $N_{oc}$ <sup>Note1</sup>   | NR_TDD_FR2_A | dBm/SCS                        | -103                              |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| SS-RSRP <sup>Note2</sup>  | NR_TDD_FR2_A | dBm/SCS <sup>Note3</sup>       | -85                               |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| $\hat{E}_s/I_{ot}$  |              | dB                             | 18                                |
| $I_o$ <sup>Note2</sup>  | NR_TDD_FR2_A | dBm/95.04 MHz <sup>Note4</sup> | -56                               |
|   | NR_TDD_FR2_B |                                |                                   |
|   | NR_TDD_FR2_F |                                |                                   |
|   | NR_TDD_FR2_G |                                |                                   |
|   | NR_TDD_FR2_T |                                |                                   |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |              |                                |                                   |

### A.5.5.10.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot  $(i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length})$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell UE specific CBW change switch delay to be counted as correct.

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

## A.5.6 Measurement procedure

### A.5.6.1 Intra-frequency Measurements

#### A.5.6.1.1 EN-DC event triggered reporting test without gap under non-DRX

##### A.5.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.1.1-1.

**Table A.5.6.1.1.1-1: supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 2             | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 3             | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 4             | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.1.1-2, A.5.6.1.1.1-3 and A.5.6.1.1.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

**Table A.5.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PCell in FR2 without gap without DRX**

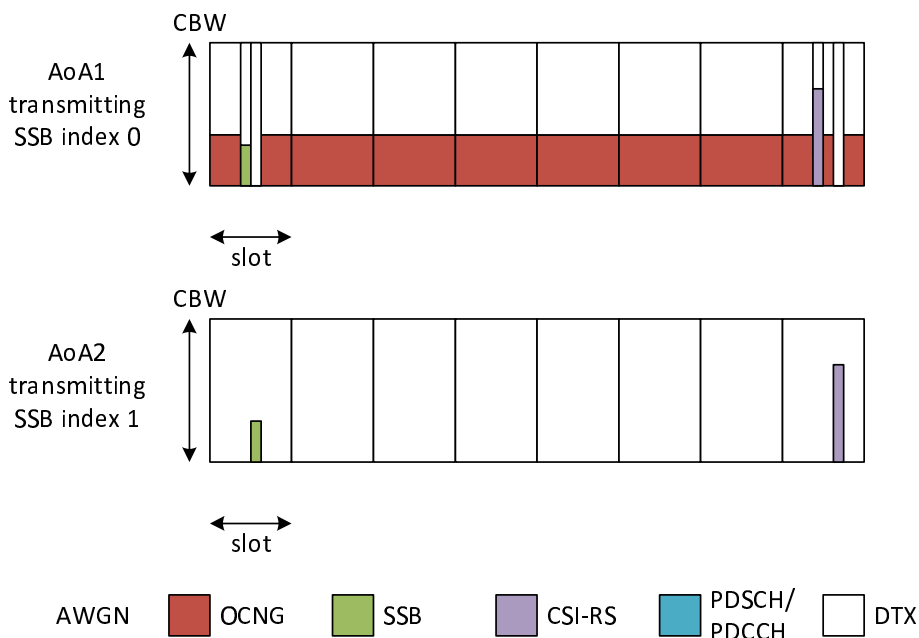
| Parameter                             | Unit | Config | Value                                    | Comment   |
|---------------------------------------|------|--------|--|---|
| Active cell                           |      | 1~4    | E-UTRAN PCell (Cell 1)<br>PCell (Cell 2) |   |
| Neighbour cell                        |      | 1~4    | Cell 3                                   | Cell to be identified.  |
| RF Channel Number                     |      | 1~4    | 1: Cell 1<br>2: Cell 2 and<br>Cell 3     | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTc configuration                    |      | 1~4    | SMTc.1                                   |   |
| A3-Offset                             | dB   | 1~4    | -11                                      |   |
| CP length                             |      | 1~4    | Normal                                   |   |
| Hysteresis                            | dB   | 1~4    | 0  |   |
| Time To Trigger                       | s    | 1~4    | 0  |   |
| Filter coefficient                    |      | 1~4    | 0  | L3 filtering is not used  |
| DRX                                   |      | 1~4    | OFF                                      |   |
| Time offset between Cell 1 and Cell 2 |      | 1~4    | 3 $\mu$ s                                | Synchronous EN-DC   |
| Time offset between Cell 2 and Cell 3 |      | 1~4    | 3 $\mu$ s                                | Synchronous cells   |
| T1                                    | s    | 1~4    | 5  |   |
| T2                                    | s    | 1~4    | 5  |   |

**Table A.5.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX**

| Parameter                           | Unit | Config | Cell 2                      |                        | Cell 3                      |    |
|-------------------------------------|------|--------|-----------------------------|------------------------|-----------------------------|----|
|                                     |      |        | T1                          | T2                     | T1                          | T2 |
| TDD configuration                   |      | 1~4    | TDDConf.3.1                 |                        | TDDConf.3.1                 |    |
| BW <sub>channel</sub>               | MHz  | 1~4    | 100: N <sub>RB,c</sub> = 66 |                        | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                  |      | 1,2    | 24                          |                        | 24                          |    |
|                                     |      | 3,4    | 48                          |                        | 48                          |    |
| Initial BWP configuration           |      | 1~4    | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1 |                             |    |
| Active DL BWP configuration         |      | 1~4    | DLBWP.1.1                   | DLBWP.1.1              |                             |    |
| Active UL BWP configuration         |      | 1~4    | ULBWP.1.1                   | ULBWP.1.1              |                             |    |
| RLM-RS                              |      | 1~4    | SSB                         | SSB                    |                             |    |
| PDSCH RMC configuration             |      | 1,2    | SR.3.2 TDD                  | N/A                    |                             |    |
|                                     |      | 3,4    | SR.3.3 TDD                  |                        |                             |    |
| RMSI CORESET RMC configuration      |      | 1,2    | CR.3.1 TDD                  | N/A                    |                             |    |
|                                     |      | 3,4    | CR.3.2 TDD                  | N/A                    |                             |    |
| Dedicated CORESET RMC configuration |      | 1,2    | CCR.3.1 TDD                 | N/A                    |                             |    |
|                                     |      | 3,4    | CCR.3.7 TDD                 | N/A                    |                             |    |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1~4    | 120                         | 120                    |                             |    |
| OCNG Patterns                       |      | 1~4    | OP.5                        | N/A                    |                             |    |
| TRS configuration                   |      | 1~4    | TRS.2.1 TDD                 | N/A                    |                             |    |
| PDSCH/PDCCH TCI state               |      | 1~4    | TCI.State.2                 | N/A                    |                             |    |
| cellIndividualOffset                | dB   | 1~4    | N/A                         | 16                     |                             |    |
| SSB configuration                   |      | 1, 2   | SSB.3 FR2                   | SSB.7 FR2              |                             |    |
|                                     |      | 3, 4   | SSB.4 FR2                   | SSB.8 FR2              |                             |    |
| Propagation Condition               |      | 1~4    | AWGN                        | AWGN                   |                             |    |

**Table A.5.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX**

| Parameter   | Unit         | Config | Cell 2                          |        | Cell 3    |        |
|---|--------------|--------|---------------------------------|--------|-----------|--------|
|   |              |        | T1                              | T2     | T1        | T2     |
| AoA setup   |              | 1~4    | Setup 3 defined in A.3.15.3     |        |           |        |
|   |              |        | AoA1                            |        | AoA2      |        |
| Assumption for UE beams <sup>Note 4</sup>   |              | 1~4    | Rough                           |        | Rough     |        |
| $E_s$   | dBm/SCS      | 1, 2   | -89                             | -89    | -Infinity | -89    |
|   |              | 3, 4   | -86                             | -86    | -Infinity | -86    |
| $\hat{E}_s / I_{ot\ BB}$ <sup>Note 5</sup>  | dB           | 1~4    | -0.12                           | -0.12  | -Infinity | -0.12  |
| SSB_RP  | dBm/SCS      | 1, 2   | -89                             | -89    | -Infinity | -89    |
|   |              | 3, 4   | -86                             | -86    | -Infinity | -86    |
| $I_o$   | dBm/95.04MHz | 1,2    | -64.41                          | -64.41 | -Infinity | -64.41 |
|   |              | 3,4    | -61.41                          | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA   |              | 1~4    | Defined in Figure A.5.6.1.1.1-1 |        |           |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Void</p> <p>Note 3: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> <p>Note 5: Calculation of <math>E_s/I_{ot\ BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_F</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |              |        |                                 |        |           |        |



**Figure A.5.6.1.1.1-1: Time multiplexed downlink transmissions (Config 1,2 example)**

**A.5.6.1.1.2 Test Requirements**

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,

- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times \text{TTIDCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.1.2 EN-DC event triggered reporting test without gap under DRX

#### A.5.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.2.1-1.

**Table A.5.6.1.2.1-1: supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 2             | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 3             | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 4             | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.2.1-2 ~ Table A.5.6.1.2.1-6 below.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX**

| Parameter | Unit | Config | Value  |        | Comment |
|-----------|------|--------|--------|--------|---------|
|           |      |        | Test 1 | Test 2 |         |

|                                       |    |     |   |       |   |
|---------------------------------------|----|-----|---|-------|---|
| Active cell                           |    | 1~4 | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) |       |   |
| Neighbour cell                        |    | 1~4 | Cell 3                                    |       | Cell to be identified.  |
| RF Channel Number                     |    | 1~4 | 1: Cell 1<br>2: Cell 2 and Cell 3         |       | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTC configuration                    |    | 1~4 | SMTC.1                                    |       |   |
| A3-Offset                             | dB | 1~4 | -6  |       |   |
| CP length                             |    | 1~4 | Normal                                    |       |   |
| Hysteresis                            | dB | 1~4 | 0   |       |   |
| Time To Trigger                       | s  | 1~4 | 0   |       |   |
| Filter coefficient                    |    | 1~4 | 0   |       | L3 filtering is not used  |
| DRX                                   |    | 1~4 | DRX.1                                     | DRX.7 | DRX related parameters are defined in Table A.5.6.1.2.1-4   |
| Time offset between Cell 1 and Cell 2 |    | 1~4 | 3 $\mu$ s                                 |       | Synchronous EN-DC   |
| Time offset between Cell 2 and Cell 3 |    | 1~4 | 3 $\mu$ s                                 |       | Synchronous cells   |
| T1                                    | s  | 1~4 | 5   |       |   |
| T2                                    | s  | 1~4 | 10  | 52    |   |

**Table A.5.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX**

| Parameter                           | Unit | Config | Cell 2                 |    | Cell 3                 |    |
|-------------------------------------|------|--------|------------------------|----|------------------------|----|
|                                     |      |        | T1                     | T2 | T1                     | T2 |
| TDD configuration                   |      | 1~4    | TDDConf.3.1            |    | TDDConf.3.1            |    |
| $BW_{channel}$                      | MHz  | 1~4    | 100: $N_{RB,c} = 66$   |    | 100: $N_{RB,c} = 66$   |    |
| Data RBs allocated                  |      | 1~4    | 66                     |    | 66                     |    |
| Initial BWP configuration           |      | 1~4    | DLBWP.0.1<br>ULBWP.0.1 |    | DLBWP.0.1<br>ULBWP.0.1 |    |
| Active DL BWP configuration         |      | 1~4    | DLBWP.1.1              |    | DLBWP.1.1              |    |
| Active UL BWP configuration         |      | 1~4    | ULBWP.1.1              |    | ULBWP.1.1              |    |
| RLM-RS                              |      | 1~4    | SSB                    |    | SSB                    |    |
| PDSCH RMC configuration             |      | 1,2    | SR.3.2 TDD             |    | N/A                    |    |
|                                     |      | 3,4    | SR.3.3 TDD             |    |                        |    |
| RMSI CORESET RMC configuration      |      | 1,2    | CR.3.1 TDD             |    | N/A                    |    |
|                                     |      | 3,4    | CR.3.2 TDD             |    |                        |    |
| Dedicated CORESET RMC configuration |      | 1,2    | CCR.3.1 TDD            |    | N/A                    |    |
|                                     |      | 3,4    | CCR.3.7 TDD            |    |                        |    |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1~4    | 120                    |    | 120                    |    |
| OCNG Patterns                       |      | 1~4    | OP.1                   |    | OP.1                   |    |
| PDSCH/PDCCH TCI state               |      | 1~4    | TCI.State.2            |    | N/A                    |    |
| CSI-RS for tracking                 |      |        | TRS.2.1 TDD            |    | N/A                    |    |
|                                     |      |        | TRS.2.1 TDD            |    | N/A                    |    |
| SSB configuration                   |      | 1, 2   | SSB.3 FR2              |    | SSB.3 FR2              |    |
|                                     |      | 3, 4   | SSB.4 FR2              |    | SSB.4 FR2              |    |
| Propagation Condition               |      | 1~4    | AWGN                   |    | AWGN                   |    |



**Table A.5.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX**

| Parameter                                 | Unit   | Config | Cell 2                      |        | Cell 3             |       |
|---|--|--------|-----------------------------|--------|--------------------|-------|
|   |  |        | T1                          | T2     | T1                 | T2    |
| AoA setup                                 |  | 1~4    | Setup 1 defined in A.3.15.1 |        |                    |       |
| Assumption for UE beams <sup>Note 4</sup> |  | 1~4    | Rough                       |        | Rough              |       |
| $\hat{E}_s/I_{ot}$ <sup>BB Note 5</sup>   | dB   | 1~4    | 3.77                        | -1.52  | -Infinity          | -1.52 |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/15 KHz   | 1~4    | -98                         |        |                    |       |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/SCS  | 1, 2   | -89                         |        |                    |       |
|   |  | 3, 4   | -86                         |        |                    |       |
| SSB_RP                                    | dBm/SCS  | 1, 2   | -85                         | -85    | -Infinity          | -85   |
|   |  | 3, 4   | -82                         | -82    | -Infinity          | -82   |
| $\hat{E}_s/N_{oc}$                        | dB   | 1~4    | 4                           | 4      | -Infinity          | 4     |
| $I_o$                                     | dBm/95.04MHz   | 1~4    | -54.53                      | -52.18 | See Cell 2 columns |       |
| Note 1:                                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |        |                             |        |                    |       |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |        |                             |        |                    |       |
| Note 3:                                   | $E_s/I_{ot}$ , SSB_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |        |                             |        |                    |       |
| Note 4:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  |        |                             |        |                    |       |
| Note 5:                                   | Calculation of $E_s/I_{ot_{BB}}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |        |                             |        |                    |       |

### A.5.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.1.3 EN-DC event triggered reporting test with per-UE gaps under non-DRX

#### A.5.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.3.1-1.

**Table A.5.6.1.3.1-1: supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 2             | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 3             | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 4             | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.3.1-2 ~ 4 below.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

**Table A.5.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX**

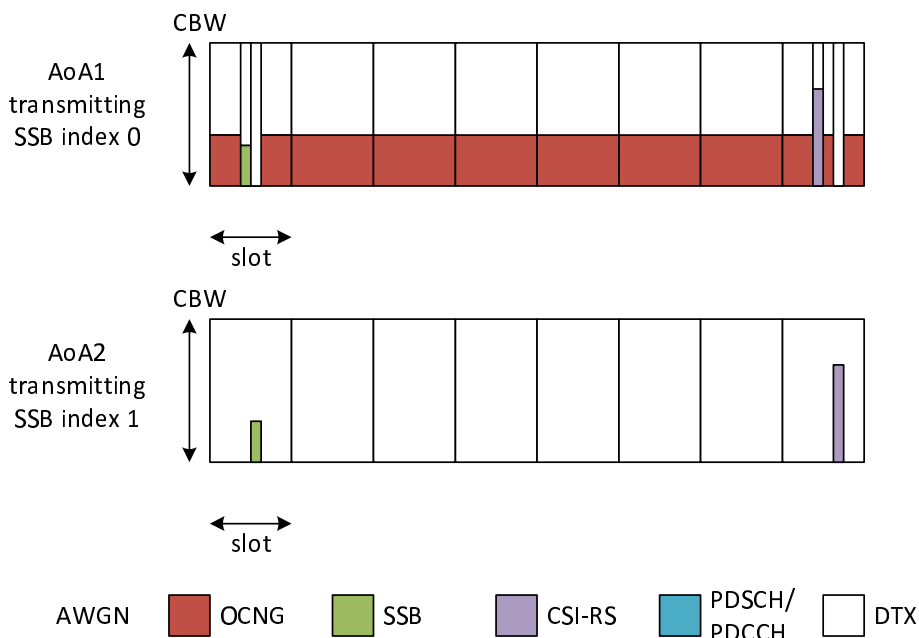
| Parameter                              | Unit | Config | Value                                     | Comment   |
|--|------|--------|---|---|
| Active cell                            |      | 1~4    | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) |   |
| Neighbour cell                         |      | 1~4    | Cell 3                                    | Cell to be identified.  |
| RF Channel Number                      |      | 1~4    | 1: Cell 1<br>2: Cell 2 and Cell 3         | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| Gap type                               |      | 1~4    | Per-UE gaps                               |   |
| Measurement gap repetition periodicity | ms   | 1~4    | 40  |   |
| Measurement gap length                 | ms   | 1~4    | 6   |   |
| Measurement gap offset                 | ms   | 1~4    | 39  |   |
| SMTTC configuration                    |      | 1~4    | SMTTC.1                                   |   |
| CSI-RS parameters                      |      | 1~4    | CSI-RS.3.2<br>TDD                         |   |
| A3-Offset                              | dB   | 1~4    | -11                                       |   |
| CP length                              |      | 1~4    | Normal                                    |   |
| Hysteresis                             | dB   | 1~4    | 0   |   |
| Time To Trigger                        | s    | 1~4    | 0   |   |
| Filter coefficient                     |      | 1~4    | 0   | L3 filtering is not used  |
| DRX                                    |      | 1~4    | OFF                                       |   |
| Time offset between Cell 1 and Cell 2  |      | 1~4    | 3 $\mu$ s                                 | Synchronous EN-DC   |
| Time offset between Cell 2 and Cell 3  |      | 1~4    | 3 $\mu$ s                                 | Synchronous cells   |
| T1                                     | s    | 1~4    | 5   |   |
| T2                                     | s    | 1~4    | 5   |   |

**Table A.5.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX**

| Parameter                           | Unit | Config      | Cell 2                 |                        | Cell 3               |    |
|-------------------------------------|------|-------------|------------------------|------------------------|----------------------|----|
|                                     |      |             | T1                     | T2                     | T1                   | T2 |
| TDD configuration                   |      | 1~4         | TDDConf.3.1            |                        | TDDConf.3.1          |    |
| $BW_{channel}$                      | MHz  | 1~4         | 100: $N_{RB,c} = 66$   |                        | 100: $N_{RB,c} = 66$ |    |
| Data RBs allocated                  |      | 1,2         | 24                     |                        | 24                   |    |
|                                     |      | 3,4         | 48                     |                        | 48                   |    |
| Initial BWP configuration           |      | 1~4         | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |                      |    |
| Active DL BWP configuration         |      | 1~4         | DLBWP.1.2              | DLBWP.1.1              |                      |    |
| Active UL BWP configuration         |      | 1~4         | ULBWP.1.2              | ULBWP.1.1              |                      |    |
| RLM-RS                              |      | 1~4         | CSI-RS                 | SSB                    |                      |    |
| PDSCH RMC configuration             |      | 1,2         | SR.3.2 TDD             | N/A                    |                      |    |
|                                     |      | 3,4         | SR.3.3 TDD             |                        |                      |    |
| RMSI CORESET RMC configuration      | 1,2  | CR.3.1 TDD  | CR.3.1 TDD             | N/A                    |                      |    |
|                                     | 3,4  | CR.3.2 TDD  | CR.3.2 TDD             | N/A                    |                      |    |
| Dedicated CORESET RMC configuration | 1,2  | CCR.3.1 TDD | CCR.3.1 TDD            | N/A                    |                      |    |
|                                     | 3,4  | CCR.3.7 TDD | CCR.3.7 TDD            | N/A                    |                      |    |
| TRS configuration                   |      | 1~4         | TRS.2.1 TDD            | N/A                    |                      |    |
| PDSCH/PDCCH TCI state               |      | 1~4         | TCI.State.2            | N/A                    |                      |    |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1~4         | 120                    | 120                    |                      |    |
| OCNG Patterns                       |      | 1~4         | OP.5                   | N/A                    |                      |    |
| cellIndividualOffset                | dB   | 1~4         | N/A                    | 16                     |                      |    |
| SSB                                 |      | 1, 2        | SSB.3 FR2              | SSB.7 FR2              |                      |    |
|                                     |      | 3, 4        | SSB.4 FR2              | SSB.8 FR2              |                      |    |
| Propagation Condition               |      | 1~4         | AWGN                   | AWGN                   |                      |    |

**Table A.5.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX**

| Parameter  | Unit         | Config | Cell 2                          |        | Cell 3    |        |
|--|--------------|--------|---------------------------------|--------|-----------|--------|
|  |              |        | T1                              | T2     | T1        | T2     |
| AoA setup  |              | 1~4    | Setup 3 defined in A.3.15.3     |        |           |        |
|  |              |        | AoA1                            |        | AoA2      |        |
| Assumption for UE beams <sup>Note 4</sup>  |              | 1~4    | Rough                           |        | Rough     |        |
| $E_s$  | dBm/SCS      | 1, 2   | -89                             | -89    | -Infinity | -89    |
|  |              | 3, 4   | -86                             | -86    | -Infinity | -86    |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note 5</sup>   | dB           | 1~4    | -0.12                           | -0.12  | -Infinity | -0.12  |
| SSB_RP   | dBm/SCS      | 1, 2   | -89                             | -89    | -Infinity | -89    |
|  |              | 3, 4   | -86                             | -86    | -Infinity | -86    |
| $I_o$  | dBm/95.04MHz | 1,2    | -64.41                          | -64.41 | -Infinity | -64.41 |
|  |              | 3,4    | -61.41                          | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA  |              | 1~4    | Defined in Figure A.5.6.1.3.1-1 |        |           |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Void</p> <p>Note 3: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> <p>Note 5: Calculation of <math>E_s/I_{ot_{BB}}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |              |        |                                 |        |           |        |



**Figure A.5.6.1.3.1-1: Time multiplexed downlink transmissions (Config 1,2 example)**

**A.5.6.1.3.2 Test Requirements**

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,

- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.1.4 EN-DC event triggered reporting test with per-UE gaps under DRX

##### A.5.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.4.1-1.

**Table A.5.6.1.4.1-1: supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 2             | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 3             | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| 4             | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                      |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.4.1-2 ~ 6.

During the test, Cell 2 and Cell 3 are transmitted from the direction determined according to A3.8.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX**

| Parameter                              | Unit | Config | Value                                     |        | Comment   |
|--|------|--------|---|--------|---|
|  |      |        | Test 1                                    | Test 2 |   |
| Active cell                            |      | 1~4    | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) |        |   |
| Neighbour cell                         |      | 1~4    | Cell 3                                    |        | Cell to be identified.  |
| RF Channel Number                      |      | 1~4    | 1: Cell 1<br>2: Cell 2 and Cell 3         |        | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| Gap type                               |      | 1~4    | Per-UE gaps                               |        |   |
| Measurement gap repetition periodicity | ms   | 1~4    | 40  |        |   |
| Measurement gap length                 | ms   | 1~4    | 6   |        |   |
| Measurement gap offset                 | ms   | 1~4    | 39  |        |   |
| SMTTC configuration                    |      | 1~4    | SMTTC.1                                   |        |   |
| CSI-RS parameters                      |      | 1~4    | CSI-RS.3.2 TDD                            |        |   |
| A3-Offset                              | dB   | 1~4    | -6  |        |   |
| CP length                              |      | 1~4    | Normal                                    |        |   |
| Hysteresis                             | dB   | 1~4    | 0   |        |   |
| Time To Trigger                        | s    | 1~4    | 0   |        |   |
| Filter coefficient                     |      | 1~4    | 0   |        | L3 filtering is not used  |
| DRX                                    |      | 1~4    | DRX.1                                     | DRX.7  | DRX related parameters are defined in Table A.5.6.1.4.1-5   |
| Time offset between Cell 1 and Cell 2  |      | 1~4    | 3 $\mu$ s                                 |        | Synchronous EN-DC   |
| Time offset between Cell 2 and Cell 3  |      | 1~4    | 3 $\mu$ s                                 |        | Synchronous cells   |
| T1                                     | s    | 1~4    | 5   |        |   |
| T2                                     | s    | 1~4    | 10  | 52     |   |

**Table A.5.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX**

| Parameter                           | Unit | Config | Cell 2                      |                        | Cell 3                      |    |
|-------------------------------------|------|--------|-----------------------------|------------------------|-----------------------------|----|
|                                     |      |        | T1                          | T2                     | T1                          | T2 |
| TDD configuration                   |      | 1~4    | TDDConf.3.1                 |                        | TDDConf.3.1                 |    |
| BW <sub>channel</sub>               | MHz  | 1~4    | 100: N <sub>RB,c</sub> = 66 |                        | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                  |      | 1~4    | 66                          |                        | 66                          |    |
| Initial BWP configuration           |      | 1~4    | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1 |                             |    |
| Active DL BWP configuration         |      | 1~4    | DLBWP.1.2                   | DLBWP.1.1              |                             |    |
| Active UL BWP configuration         |      | 1~4    | ULBWP.1.2                   | ULBWP.1.1              |                             |    |
| RLM-RS                              |      | 1~4    | CSI-RS                      | SSB                    |                             |    |
| PDSCH RMC configuration             |      | 1,2    | SR.3.2 TDD                  | N/A                    |                             |    |
|                                     |      | 3,4    | SR.3.3 TDD                  |                        |                             |    |
| RMSI CORESET RMC configuration      |      | 1,2    | CR.3.1 TDD                  | N/A                    |                             |    |
|                                     |      | 3,4    | CR.3.2 TDD                  | N/A                    |                             |    |
| Dedicated CORESET RMC configuration |      | 1,2    | CCR.3.1 TDD                 | N/A                    |                             |    |
|                                     |      | 3,4    | CCR.3.7 TDD                 | N/A                    |                             |    |
| TRS configuration                   |      | 1~4    | TRS.2.1 TDD                 | N/A                    |                             |    |
| PDSCH/PDCCH TCI state               |      | 1~4    | TCI.State.2                 | N/A                    |                             |    |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1~4    | 120                         | 120                    |                             |    |
| OCNG Patterns                       |      | 1~4    | OP.1                        | OP.1                   |                             |    |
| SSB                                 |      | 1, 2   | SSB.3 FR2                   | SSB.3 FR2              |                             |    |
|                                     |      | 3, 4   | SSB.4 FR2                   | SSB.4 FR2              |                             |    |
| Propagation Condition               |      | 1~4    | AWGN                        | AWGN                   |                             |    |

**Table A.5.6.1.4.1-4: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX**

| Parameter                                 | Unit  | Config | Cell 2                      |        | Cell 3             |       |
|---|---|--------|-----------------------------|--------|--------------------|-------|
|   |   |        | T1                          | T2     | T1                 | T2    |
| AoA setup                                 |   | 1~4    | Setup 1 defined in A.3.15.1 |        |                    |       |
| Assumption for UE beams <sup>Note 4</sup> |   | 1~4    | Rough                       |        | Rough              |       |
| $\hat{E}_s/I_{ot}$ <sup>BB Note 5</sup>   | dB  | 1~4    | 3.77                        | -1.52  | -Infinity          | -1.52 |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/15 KHz  | 1~4    | -98                         |        |                    |       |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/SCS   | 1, 2   | -89                         |        |                    |       |
|   |   | 3, 4   | -86                         |        |                    |       |
| SS-RSRP                                   | dBm/SCS   | 1, 2   | -85                         | -85    | -Infinity          | -85   |
|   |   | 3, 4   | -82                         | -82    | -Infinity          | -82   |
| $\hat{E}_s/N_{oc}$                        | dB  | 1~4    | 4                           | 4      | -Infinity          | 4     |
| $I_o$                                     | dBm/95.04MHz  | 1~4    | -54.53                      | -52.18 | See Cell 2 columns |       |
| Note 1:                                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |        |                             |        |                    |       |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |        |                             |        |                    |       |
| Note 3:                                   | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |        |                             |        |                    |       |
| Note 4:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.   |        |                             |        |                    |       |
| Note 5:                                   | Calculation of Es/Iot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |        |                             |        |                    |       |

**Table A.5.6.1.4.1-5: Void****Table A.5.6.1.4.1-6: Void**

#### A.5.6.1.4.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.20s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.



## A.5.6.2 Inter-frequency Measurements

### A.5.6.2.1 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

#### A.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.1.1-1, A.5.6.2.1.1-2, and A.5.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.1.1-1.

**Table A.5.6.2.1.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                     |
| 2       | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                     |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.5.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |                               | Comment   |
|---|------|--------------------|---|-------------------------------|---|
|   |      |                    | Test 1                                    | Test 2                        |   |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1   |                               | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2                                      |                               | Two FR2 NR carrier frequencies are used.  |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 (PScell) |                               | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3                                 |                               | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2         | 0   | 13                            | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2         | 39  | 39                            |   |
| SMTC-SSB parameters                             |      | Config 1,2         | SSB.3 FR2                                 |                               | As specified in clause A.3.10.2   |
| offsetMO  | dB   | Config 1,2         | 16  |                               | Applied to NR Cell 3 measurement object   |
| A3-Offset                                       | dB   | Config 1,2         | -11                                       |                               |   |
| Hysteresis                                      | dB   | Config 1,2         | 0   |                               |   |
| CP length                                       |      | Config 1,2         | Normal                                    |                               |   |
| TimeToTrigger                                   | s    | Config 1,2         | 0   |                               |   |
| Filter coefficient                              |      | Config 1,2         | 0   |                               | L3 filtering is not used  |
| DRX   |      | Config 1,2         | OFF                                       |                               | DRX is not used   |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 μs                                      |                               | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3μs                                       |                               | Synchronous cells.  |
| T1  | s    | Config 1,2         | 5   |                               |   |
| T2  | s    | Config 1,2         | 5.2 for PC1; 3.5 for other PC             | 5.2 for PC1; 3.5 for other PC |   |

**Table A.5.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 | Unit | Test configuration | Cell 2                                |    | Cell 3                      |    |
|---|------|--------------------|---------------------------------------|----|-----------------------------|----|
|   |      |                    | T1                                    | T2 | T1                          | T2 |
| AoA setup                                 |      | Config 1,2         | Setup 3 as specified in clause A.3.15 |    |                             |    |
|   |      |                    | AoA1                                  |    | AoA2                        |    |
| Assumption for UE beams <sup>Note 7</sup> |      | Config 1,2         | Rough                                 |    | Rough                       |    |
| NR RF Channel Number                      |      | Config 1,2         | 1                                     |    | 2                           |    |
| Duplex mode                               |      | Config 1,2         | TDD                                   |    | TDD                         |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                        |      | Config 1,2         | 66                                    |    | 66                          |    |
| BWP BW                                    | MHz  | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| TDD configuration                         |      | Config 1,2         | TDDConf.3.1                           |    | TDDConf.3.1                 |    |
| Initial DL BWP                            |      | Config 1,2         | DLBWP.0.1                             |    | NA                          |    |
| Initial UL BWP                            |      | Config 1,2         | ULBWP.0.1                             |    | NA                          |    |

|   |                                       |            |             |        |           |        |
|---|---------------------------------------|------------|-------------|--------|-----------|--------|
| Dedicated DL BWP  |                                       | Config 1,2 | DLBWP.1.1   |        | NA        |        |
| Dedicated UL BWP  |                                       | Config 1,2 | ULBWP.1.1   |        | NA        |        |
| OCNG Patterns defined in A.3.2.1.1  |                                       | Config 1,2 | OP.1        |        | OP.1      |        |
| TRS configuration   |                                       | Config 1,2 | TRS.2.1 TDD |        | NA        |        |
| PDSCH/PDCCH TCI state   |                                       | Config 1,2 | TCI.State.2 |        | NA        |        |
| PDSCH Reference measurement channel   |                                       | Config 1,2 | SR.3.1 TDD  |        | -         |        |
| RMSI CORESET Reference Channel  |                                       | Config 1,2 | CR.3.1 TDD  |        | -         |        |
| Dedicated CORESET Reference Channel   |                                       | Config 1,2 | CCR.3.1 TDD |        | -         |        |
| SMTC configuration defined in A.3.11  |                                       | Config 1,2 | SMTC.1      |        | SMTC.1    |        |
| PDSCH/PDCCH subcarrier spacing  | kHz                                   | Config 1,2 | 120         |        | 120       |        |
| EPRE ratio of PSS to SSS  |                                       | Config 1,2 | 0           |        | 0         |        |
| EPRE ratio of PBCH DMRS to SSS  |                                       |            |             |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS   |                                       |            |             |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS   |                                       |            |             |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |                                       |            |             |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS   |                                       |            |             |        |           |        |
| EPRE ratio of PDSCH to PDSCH  |                                       |            |             |        |           |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                                       |            |             |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                                       |            |             |        |           |        |
| $\hat{E}_s$   | dBm/SC<br>S                           |            |             |        |           |        |
| SSB-RP <sup>Note 3</sup>  | dBm/SC<br>S <sup>Note5</sup>          | Config 1,2 | -87         | -87    | -Infinity | -87    |
| $\hat{E}_s / I_{ot\ BB}$ <sup>Note 8</sup>  | dB                                    | Config 1,2 | 1.89        | 1.89   | -Infinity | 1.89   |
| $I_o$ <sup>Note3</sup>  | dBm/95.0<br>4<br>MHz <sup>Note5</sup> | Config 1,2 | -58.01      | -58.01 | -Infinity | -58.01 |
| Propagation Condition   |                                       | Config 1,2 | AWGN        |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: SSB-RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone.</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> <p>Note 8: Calculation of <math>E_s/I_{ot\ BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_S</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                                       |            |             |        |           |        |

### A.5.6.2.1.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.5.6.2.2 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

#### A.5.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.2.1-1, A.5.6.2.2.1-2, and A.5.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.2.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.2.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.2.2.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                     |
| 2       | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                     |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.5.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |                                |                              |                                | Comment   |
|---|------|--------------------|---|--------------------------------|------------------------------|--------------------------------|---|
|   |      |                    | Test 1                                    | Test 2                         | Test 3                       | Test 4                         |   |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1   |                                |                              |                                | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2                                      |                                |                              |                                | Two FR2 NR carrier frequencies are used.  |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 (PScell) |                                |                              |                                | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3                                 |                                |                              |                                | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2         | 0   | 13                             |                              |                                | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2         | 39  | 39                             |                              |                                |   |
| SMTC-SSB parameters                             |      | Config 1,2         | SSB.3 FR2                                 |                                |                              |                                | As specified in clause A.3.10.2   |
| A3-Offset                                       | dB   | Config 1,2         | -6  |                                |                              |                                |   |
| Hysteresis                                      | dB   | Config 1,2         | 0   |                                |                              |                                |   |
| CP length                                       |      | Config 1,2         | Normal                                    |                                |                              |                                |   |
| TimeToTrigger                                   | s    | Config 1,2         | 0   |                                |                              |                                |   |
| Filter coefficient                              |      | Config 1,2         | 0   |                                |                              |                                | L3 filtering is not used  |
| DRX   |      | Config 1,2         | DRX .1                                    | DRX .7                         | DRX .1                       | DRX .7                         | As specified in clause A.3.3  |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 μs                                      |                                |                              |                                | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3μs                                       |                                |                              |                                | Synchronous cells.  |
| T1  | s    | Config 1,2         | 5   |                                |                              |                                |   |
| T2  | s    | Config 1,2         | 8 for PC1;<br>5 for other PC              | 82 for PC1;<br>52 for other PC | 8 for PC1;<br>5 for other PC | 82 for PC1;<br>52 for other PC |   |

**Table A.5.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 | Unit             | Test configuration | Cell 2                                |       | Cell 3                      |       |
|---|------------------|--------------------|---------------------------------------|-------|-----------------------------|-------|
|   |                  |                    | T1                                    | T2    | T1                          | T2    |
| AoA setup                                 |                  | Config 1,2         | Setup 1 as specified in clause A.3.15 |       |                             |       |
| Assumption for UE beams <sup>Note 7</sup> |                  | Config 1,2         | Rough                                 |       | Rough                       |       |
| NR RF Channel Number                      |                  | Config 1,2         | 1                                     |       | 2                           |       |
| Duplex mode                               |                  | Config 1,2         | TDD                                   |       | TDD                         |       |
| BW <sub>channel</sub>                     | MHz              | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |       | 100: N <sub>RB,c</sub> = 66 |       |
| Data RBs allocated                        |                  | Config 1,2         | 66                                    |       | 66                          |       |
| BWP BW                                    | MHz              | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |       | 100: N <sub>RB,c</sub> = 66 |       |
| TDD configuration                         |                  | Config 1,2         | TDDConf.3.1                           |       | TDDConf.3.1                 |       |
| Initial DL BWP                            |                  | Config 1,2         | DLBWP.0.1                             |       | NA                          |       |
| Initial UL BWP                            |                  | Config 1,2         | ULBWP.0.1                             |       |                             |       |
| Dedicated DL BWP                          |                  | Config 1,2         | DLBWP.1.1                             |       | NA                          |       |
| Dedicated UL BWP                          |                  | Config 1,2         | ULBWP.1.1                             |       | NA                          |       |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  | Config 1,2         | OP.1                                  |       | OP.1                        |       |
| TRS configuration                         |                  | Config 1,2         | TRS.2.1 TDD                           |       | NA                          |       |
| PDSCH/PDCCH TCI state                     |                  | Config 1,2         | TCI.State.2                           |       | NA                          |       |
| PDSCH Reference measurement channel       |                  | Config 1,2         | SR.3.1 TDD                            |       | -                           |       |
| RMSI CORESET Reference Channel            |                  | Config 1,2         | CR.3.1 TDD                            |       | -                           |       |
| Dedicated CORESET Reference Channel       |                  | Config 1,2         | CCR.3.1 TDD                           |       | -                           |       |
| SMTC configuration defined in A.3.11      |                  | Config 1,2         | SMTC.1                                |       | SMTC.1                      |       |
| PDSCH/PDCCH subcarrier spacing            | kHz              | Config 1,2         | 120                                   |       | 120                         |       |
| EPRE ratio of PSS to SSS                  |                  | Config 1,2         | 0                                     |       | 0                           |       |
| EPRE ratio of PBCH DMRS to SSS            |                  |                    |                                       |       |                             |       |
| EPRE ratio of PBCH to PBCH DMRS           |                  |                    |                                       |       |                             |       |
| EPRE ratio of PDCCH DMRS to SSS           |                  |                    |                                       |       |                             |       |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |                    |                                       |       |                             |       |
| EPRE ratio of PDSCH DMRS to SSS           |                  |                    |                                       |       |                             |       |
| EPRE ratio of PDSCH to PDSCH              |                  |                    |                                       |       |                             |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |                    |                                       |       |                             |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |                    |                                       |       |                             |       |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/15k Hz Note5 |                    |                                       |       |                             |       |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/SC S Note4   | Config 1,2         | -95.7                                 |       | -95.7                       |       |
| SS-RSRP <sup>Note 3</sup>                 | dBm/SC S Note5   | Config 1,2         | -89.7                                 | -89.7 | -Infinity                   | -86.7 |
| $\hat{E}_s / I_{ot}$                      | dB               | Config 1,2         | 6                                     | 6     | -Infinity                   | 9     |
| $\hat{E}_s / N_{oc}$                      | dB               | Config 1,2         | 6                                     | 6     | -Infinity                   | 9     |

|                        |  |            |       |       |       |       |
|------------------------|--|------------|-------|-------|-------|-------|
| $I_0$ <sup>Note3</sup> | dBm/95.0<br>4 MHz<br>Note5   | Config 1,2 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition  |  | Config 1,2 | AWGN  |       | AWGN  |       |
| Note 1:                | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |            |       |       |       |       |
| Note 2:                | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |            |       |       |       |       |
| Note 3:                | SSB_RP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |            |       |       |       |       |
| Note 4:                | Void   |            |       |       |       |       |
| Note 5:                | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |            |       |       |       |       |
| Note 6:                | As observed with 0 dBi gain antenna at the centre of the quiet zone  |            |       |       |       |       |
| Note 7:                | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |            |       |       |       |       |

### A.5.6.2.2.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X_1$  ms from the beginning of time period T2, where  $X_1$  is

- 7680 for UE supporting power class 1, or
- 4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X_2$  ms from the beginning of time period T2, where  $X_2$  is

- 81920 for UE supporting power class 1, or
- 51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.5.6.2.3 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

#### A.5.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.3.1-1, A.5.6.2.3.1-2, and A.5.6.2.3.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.3.1-1 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.3.1-1 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.3.1-1.



**Table A.5.6.2.3.1-1 EN-DC event triggered reporting tests with SSB index reading for FR2-FR2**

| Config   | Description  |
|--|--|
| 1  | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |
| Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell           |  |

**Table A.5.6.2.3.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |                                | Comment   |
|---|------|--------------------|---|--------------------------------|---|
|   |      |                    | Test 1                                    | Test 2                         |   |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1   |                                | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2                                      |                                | Two FR2 NR carrier frequencies are used.  |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 (PScell) |                                | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3                                 |                                | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2         | 0   | 13                             | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2         | 39  | 39                             |   |
| SMTC-SSB parameters                             |      | Config 1,2         | SSB.3 FR2                                 |                                | As specified in clause A.3.10.2   |
| offsetMO  | dB   | Config 1,2         | 16  |                                | Applied to NR Cell 3 measurement object   |
| A3-Offset                                       | dB   | Config 1,2         | -11                                       |                                |   |
| Hysteresis                                      | dB   | Config 1,2         | 0   |                                |   |
| CP length                                       |      | Config 1,2         | Normal                                    |                                |   |
| TimeToTrigger                                   | s    | Config 1,2         | 0   |                                |   |
| Filter coefficient                              |      | Config 1,2         | 0   |                                | L3 filtering is not used  |
| DRX   |      | Config 1,2         | OFF                                       |                                | DRX is not used   |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 μs                                      |                                | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3μs                                       |                                | Synchronous cells.  |
| T1  | s    | Config 1,2         | 5   |                                |   |
| T2  | s    | Config 1,2         | 7 for PC1;<br>4.5 for other PC            | 7 for PC1;<br>4.5 for other PC |   |

**Table A.5.6.2.3.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 | Unit                      | Test configuration | Cell 2                                |      | Cell 3                      |      |
|---|---------------------------|--------------------|---------------------------------------|------|-----------------------------|------|
|   |                           |                    | T1                                    | T2   | T1                          | T2   |
| AoA setup                                 |                           | Config 1,2         | Setup 3 as specified in clause A.3.15 |      |                             |      |
|   |                           |                    | AoA1                                  |      | AoA2                        |      |
| Assumption for UE beams <sup>Note 7</sup> |                           | Config 1,2         | Rough                                 |      | Rough                       |      |
| NR RF Channel Number                      |                           | Config 1,2         | 1                                     |      | 2                           |      |
| Duplex mode                               |                           | Config 1,2         | TDD                                   |      | TDD                         |      |
| BW <sub>channel</sub>                     | MHz                       | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |      | 100: N <sub>RB,c</sub> = 66 |      |
| Data RBs allocated                        |                           | Config 1,2         | 66                                    |      | 66                          |      |
| BWP BW                                    | MHz                       | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |      | 100: N <sub>RB,c</sub> = 66 |      |
| TDD configuration                         |                           | Config 1,2         | TDDConf.3.1                           |      | TDDConf.3.1                 |      |
| Initial DL BWP                            |                           | Config 1,2         | DLBWP.0.1                             |      | NA                          |      |
| Initial UL BWP                            |                           | Config 1,2         | DLBWP.0.1                             |      | N/A                         |      |
| Dedicated DL BWP                          |                           | Config 1,2         | DLBWP.1.1                             |      | NA                          |      |
| Dedicated UL BWP                          |                           | Config 1,2         | ULBWP.1.1                             |      | NA                          |      |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                           | Config 1,2         | OP.1                                  |      | OP.1                        |      |
| PDSCH Reference measurement channel       |                           | Config 1,2         | SR.3.1 TDD                            |      | -                           |      |
| RMSI CORESET Reference Channel            |                           | Config 1,2         | CR.3.1 TDD                            |      | -                           |      |
| Dedicated CORESET Reference Channel       |                           | Config 1,2         | CCR.3.1 TDD                           |      | -                           |      |
| TRS configuration                         |                           | Config 1,2         | TRS.2.1 TDD                           |      | NA                          |      |
| PDSCH/PDCCH TCI state                     |                           | Config 1,2         | TCI.State.2                           |      | NA                          |      |
| SMTc configuration defined in A.3.11      |                           | Config 1,2         | SMTc.1                                |      | SMTc.1                      |      |
| PDSCH/PDCCH subcarrier spacing            | kHz                       | Config 1,2         | 120                                   |      | 120                         |      |
| EPRE ratio of PSS to SSS                  |                           | Config 1,2         | 0                                     |      | 0                           |      |
| EPRE ratio of PBCH DMRS to SSS            |                           |                    |                                       |      |                             |      |
| EPRE ratio of PBCH to PBCH DMRS           |                           |                    |                                       |      |                             |      |
| EPRE ratio of PDCCH DMRS to SSS           |                           |                    |                                       |      |                             |      |
| EPRE ratio of PDCCH to PDCCH DMRS         |                           |                    |                                       |      |                             |      |
| EPRE ratio of PDSCH DMRS to SSS           |                           |                    |                                       |      |                             |      |
| EPRE ratio of PDSCH to PDSCH              |                           |                    |                                       |      |                             |      |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                           |                    |                                       |      |                             |      |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                           |                    |                                       |      |                             |      |
| $\hat{E}_s$                               | dBm/SCS                   |                    | Config 1                              | -87  |                             | -87  |
| SSB-RP <sup>Note 3</sup>                  | dBm/SCS <sup>Note 5</sup> | Config 1,2         | -87                                   | -87  | -Infinity                   | -87  |
| $\hat{E}_s / I_{ot}$ BB <sup>Note 8</sup> | dB                        | Config 1,2         | 1.89                                  | 1.89 | -Infinity                   | 1.89 |

|                        |   |            |        |        |           |        |
|------------------------|---|------------|--------|--------|-----------|--------|
| $I_0$ <sup>Note3</sup> | dBm/95.0<br>4 MHz<br><sup>Note5</sup>   | Config 1,2 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition  |   | Config 1,2 | AWGN   |        | AWGN      |        |
| Note 1:                | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |            |        |        |           |        |
| Note 2:                | Void  |            |        |        |           |        |
| Note 3:                | SSB-RP, $E_s/lot$ and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |            |        |        |           |        |
| Note 4:                | Void  |            |        |        |           |        |
| Note 5:                | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  |            |        |        |           |        |
| Note 6:                | As observed with 0dBi gain antenna at the centre of the quiet zone  |            |        |        |           |        |
| Note 7:                | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |            |        |        |           |        |
| Note 8:                | Calculation of $E_s/lot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4. |            |        |        |           |        |

### A.5.6.2.3.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.2.4 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

#### A.5.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.4.1-1, A.5.6.2.4.1-2, and A.5.6.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.4.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.4.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.2.4.1-1: EN-DC event triggered reporting tests with SSB index reading for FR2-FR2**

| Config   | Description  |
|--|--|
| 1  | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |
| Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell           |  |

**Table A.5.6.2.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value   |   |   |   | Comment   |
|---|------|--------------------|---|---|---|---|---|
|   |      |                    | Test 1  | Test 2  | Test 3  | Test 4  |   |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1   |   |   |   | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2  |   |   |   | Two FR2 NR carrier frequencies are used.  |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 (PScell)       |   |   |   | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3                                       |   |   |   | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2         | 0   |   | 13  |   | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2         | 39  |   | 39  |   |   |
| SMT-C-SSB parameters                            |      | Config 1,2         | SSB.3 FR2                                       |   |   |   | As specified in clause A.3.10.2   |
| A3-Offset                                       | dB   | Config 1,2         | -6  |   |   |   |   |
| Hysteresis                                      | dB   | Config 1,2         | 0   |   |   |   |   |
| CP length                                       |      | Config 1,2         | Normal  |   |   |   |   |
| TimeToTrigger                                   | s    | Config 1,2         | 0   |   |   |   |   |
| Filter coefficient                              |      | Config 1,2         | 0   |   |   |   | L3 filtering is not used  |
| DRX   |      | Config 1,2         | DRX<br>.1                                       | DRX<br>.7                                       | DRX<br>.1                                       | DRX<br>.7                                       | As specified in clause A.3.3  |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 μs  |   |   |   | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3μs   |   |   |   | Synchronous cells.  |
| T1  | s    | Config 1,2         | 5   |   |   |   |   |
| T2  | s    | Config 1,2         | 11<br>for<br>PC1;<br>6.5<br>for<br>othe<br>r PC | 108<br>for<br>PC1;<br>67<br>for<br>othe<br>r PC | 11<br>for<br>PC1;<br>6.5<br>for<br>othe<br>r PC | 108<br>for<br>PC1;<br>67<br>for<br>othe<br>r PC |   |

**Table A.5.6.2.4.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 | Unit | Test configuration | Cell 2                                |    | Cell 3                      |    |
|---|------|--------------------|---------------------------------------|----|-----------------------------|----|
|   |      |                    | T1                                    | T2 | T1                          | T2 |
| AoA setup                                 |      | Config 1,2         | Setup 1 as specified in clause A.3.15 |    |                             |    |
| Assumption for UE beams <sup>Note 7</sup> |      | Config 1,2         | Rough                                 |    | Rough                       |    |
| NR RF Channel Number                      |      | Config 1,2         | 1                                     |    | 2                           |    |
| Duplex mode                               |      | Config 1,2         | TDD                                   |    | TDD                         |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                        |      | Config 1,2         | 66                                    |    | 66                          |    |
| BWP BW                                    | MHz  | Config 1,2         | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| TDD configuration                         |      | Config 1,2         | TDDConf.3.1                           |    | TDDConf.3.1                 |    |

|  |                        |            |             |         |           |       |
|--|------------------------|------------|-------------|---------|-----------|-------|
| Initial DL BWP   |                        | Config 1,2 | DLBWP.0.1   | NA      |           |       |
| Initial UL BWP   |                        | Config 1,2 | ULBWP.0.1   |         |           |       |
| Dedicated DL BWP   |                        | Config 1,2 | DLBWP.1.1   | NA      |           |       |
| Dedicated UL BWP   |                        | Config 1,2 | ULBWP.1.1   | NA      |           |       |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |                        | Config 1,2 | OP.1        | OP.1    |           |       |
| PDSCH Reference measurement channel  |                        | Config 1,2 | SR.3.1 TDD  | -       |           |       |
| RMSI CORESET Reference Channel   |                        | Config 1,2 | CR.3.1 TDD  | -       |           |       |
| Dedicated CORESET Reference Channel  |                        | Config 1,2 | CCR.3.1 TDD | -       |           |       |
| TRS configuration  |                        | Config 1,2 | TRS.2.1 TDD | NA      |           |       |
| PDSCH/PDCCH TCI state  |                        | Config 1,2 | TCI.State.2 | NA      |           |       |
| SMTTC configuration defined in A.3.11  |                        | Config 1,2 | SMTTC.1     | SMTTC.1 |           |       |
| PDSCH/PDCCH subcarrier spacing   | kHz                    | Config 1,2 | 120         | 120     |           |       |
| EPRE ratio of PSS to SSS   |                        | Config 1,2 | 0           | 0       |           |       |
| EPRE ratio of PBCH DMRS to SSS   |                        |            |             |         |           |       |
| EPRE ratio of PBCH to PBCH DMRS  |                        |            |             |         |           |       |
| EPRE ratio of PDCCH DMRS to SSS  |                        |            |             |         |           |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                        |            |             |         |           |       |
| EPRE ratio of PDSCH DMRS to SSS  |                        |            |             |         |           |       |
| EPRE ratio of PDSCH to PDSCH   |                        |            |             |         |           |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                        |            |             |         |           |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                        |            |             |         |           |       |
| $N_{oc}^{Note2}$   | dBm/15 kHz<br>Note5    |            |             |         |           |       |
| $N_{oc}^{Note2}$   | dBm/S CS<br>Note4      | Config 1,2 | -95.7       | -95.7   |           |       |
| SSB_RP <sup>Note 3</sup>   | dBm/S CS<br>Note5      | Config 1,2 | -89.7       | -89.7   | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$   | dB                     | Config 1,2 | 6           | 6       | -Infinity | 9     |
| $\hat{E}_s/N_{oc}$   | dB                     | Config 1,2 | 6           | 6       | -Infinity | 9     |
| $I_o^{Note3}$  | dBm/95.04 MHz<br>Note5 | Config 1,2 | -59.7       | -59.7   | -66.7     | -57.2 |
| Propagation Condition  |                        | Config 1,2 | AWGN        |         | AWGN      |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                        |            |             |         |           |       |

#### A.5.6.2.4.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.2.5 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

##### A.5.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.5.1-1, A.5.6.2.5.1-2, and A.5.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.5.1-1.

**Table A.5.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2**

| Config | Description of serving cell  | Description of target cell                          |
|--------|--|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |   |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |   |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |   |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |   |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |   |

**Table A.5.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |                                  | Comment   |
|---|------|--------------------|---|----------------------------------|---|
|   |      |                    | Test 1                                    | Test 2                           |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |                                  | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |                                  | One FR1 and one FR2 NR carrier frequency is used.                                       |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |                                  | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |                                  | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 13                               | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 39  | 39                               |   |
| SMTC-SSB parameters on NR RF Channel 1          |      | Config 1,4         | SSB.1 FR1                                 |                                  | As specified in clause A.3.10.1   |
|   |      | Config 2,5         | SSB.1 FR1                                 |                                  | As specified in clause A.3.10.1   |
|   |      | Config 3,6         | SSB.2 FR1                                 |                                  | As specified in clause A.3.10.1   |
| SMTC-SSB parameters on NR RF Channel 2          |      | Config 1,2,3,4,5,6 | SSB.3 FR2                                 |                                  | As specified in clause A.3.10.2   |
| CSI-RS for tracking                             |      | Config 1,4         | TRS.1.1 FDD                               |                                  |   |
|   |      | Config 2,5         | TRS.1.1 TDD                               |                                  |   |
|   |      | Config 3,6         | TRS.1.2 TDD                               |                                  |   |
| <i>offsetMO</i>                                 | dB   | Config 1,2,3,4,5,6 | 6   |                                  |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |                                  |   |
| <i>a4-Threshold</i>                             | dBm  | Config 1,2,3,4,5,6 | -105                                      |                                  |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |                                  |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |                                  |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |                                  | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | OFF                                       |                                  | DRX is not used   |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |                                  | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3ms                                       |                                  | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3 $\mu$ s                                 |                                  | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |                                  |   |
| T2  | s    | Config 1,2,3,4,5,6 | 5.2 for PC1;<br>3.5 for other PC          | 5.2 for PC1;<br>3.5 for other PC |   |



**Table A.5.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 | Unit | Test configuration | Cell 2                      |    | Cell 3                                |    |
|---|------|--------------------|-----------------------------|----|---------------------------------------|----|
|   |      |                    | T1                          | T2 | T1                                    | T2 |
| AoA setup                                 |      | Config 1,2,3,4,5,6 | NA                          |    | Setup 1 as specified in clause A.3.15 |    |
| Assumption for UE beams <sup>Note 7</sup> |      | Config 1,2,3,4,5,6 | N/A                         |    | Rough                                 |    |
| NR RF Channel Number                      |      | Config 1,2,3,4,5,6 | 1                           |    | 2                                     |    |
| Duplex mode                               |      | Config 1,4         | FDD                         |    | TDD                                   |    |
|   |      | Config 2,3,5,6     | TDD                         |    | TDD                                   |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| BWP BW                                    | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| Data RBs allocated                        |      | Config 1,4         | 52                          |    | 66                                    |    |
|   |      | Config 2,5         | 52                          |    | 66                                    |    |
|   |      | Config 3,6         | 106                         |    | 66                                    |    |
| TDD configuration                         |      | Config 2,5         | TDDConf.1.1                 |    | TDDConf.3.1                           |    |
|   |      | Config 3,6         | TDDConf.2.1                 |    | TDDConf.3.1                           |    |
| Initial DL BWP                            |      | Config 1,2,3,4,5,6 | DLBWP.0.1                   |    | NA                                    |    |
| Initial UL BWP                            |      | Config 1,2,3,4,5,6 | ULBWP.0.1                   |    | NA                                    |    |
| Dedicated DL BWP                          |      | Config 1,2,3,4,5,6 | DLBWP.1.1                   |    | NA                                    |    |
| Dedicated UL BWP                          |      | Config 1,2,3,4,5,6 | ULBWP.1.1                   |    | NA                                    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |      | Config 1,2,3,4,5,6 | OP.1                        |    | OP.1                                  |    |
| PDSCH Reference measurement channel       |      | Config 1,4         | SR.1.1 FDD                  |    | -                                     |    |
|   |      | Config 2,5         | SR.1.1 TDD                  |    |                                       |    |
|   |      | Config 3,6         | SR2.1 TDD                   |    |                                       |    |
| RMSI CORESET Reference Channel            |      | Config 1,4         | CR.1.1 FDD                  |    | -                                     |    |
|   |      | Config 2,5         | CR.1.1 TDD                  |    |                                       |    |
|   |      | Config 3,6         | CR2.1 TDD                   |    |                                       |    |
| Dedicated CORESET Reference Channel       |      | Config 1,4         | CCR.1.1 FDD                 |    | -                                     |    |
|   |      | Config 2,5         | CCR.1.1 TDD                 |    |                                       |    |
|   |      | Config 3,6         | CCR.2.1 TDD                 |    |                                       |    |
| SMTc configuration defined in A.3.11      |      | Config 1,4         | SMTc.2                      |    | SMTc.2                                |    |
|   |      | Config 2,3,5,6     | SMTc.1                      |    | SMTc.1                                |    |
| PDSCH/PDCCH subcarrier spacing            | kHz  | Config 1,2,4,5     | 15                          |    | 120                                   |    |
|   |      | Config 3,6         | 30                          |    | 120                                   |    |
| EPRE ratio of PSS to SSS                  |      | Config 1,2,3,4,5,6 | 0                           |    | 0                                     |    |
| EPRE ratio of PBCH DMRS to SSS            |      | 1,2,3,4,5,6        |                             |    |                                       |    |
| EPRE ratio of PBCH to PBCH DMRS           |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH DMRS to SSS           |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH DMRS to SSS           |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH to PDSCH              |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |      |                    |                             |    |                                       |    |

|  |                               |                       |                                 |           |        |
|--|-------------------------------|-----------------------|---------------------------------|-----------|--------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                               |                       |                                 |           |        |
| $\hat{E}_s$  | dBm/S<br>CS                   | Config<br>1,2,3,4,5,6 | Link only, see clause<br>A.3.7A | -Infinity | -87    |
| SSB_RP <sup>Note 3</sup>   | dBm/S<br>CS<br>Note5          | Config<br>1,2,3,4,5,6 |                                 | -Infinity | -87    |
| $\hat{E}_s / I_{ot\ BB}$ <sup>Note 8</sup>   | dB                            | Config<br>1,2,3,4,5,6 |                                 | -Infinity | 14.69  |
| $I_o$ <sup>Note3</sup>   | dBm/95<br>.04<br>MHz<br>Note5 | Config<br>1,2,3,4,5,6 |                                 | -Infinity | -58.01 |
| Propagation Condition  |                               | Config<br>1,2,3,4,5,6 |                                 | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: SSB_RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void.</p> <p>Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 8: Calculation of <math>E_s/I_{ot\ BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_s</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                               |                       |                                 |           |        |

#### A.5.6.2.5.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.2.6 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

##### A.5.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.6.1-1, A.5.6.2.6.1-2, and A.5.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.6.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2**

| Config   | Description of serving cell                                   | Description of target cell                          |
|--|---|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 3  | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |   |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 6  | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| Note: The UE is only required to be tested in one of the supported test configurations |   |   |

**Table A.5.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                              | Unit | Test configuration | Value                                     |        |        |        | Comment   |
|--|------|--------------------|---|--------|--------|--------|---|
|  |      |                    | Test 1                                    | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number               |      | Config 1,2,3,4,5,6 | 1   |        |        |        | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                   |      | Config 1,2,3,4,5,6 | 1, 2                                      |        |        |        | One FR1 and one Fr2 NR carrier frequency is used.                                       |
| Active cell                            |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        |        |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                         |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        |        |        | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                         |      | Config 1,2,3,4,5,6 | 0   |        | 13     |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                 |      | Config 1,2,3,4,5,6 | 39  |        | 39     |        |   |
| SMTC-SSB parameters on NR RF Channel 1 |      | Config 1,4         | SSB.1 FR1                                 |        |        |        | As specified in clause A.3.10.1   |
|  |      | Config 2,5         | SSB.1 FR1                                 |        |        |        | As specified in clause A.3.10.1   |
|  |      | Config 3,6         | SSB.2 FR1                                 |        |        |        | As specified in clause A.3.10.1   |
| SMTC-SSB parameters on NR RF Channel 2 |      | Config 1,2,3,4,5,6 | SSB.3 FR2                                 |        |        |        | As specified in clause A.3.10.2   |
| CSI-RS for tracking                    |      | Config 1,4         | TRS.1.1 FDD                               |        |        |        |   |
|  |      | Config 2,5         | TRS.1.1 TDD                               |        |        |        |   |
|  |      | Config 3,6         | TRS.1.2 TDD                               |        |        |        |   |
| offset <sub>MO</sub>                   | dB   | Config 1,2,3,4,5,6 | 6   |        |        |        |   |
| Hysteresis                             | dB   | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| a4-Threshold                           | dBm  | Config 1,2,3,4,5,6 | -105                                      |        |        |        |   |
| CP length                              |      | Config 1,2,3,4,5,6 | Normal                                    |        |        |        |   |
| TimeToTrigger                          | s    | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| Filter coefficient                     |      | Config 1,2,3,4,5,6 | 0   |        |        |        | L3 filtering is not used  |

|   |   |                    |                              |                                |                              |                                |   |
|---|---|--------------------|------------------------------|--------------------------------|------------------------------|--------------------------------|---|
| DRX   |   | Config 1,2,3,4,5,6 | DRX .1                       | DRX .7                         | DRX .1                       | DRX .7                         | As specified in clause A.3.3  |
| Time offset between PCell and PSCell            |   | Config 1,2,3,4,5,6 | 3 $\mu$ s                    |                                |                              |                                | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |   | Config 1,4         | 3ms                          |                                |                              |                                | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|   |   | Config 2,3,5,6     | 3 $\mu$ s                    |                                |                              |                                | Synchronous cells.  |
| T1  | s | Config 1,2,3,4,5,6 | 5                            |                                |                              |                                |   |
| T2  | s | Config 1,2,3,4,5,6 | 8 for PC1;<br>5 for other PC | 82 for PC1;<br>52 for other PC | 8 for PC1;<br>5 for other PC | 82 for PC1;<br>52 for other PC |   |

**Table A.5.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 | Unit | Test configuration | Cell 2                      |    | Cell 3                                |    |
|---|------|--------------------|-----------------------------|----|---------------------------------------|----|
|   |      |                    | T1                          | T2 | T1                                    | T2 |
| AoA setup                                 |      | Config 1,2,3,4,5,6 | NA                          |    | Setup 1 as specified in clause A.3.15 |    |
| Assumption for UE beams <sup>Note 7</sup> |      | Config 1,2,3,4,5,6 | N/A                         |    | Rough                                 |    |
| NR RF Channel Number                      |      | Config 1,2,3,4,5,6 | 1                           |    | 2                                     |    |
| Duplex mode                               |      | Config 1,4         | FDD                         |    | TDD                                   |    |
|   |      | Config 2,3,5,6     | TDD                         |    | TDD                                   |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| BWP BW                                    | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| Data RBs allocated                        |      | Config 1,4         | 52                          |    | 66                                    |    |
|   |      | Config 2,5         | 52                          |    | 66                                    |    |
|   |      | Config 3,6         | 106                         |    | 66                                    |    |
| TDD configuration                         |      | Config 2,5         | TDDConf.1.1                 |    | TDDConf.3.1                           |    |
|   |      | Config 3,6         | TDDConf.2.1                 |    | TDDConf.3.1                           |    |
| Initial DL BWP                            |      | Config 1,2,3,4,5,6 | DLBWP.0.1                   |    | NA                                    |    |
| Initial UL BWP                            |      | Config 1,2,3,4,5,6 | ULBWP.0.1                   |    | NA                                    |    |
| Dedicated DL BWP                          |      | Config 1,2,3,4,5,6 | DLBWP.1.1                   |    | NA                                    |    |
| Dedicated UL BWP                          |      | Config 1,2,3,4,5,6 | ULBWP.1.1                   |    | NA                                    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |      | Config 1,2,3,4,5,6 | OP.1                        |    | OP.1                                  |    |
| PDSCH Reference measurement channel       |      | Config 1,4         | SR.1.1 FDD                  |    | -                                     |    |
|   |      | Config 2,5         | SR.1.1 TDD                  |    |                                       |    |
|   |      | Config 3,6         | SR2.1 TDD                   |    |                                       |    |
| RMSI CORESET Reference Channel            |      | Config 1,4         | CR.1.1 FDD                  |    | -                                     |    |
|   |      | Config 2,5         | CR.1.1 TDD                  |    |                                       |    |
|   |      | Config 3,6         | CR2.1 TDD                   |    |                                       |    |
| Dedicated CORESET Reference Channel       |      | Config 1,4         | CCR.1.1 FDD                 |    | -                                     |    |
|   |      | Config 2,5         | CCR.1.1 TDD                 |    |                                       |    |

|  |                        | Config 3,6         | CCR.2.1 TDD                        |           |       |
|--|------------------------|--------------------|------------------------------------|-----------|-------|
| SMTC configuration defined in A.3.11   |                        | Config 1,4         | SMTC.2                             | SMTC.2    |       |
|  |                        | Config 2,3,5,6     | SMTC.1                             | SMTC.1    |       |
|  |                        | Config 1,2,4,5     | 15                                 | 120       |       |
| PDSCH/PDCCH subcarrier spacing   | kHz                    | Config 3,6         | 30                                 | 120       |       |
|  |                        | Config 1,2,3,4,5,6 | 0                                  | 0         |       |
| EPRE ratio of PSS to SSS   |                        | Config 1,2,3,4,5,6 | NA<br>Link only, see clause A.3.7A | 0         |       |
| EPRE ratio of PBCH DMRS to SSS   |                        |                    |                                    |           |       |
| EPRE ratio of PBCH to PBCH DMRS  |                        |                    |                                    |           |       |
| EPRE ratio of PDCCH DMRS to SSS  |                        |                    |                                    |           |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                        |                    |                                    |           |       |
| EPRE ratio of PDSCH DMRS to SSS  |                        |                    |                                    |           |       |
| EPRE ratio of PDSCH to PDSCH   |                        |                    |                                    |           |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                        |                    |                                    |           |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                        |                    |                                    |           |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz<br>Note5    |                    |                                    |           |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS<br>Note4      | Config 1,2,4,5     |                                    | -95.7     |       |
|  |                        | Config 3,6         |                                    | -95.7     |       |
| SSB_RP <sup>Note 3</sup>   | dBm/S CS<br>Note5      | Config 1,2,4,5     |                                    | -Infinity | -86.7 |
|  |                        | Config 3,6         |                                    | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$   | dB                     | Config 1,2,3,4,5,6 |                                    | -Infinity | 9     |
| $\hat{E}_s / N_{oc}$   | dB                     | Config 1,2,3,4,5,6 |                                    | -Infinity | 9     |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz            | Config 1,2,4,5     |                                    | -         | -     |
|  | dBm/38.16MHz           | Config 3,6         |                                    | -         | -     |
|  | dBm/95.04 MHz<br>Note5 | Config 1,2,3,4,5,6 |                                    | -66.7     | -57.2 |
| Propagation Condition  |                        | Config 1,2,3,4,5,6 |                                    | AWGN      |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                        |                    |                                    |           |       |

A.5.6.2.6.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or  
4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than  $X2$  ms from the beginning of time period T2, where  $X2$  is

81920 for UE supporting power class 1, or  
51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.5.6.2.7 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

#### A.5.6.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.7.1-1, A.5.6.2.7.1-2, and A.5.6.2.7.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.7.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.7.1-1.

**Table A.5.6.2.7.1-1: EN-DC event triggered reporting tests with SSB index reading for FR1-FR2**

| Config   | Description of serving cell                                   | Description of target cell                          |
|--|---|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 3  | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |   |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 6  | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| Note: The UE is only required to be tested in one of the supported test configurations |   |   |

**Table A.5.6.2.7.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |                                | Comment   |
|---|------|--------------------|---|--------------------------------|---|
|   |      |                    | Test 1                                    | Test 2                         |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |                                | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |                                | One FR1 and one FR2 NR carrier frequency is used.                                       |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |                                | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |                                | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 13                             | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 39  | 39                             |   |
| SMTC-SSB parameters on NR RF Channel 1          |      | Config 1,4         | SSB.1 FR1                                 |                                | As specified in clause A.3.10.1   |
|   |      | Config 2,5         | SSB.1 FR1                                 |                                | As specified in clause A.3.10.1   |
|   |      | Config 3,6         | SSB.2 FR1                                 |                                | As specified in clause A.3.10.1   |
| SMTC-SSB parameters on NR RF Channel 2          |      | Config 1,2,3,4,5,6 | SSB.3 FR2                                 |                                | As specified in clause A.3.10.2   |
| CSI-RS for tracking                             |      | Config 1,4         | TRS.1.1 FDD                               |                                |   |
|   |      | Config 2,5         | TRS.1.1 TDD                               |                                |   |
|   |      | Config 3,6         | TRS.1.2 TDD                               |                                |   |
| <i>offsetMO</i>                                 | dB   | Config 1,2,3,4,5,6 | 6   |                                |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |                                |   |
| <i>a4-Threshold</i>                             | dBm  | Config 1,2,3,4,5,6 | -105                                      |                                |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |                                |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |                                |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |                                | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | OFF                                       |                                | DRX is not used   |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |                                | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3ms                                       |                                | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3 $\mu$ s                                 |                                | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |                                |   |
| T2  | s    | Config 1,2,3,4,5,6 | 7 for PC1;<br>4.5 for other PC            | 7 for PC1;<br>4.5 for other PC |   |

**Table A.5.6.2.7.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 |    | Cell 3 |    |
|-----------|------|--------------------|--------|----|--------|----|
|           |      |                    | T1     | T2 | T1     | T2 |
|           |      |                    |        |    |        |    |



|   |          |                    |                             |                                       |     |
|---|----------|--------------------|-----------------------------|---------------------------------------|-----|
| AoA setup                                 |          | Config 1,2,3,4,5,6 | NA                          | Setup 1 as specified in clause A.3.15 |     |
| Assumption for UE beams <sup>Note 7</sup> |          | Config 1,2,3,4,5,6 | N/A                         | Rough                                 |     |
| NR RF Channel Number                      |          | Config 1,2,3,4,5,6 | 1                           | 2                                     |     |
| Duplex mode                               |          | Config 1,4         | FDD                         | TDD                                   |     |
|   |          | Config 2,3,5,6     | TDD                         | TDD                                   |     |
| BW <sub>channel</sub>                     | MHz      | Config 1,4         | 10: N <sub>RB,c</sub> = 52  | 100: N <sub>RB,c</sub> = 66           |     |
|   |          | Config 2,5         | 10: N <sub>RB,c</sub> = 52  | 100: N <sub>RB,c</sub> = 66           |     |
|   |          | Config 3,6         | 40: N <sub>RB,c</sub> = 106 | 100: N <sub>RB,c</sub> = 66           |     |
| BWP BW                                    | MHz      | Config 1,4         | 10: N <sub>RB,c</sub> = 52  | 100: N <sub>RB,c</sub> = 66           |     |
|   |          | Config 2,5         | 10: N <sub>RB,c</sub> = 52  | 100: N <sub>RB,c</sub> = 66           |     |
|   |          | Config 3,6         | 40: N <sub>RB,c</sub> = 106 | 100: N <sub>RB,c</sub> = 66           |     |
| Data RBs allocated                        |          | Config 1,4         | 52                          | 66                                    |     |
|   |          | Config 2,5         | 52                          | 66                                    |     |
|   |          | Config 3,6         | 106                         | 66                                    |     |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |          | Config 1,2,3,4,5,6 | OP.1                        | OP.1                                  |     |
| PDSCH Reference measurement channel       |          | Config 1,4         | SR.1.1 FDD                  | -                                     |     |
|   |          | Config 2,5         | SR.1.1 TDD                  |                                       |     |
|   |          | Config 3,6         | SR2.1 TDD                   |                                       |     |
| RMSI CORESET Reference Channel            |          | Config 1,4         | CR.1.1 FDD                  | -                                     |     |
|   |          | Config 2,5         | CR.1.1 TDD                  |                                       |     |
|   |          | Config 3,6         | CR2.1 TDD                   |                                       |     |
| Dedicated CORESET Reference Channel       |          | Config 1,4         | CCR.1.1 FDD                 | -                                     |     |
|   |          | Config 2,5         | CCR.1.1 TDD                 |                                       |     |
|   |          | Config 3,6         | CCR.2.1 TDD                 |                                       |     |
| TDD configuration                         |          | Config 2,5         | TDDConf.1.1                 | TDDConf.3.1                           |     |
|   |          | Config 3,6         | TDDConf.2.1                 | TDDConf.3.1                           |     |
| Initial DL BWP                            |          | Config 1,2,3,4,5,6 | DLBWP.0.1                   | NA                                    |     |
| Initial UL BWP                            |          | Config 1,2,3,4,5,6 | ULBWP.0.1                   | NA                                    |     |
| Dedicated DL BWP                          |          | Config 1,2,3,4,5,6 | DLBWP.1.1                   | NA                                    |     |
| Dedicated UL BWP                          |          | Config 1,2,3,4,5,6 | ULBWP.1.1                   | NA                                    |     |
| SMTC configuration defined in A.3.11      |          | Config 1,4         | SMTC.2                      | SMTC.2                                |     |
|   |          | Config 2,3,5,6     | SMTC.1                      | SMTC.1                                |     |
| PDSCH/PDCCH subcarrier spacing            | kHz      | Config 1,2,4,5     | 15                          | 120                                   |     |
|   |          | Config 3,6         | 30                          | 120                                   |     |
| EPRE ratio of PSS to SSS                  |          | Config 1,2,3,4,5,6 | 0                           | 0                                     |     |
| EPRE ratio of PBCH DMRS to SSS            |          |                    |                             |                                       |     |
| EPRE ratio of PBCH to PBCH DMRS           |          |                    |                             |                                       |     |
| EPRE ratio of PDCCH DMRS to SSS           |          |                    |                             |                                       |     |
| EPRE ratio of PDCCH to PDCCH DMRS         |          |                    |                             |                                       |     |
| EPRE ratio of PDSCH DMRS to SSS           |          |                    |                             |                                       |     |
| EPRE ratio of PDSCH to PDSCH              |          |                    |                             |                                       |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |          |                    |                             |                                       |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |          |                    |                             |                                       |     |
| $\bar{E}_s$                               | dBm/S CS | Config 1,2,3,4,5,6 |                             | -Infinity                             | -87 |

|  |                               |                       |                                 |           |        |
|--|-------------------------------|-----------------------|---------------------------------|-----------|--------|
| SSB_RP <sup>Note 3</sup>   | dBm/S<br>CS<br>Note5          | Config<br>1,2,3,4,5,6 | Link only, see clause<br>A.3.7A | -Infinity | -87    |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note 8</sup>   | dB                            | Config<br>1,2,3,4,5,6 |                                 | -Infinity | 14.69  |
| $I_o$ <sup>Note3</sup>   | dBm/95<br>.04<br>MHz<br>Note5 | Config<br>1,2,3,4,5,6 |                                 | -Infinity | -58.01 |
| Propagation Condition  |                               | Config<br>1,2,3,4,5,6 |                                 | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: SS-RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 8: Calculation of <math>E_s/I_{ot\_BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_s</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                               |                       |                                 |           |        |

#### A.5.6.2.7.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 6720 for UE supporting power class 1, or
- 4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

#### A.5.6.2.8 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

##### A.5.6.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.8.1-1, A.5.6.2.8.1-2, and A.5.6.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.8.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.8.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.2.8.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2**

| <b>Config</b>  | <b>Description of serving cell</b>                            | <b>Description of target cell</b>                   |
|--|---|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 3  | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |   |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 6  | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| Note: The UE is only required to be tested in one of the supported test configurations |   |   |

**Table A.5.6.2.8.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |                                 |                                 |                                 | Comment   |
|---|------|--------------------|---|---------------------------------|---------------------------------|---------------------------------|---|
|   |      |                    | Test 1                                    | Test 2                          | Test 3                          | Test 4                          |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |                                 |                                 |                                 | One E-UTRAN TDD carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |                                 |                                 |                                 | One FR1 and one FR2 NR carrier frequency is used.                                       |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) |                                 |                                 |                                 | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |                                 |                                 |                                 | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 13                              |                                 |                                 | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 39  | 39                              |                                 |                                 |   |
| SMTC-SSB parameters on NR RF Channel 1          |      | Config 1,4         | SSB.1 FR1                                 |                                 |                                 |                                 | As specified in clause A.3.10.1   |
|   |      | Config 2,5         | SSB.1 FR1                                 |                                 |                                 |                                 | As specified in clause A.3.10.1   |
|   |      | Config 3,6         | SSB.2 FR1                                 |                                 |                                 |                                 | As specified in clause A.3.10.1   |
| SMTC-SSB parameters on NR RF Channel 2          |      | Config 1,2,3,4,5,6 | SSB.3 FR2                                 |                                 |                                 |                                 | As specified in clause A.3.10.2   |
| CSI-RS for tracking                             |      | Config 1,4         | TRS.1.1 FDD                               |                                 |                                 |                                 |   |
|   |      | Config 2,5         | TRS.1.1 TDD                               |                                 |                                 |                                 |   |
|   |      | Config 3,6         | TRS.1.2 TDD                               |                                 |                                 |                                 |   |
| <i>offsetMO</i>                                 | dB   | Config 1,2,3,4,5,6 | 6   |                                 |                                 |                                 |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |                                 |                                 |                                 |   |
| <i>a4-Threshold</i>                             | dBm  | Config 1,2,3,4,5,6 | -105                                      |                                 |                                 |                                 |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |                                 |                                 |                                 |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |                                 |                                 |                                 |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |                                 |                                 |                                 | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | DRX .1                                    | DRX .7                          | DRX .1                          | DRX .7                          | As specified in clause A.3.3  |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 μs                                      |                                 |                                 |                                 | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,4         | 3ms                                       |                                 |                                 |                                 | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2.     |
|   |      | Config 2,3,5,6     | 3μs                                       |                                 |                                 |                                 | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |                                 |                                 |                                 |   |
| T2  | s    | Config 1,2,3,4,5,6 | 11 for PC1;<br>6.5 for other PC           | 108 for PC1;<br>67 for other PC | 11 for PC1;<br>6.5 for other PC | 108 for PC1;<br>67 for other PC |   |

**Table A.5.6.2.8.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 | Unit | Test configuration | Cell 2                      |    | Cell 3                                |    |
|---|------|--------------------|-----------------------------|----|---------------------------------------|----|
|   |      |                    | T1                          | T2 | T1                                    | T2 |
| AoA setup                                 |      | Config 1,2,3,4,5,6 | NA                          |    | Setup 1 as specified in clause A.3.15 |    |
| Assumption for UE beams <sup>Note 7</sup> |      | Config 1,2,3,4,5,6 | N/A                         |    | Rough                                 |    |
| NR RF Channel Number                      |      | Config 1,2,3,4,5,6 | 1                           |    | 2                                     |    |
| Duplex mode                               |      | Config 1,4         | FDD                         |    | TDD                                   |    |
|   |      | Config 2,3,5,6     | TDD                         |    | TDD                                   |    |
| BW <sub>channel</sub>                     | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| BWP BW                                    | MHz  | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| Data RBs allocated                        |      | Config 1,4         | 52                          |    | 66                                    |    |
|   |      | Config 2,5         | 52                          |    | 66                                    |    |
|   |      | Config 3,6         | 106                         |    | 66                                    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |      | Config 1,2,3,4,5,6 | OP.1                        |    | OP.1                                  |    |
| PDSCH Reference measurement channel       |      | Config 1,4         | SR.1.1 FDD                  |    | -                                     |    |
|   |      | Config 2,5         | SR.1.1 TDD                  |    |                                       |    |
|   |      | Config 3,6         | SR2.1 TDD                   |    |                                       |    |
| RMSI CORESET Reference Channel            |      | Config 1,4         | CR.1.1 FDD                  |    | -                                     |    |
|   |      | Config 2,5         | CR.1.1 TDD                  |    |                                       |    |
|   |      | Config 3,6         | CR2.1 TDD                   |    |                                       |    |
| Dedicated CORESET Reference Channel       |      | Config 1,4         | CCR.1.1 FDD                 |    | -                                     |    |
|   |      | Config 2,5         | CCR.1.1 TDD                 |    |                                       |    |
|   |      | Config 3,6         | CCR.2.1 TDD                 |    |                                       |    |
| TDD configuration                         |      | Config 2,5         | TDDConf.1.1                 |    | TDDConf.3.1                           |    |
|   |      | Config 3,6         | TDDConf.2.1                 |    | TDDConf.3.1                           |    |
| Initial DL BWP                            |      | Config 1,2,3,4,5,6 | DLBWP.0.1                   |    | NA                                    |    |
| Initial UL BWP                            |      | Config 1,2,3,4,5,6 | ULBWP.0.1                   |    | NA                                    |    |
| Dedicated DL BWP                          |      | Config 1,2,3,4,5,6 | DLBWP.1.1                   |    | NA                                    |    |
| Dedicated UL BWP                          |      | Config 1,2,3,4,5,6 | ULBWP.1.1                   |    | NA                                    |    |
| SMTC configuration defined in A.3.11      |      | Config 1,4         | SMTC.2                      |    | SMTC.2                                |    |
|   |      | Config 2,3,5,6     | SMTC.1                      |    | SMTC.1                                |    |
| PDSCH/PDCCH subcarrier spacing            | kHz  | Config 1,2,4,5     | 15                          |    | 120                                   |    |
|   |      | Config 3,6         | 30                          |    | 120                                   |    |
| EPRE ratio of PSS to SSS                  |      | Config 1,2,3,4,5,6 | 0                           |    | 0                                     |    |
| EPRE ratio of PBCH DMRS to SSS            |      |                    |                             |    |                                       |    |
| EPRE ratio of PBCH to PBCH DMRS           |      |                    |                             |    |                                       |    |

|  |                        |                    |                                    |           |       |
|--|------------------------|--------------------|------------------------------------|-----------|-------|
| EPRE ratio of PDCCH DMRS to SSS  |                        |                    |                                    |           |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                        |                    |                                    |           |       |
| EPRE ratio of PDSCH DMRS to SSS  |                        |                    |                                    |           |       |
| EPRE ratio of PDSCH to PDSCH   |                        |                    |                                    |           |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                        |                    |                                    |           |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                        |                    |                                    |           |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz<br>Note5    |                    | NA<br>Link only, see clause A.3.7A | -104.7    |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS<br>Note4      | Config 1,2,4,5     |                                    | -95.7     |       |
|  |                        | Config 3,6         |                                    | -95.7     |       |
| SSB_RP <sup>Note 3</sup>   | dBm/S CS<br>Note5      | Config 1,2,4,5     |                                    | -Infinity | -86.7 |
|  |                        | Config 3,6         |                                    | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$   | dB                     | Config 1,2,3,4,5,6 |                                    | -Infinity | 9     |
| $\hat{E}_s / N_{oc}$   | dB                     | Config 1,2,3,4,5,6 |                                    | -Infinity | 9     |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz            | Config 1,2,4,5     |                                    | -         | -     |
|  | dBm/38.16MHz           | Config 3,6         |                                    | -         | -     |
|  | dBm/95.04 MHz<br>Note5 | Config 1,2,3,4,5,6 |                                    | -66.7     | -57.2 |
| Propagation Condition  |                        | Config 1,2,3,4,5,6 | AWGN                               |           |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                        |                    |                                    |           |       |

**A.5.6.2.8.2 Test Requirements**

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.3 L1-RSRP measurement for beam reporting

#### A.5.6.3.1 SSB based L1-RSRP measurement when DRX is not used

##### A.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.5.6.3.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

**Table A.5.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 3      | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 4      | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

##### A.5.6.3.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.1.2-1 and Table A.5.6.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.5.6.3.1.2-1: General test parameters

| Parameter   | Config | Unit | Value                  |     |  |      |
|---|--------|------|------------------------|-----|--|------|
| SSB GSCN  | 1~4    |      | freq1                  |     |  |      |
| Duplex mode   | 1~4    |      | TDD                    |     |  |      |
| TDD Configuration   | 1~4    |      | TDDConf.3.1            |     |  |      |
| $BW_{\text{channel}}$   | 1~4    | MHz  | 100: $N_{RB,c} = 66$   |     |  |      |
| Data RBs allocated  | 1~4    |      | 66                     |     |  |      |
| PDSCH Reference measurement channel   | 1,2    |      | SR.3.2 TDD             |     |  |      |
|   | 3,4    |      | SR.3.3 TDD             |     |  |      |
| RMSI CORESET Reference Channel  | 1,2    |      | CR.3.1 TDD             |     |  |      |
|   | 3,4    |      | CR.3.2 TDD             |     |  |      |
| Dedicated CORESET Reference Channel   | 1,2    |      | CCR.3.1 TDD            |     |  |      |
|   | 3,4    |      | CCR.3.7 TDD            |     |  |      |
| SSB configuration   | 1,2    |      | SSB.1 FR2              |     |  |      |
|   | 3,4    |      | SSB.2 FR2              |     |  |      |
| OCNG Patterns   | 1~4    |      | OP.1                   |     |  |      |
| Initial BWP Configuration   | 1~4    |      | DLBWP.0.1<br>ULBWP.0.1 |     |  |      |
| Dedicated BWP configuration   | 1~4    |      | DLBWP.1.3<br>ULBWP.1.3 |     |  |      |
| SMTC configuration  | 1~4    |      | SMTC.1                 |     |  |      |
| TRS Configuration   | 1~4    |      | TRS.2.1 TDD            |     |  |      |
| PDCCH/PDSCH TCI Configuration   | 1~4    |      | TCI.State.2            |     |  |      |
| DRX configuration   | 1~4    |      | Off                    |     |  |      |
| reportConfigType  | 1~4    |      | periodic               |     |  |      |
| reportQuantity  | 1~4    |      | ssb-Index-RSRP         |     |  |      |
| Number of reported RS   | 1~4    |      | 2                      |     |  |      |
| L1-RSRP reporting period  | 1~4    | slot | 320                    |     |  |      |
| T1  | 1~4    | s    | 5                      |     |  |      |
| T2  | 1~4    | s    | 2                      |     |  |      |
| EPRE ratio of PSS to SSS  | 1~4    | dB   | 0                      |     |  |      |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                        |     |  |      |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                        |     |  |      |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                        |     |  |      |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                        |     |  |      |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                        |     |  |      |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                        |     |  |      |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                        |     |  |      |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                        |     |  |      |
| Propagation condition   |        |      |                        | 1~4 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                        |     |  |      |



Table A.5.6.3.1.2-2: SSB specific test parameters

| Parameter   | Config | Unit         | SSB#0                         |        | SSB#1     |        |
|---|--------|--------------|-------------------------------|--------|-----------|--------|
|   |        |              | T1                            | T2     | T1        | T2     |
| Angle of arrival configuration  |        |              | Setup 1 according to A.3.15.1 |        |           |        |
| Assumption for UE beams <sup>Note 4</sup>   | 1~4    |              | Rough                         |        |           |        |
| $N_{oc}$ <sup>Note2</sup>   | 1~4    | dBm/15kHz    | -105                          |        |           |        |
| $N_{oc}$ <sup>Note2</sup>   | 1,2    | dBm/SSB SCS  | -96                           |        |           |        |
|   | 3,4    |              | -93                           |        |           |        |
| $\hat{E}_s / I_{ot}$  | 1~4    | dB           | 0                             | 0      | -Infinity | 9      |
| SSB RSRP <sup>Note3</sup>   | 1,2    | dBm/SSB SCS  | -96                           | -96    | -Infinity | -87    |
|   | 3,4    |              | -93                           | -93    | -Infinity | -84    |
| $I_o$ <sup>Note3</sup>  | 1,2    | dBm/95.04MHz | -63.97                        | -63.97 | -66.98    | -57.47 |
|   | 3,4    |              | -63.97                        | -63.97 | -66.98    | -57.47 |
| $\hat{E}_s / N_{oc}$  | 1~4    | dB           | 0                             | 0      | -Infinity | 9      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |        |           |        |

### A.5.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

### A.5.6.3.2 SSB based L1-RSRP measurement when DRX is used

#### A.5.6.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.5.6.3.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

**Table A.5.6.3.2.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 3      | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 4      | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.5.6.3.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.2.2-1 and Table A.5.6.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.5.6.3.2.2-1: General test parameters

| Parameter   | Config | Unit | Value                       |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1~4    |      | freq1                       |
| Duplex mode   | 1~4    |      | TDD                         |
| TDD Configuration   | 1~4    |      | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1~4    | MHz  | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated  | 1~4    |      | 66                          |
| PDSCH Reference measurement channel   | 1,2    |      | SR.3.2 TDD                  |
|   | 3,4    |      | SR.3.3 TDD                  |
| RMSI CORESET Reference Channel  | 1,2    |      | CR.3.1 TDD                  |
|   | 3,4    |      | CR.3.2 TDD                  |
| Dedicated CORESET Reference Channel   | 1,2    |      | CCR.3.1 TDD                 |
|   | 3,4    |      | CCR.3.7 TDD                 |
| SSB configuration   | 1,2    |      | SSB.1 FR2                   |
|   | 3,4    |      | SSB.2 FR2                   |
| OCNG Patterns   | 1~4    |      | OP.1                        |
| Initial BWP Configuration   | 1~4    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~4    |      | DLBWP.1.3<br>ULBWP.1.3      |
| SMTC configuration  | 1~4    |      | SMTC.1                      |
| TRS Configuration   | 1~4    |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1~4    |      | TCI.State.2                 |
| DRX configuration   | 1~4    |      | DRX.3                       |
| reportConfigType  | 1~4    |      | periodic                    |
| reportQuantity  | 1~4    |      | ssb-Index-RSRP              |
| Number of reported RS   | 1~4    |      | 2                           |
| L1-RSRP reporting period  | 1~4    | slot | 320                         |
| T1  | 1~4    | s    | 5                           |
| T2  | 1~4    | s    | 3                           |
| EPRE ratio of PSS to SSS  | 1~4    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| Propagation condition   |        |      |                             |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |

Table A.5.6.3.2.2-2: SSB specific test parameters

| Parameter  | Config | Unit         | SSB#0                         |        | SSB#1     |        |
|--|--------|--------------|-------------------------------|--------|-----------|--------|
|  |        |              | T1                            | T2     | T1        | T2     |
| Angle of arrival configuration   |        |              | Setup 1 according to A.3.15.1 |        |           |        |
| Assumption for UE beams <sup>Note 4</sup>  | 1~4    |              | Rough                         |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1~4    | dBm/15kHz    | -105                          |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2    | dBm/SSB SCS  | -96                           |        |           |        |
|  | 3,4    |              | -93                           |        |           |        |
| $\hat{E}_s / I_{ot}$   | 1~4    | dB           | 0                             | 0      | -Infinity | 9      |
| SSB RSRP <sup>Note3</sup>  | 1,2    | dBm/SSB SCS  | -96                           | -96    | -Infinity | -87    |
|  | 3,4    |              | -93                           | -93    | -Infinity | -84    |
| $I_o$ <sup>Note3</sup>   | 1,2    | dBm/95.04MHz | -63.97                        | -63.97 | -66.98    | -57.47 |
|  | 3,4    |              | -63.97                        | -63.97 | -66.98    | -57.47 |
| $\hat{E}_s / N_{oc}$   | 1~4    | dB           | 0                             | 0      | -Infinity | 9      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |        |              |                               |        |           |        |

### A.5.6.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

### A.5.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

#### A.5.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.5.6.3.3.1-1.

**Table A.5.6.3.3.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test**

| <b>Config</b>  | <b>Description</b>   |
|--|--|
| 1  | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.5.6.3.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.3.2-1 and Table A.5.6.3.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 480ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.3.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.5.6.3.3.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1~2    |      | freq1  |
| Duplex mode                                       | 1~2    |      | TDD  |
| TDD Configuration                                 | 1~2    |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>                             | 1~2    | MHz  | 100: N <sub>RB,C</sub> = 66                  |
| Data RBs allocated                                | 1~2    |      | 66   |
| PDSCH Reference measurement channel               | 1~2    |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel                    | 1~2    |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel               | 1~2    |      | CCR.3.1 TDD                                  |
| SSB configuration                                 | 1~2    |      | SSB.1 FR2                                    |
| CSI-RS configuration                              | 1~2    |      | CSI-RS.3.3 TDD                               |
| OCNG Patterns                                     | 1~2    |      | OP.1   |
| Initial BWP Configuration                         | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration                       | 1~2    |      | DLBWP.1.1<br>ULBWP.1.1                       |
| SMTc configuration                                | 1~2    |      | SMTc.1                                       |
| TRS Configuration                                 | 1~2    |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration                     | 1~2    |      | TCI.State.2                                  |
| DRX configuration                                 | 1~2    |      | Off  |
| reportConfigType                                  | 1~2    |      | aperiodic                                    |
| reportQuantity                                    | 1~2    |      | cri-RSRP                                     |
| Number of reported RS                             | 1~2    |      | 2  |
| qcl-Info  | 1~2    |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList                              | 1~2    |      | 8  |
| Propagation condition                             | 1~2    |      | AWGN   |
| T1  | 1~2    | s    | 5  |
| EPRE ratio of PSS to SSS                          | 1~2    | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |        |      |  |
| Note 1:   |        |      |  |

Table A.5.6.3.3.2-1: CSI-RS specific test parameters

| Parameter                                 | Config   | Unit         | CSI-RS#0                      | CSI-RS#1 |
|---|--|--------------|-------------------------------|----------|
| Angle of arrival configuration            | 1~2  |              | Setup 1 according to A.3.15.1 |          |
| Assumption for UE beams <sup>Note 4</sup> | 1~2  |              | Rough                         |          |
| $N_{oc}$ <sup>Note1</sup>                 | 1~2  | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>                 | 1~2  | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s / I_{ot}$                      | 1~2  | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note2</sup>              | 1~2  | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>                    | 1~2  | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s / N_{oc}$                      | 1~2  | dB           | 0                             | 9        |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                               |          |
| Note 3:                                   | CSI-RS RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |                               |          |
| Note 4:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |              |                               |          |

### A.5.6.3.3.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.6.3.3.3-1.

For relative accuracy of CSI-RS0 compared with CSI-RS1, the UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.5.6.3.3.3-1: L1-RSRP absolute accuracy test requirement

|         | Test requirement <sup>Notes1,2,3</sup>   |
|---------|--|
| CSI-RS0 | $CSI-RS\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP0 + \delta + G_{max}$  |
| CSI-RS1 | $CSI-RS\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP1 + \delta + G_{max}$  |
| Note 1: | CSI-RS_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the $I_o$ used in the test  |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                                  |

### A.5.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

#### A.5.6.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.5.6.3.4.1-1.

**Table A.5.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test**

| <b>Config</b>  | <b>Description</b>   |
|--|--|
| 1  | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.5.6.3.4.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.4.2-1 and Table A.5.6.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 1440ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.3.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.



Table A.5.6.3.4.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1~2    |      | freq1  |
| Duplex mode                                       | 1~2    |      | TDD  |
| TDD Configuration                                 | 1~2    |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>                             | 1~2    | MHz  | 100: N <sub>RB,C</sub> = 66                  |
| Data RBs allocated                                | 1~2    |      | 66   |
| PDSCH Reference measurement channel               | 1~2    |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel                    | 1~2    |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel               | 1~2    |      | CCR.3.1 TDD                                  |
| SSB configuration                                 | 1~2    |      | SSB.1 FR2                                    |
| CSI-RS configuration                              | 1~2    |      | CSI-RS.3.3 TDD                               |
| OCNG Patterns                                     | 1~2    |      | OP.1   |
| Initial BWP Configuration                         | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration                       | 1~2    |      | DLBWP.1.1<br>ULBWP.1.1                       |
| SMTc configuration                                | 1~2    |      | SMTc.1                                       |
| TRS Configuration                                 | 1~2    |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration                     | 1~2    |      | TCI.State.2                                  |
| DRX configuration                                 | 1~2    |      | DRX.3  |
| reportConfigType                                  | 1~2    |      | aperiodic                                    |
| reportQuantity                                    | 1~2    |      | cri-RSRP                                     |
| Number of reported RS                             | 1~2    |      | 2  |
| qcl-Info  | 1~2    |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList                              | 1~2    |      | 8  |
| Propagation condition                             | 1~2    |      | AWGN   |
| T1  | 1~2    | s    | 5  |
| EPRE ratio of PSS to SSS                          | 1~2    | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |        |      |  |
| Note 1:   |        |      |  |

Table A.5.6.3.4.2-1: CSI-RS specific test parameters

| Parameter                                 | Config   | Unit         | CSI-RS#0                      | CSI-RS#1 |
|---|--|--------------|-------------------------------|----------|
| Angle of arrival configuration            | 1~2  |              | Setup 1 according to A.3.15.1 |          |
| Assumption for UE beams <sup>Note 4</sup> | 1~2  |              | Rough                         |          |
| $N_{oc}$ <sup>Note1</sup>                 | 1~2  | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>                 | 1~2  | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s / I_{ot}$                      | 1~2  | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note2</sup>              | 1~2  | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>                    | 1~2  | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s / N_{oc}$                      | 1~2  | dB           | 0                             | 9        |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                               |          |
| Note 3:                                   | CSI-RS RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |                               |          |
| Note 4:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |              |                               |          |

### A.5.6.3.4.3 Test Requirements

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of [-10 ~ +20] dB.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.6.3.4.3-1.

For relative accuracy of CSI-RS0 compared with CSI-RS1, the UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.5.6.3.4.3-1: L1-RSRP absolute accuracy test requirement

|         | Test requirement <sup>Notes1,2,3</sup>   |
|---------|--|
| CSI-RS0 | $CSI-RS\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP0 + \delta + G_{max}$  |
| CSI-RS1 | $CSI-RS\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP1 + \delta + G_{max}$  |
| Note 1: | CSI-RS_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the $I_o$ used in the test  |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                                  |

## A.5.6.4 CLI measurements

### A.5.6.4.1 SRS-RSRP measurement with DRX

#### A.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 9.7.2.5 with the testing configurations for NR cells in Table A.5.6.4.1.1-1.

**Table A.5.6.4.1.1-1: Applicable NR configurations for FR2 SRS-RSRP test**

| Configuration | Description  |
|---------------|--|
| 1             | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |

#### A.5.6.4.1.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table A.5.6.4.1.2-1 ~ A.5.6.4.1.2-3 below and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table A.5.6.4.1.2-4 and the test parameters for the (virtual) neighbour cell UE in Table A.5.6.4.1.2-3. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

**Table A.5.6.4.1.2-1: General test parameters for SRS-RSRP event triggered reporting for PSCell in FR2**

| Parameter   | Unit | Test configuration | Value                           | Comment                  |
|---|------|--------------------|---------------------------------|--------------------------|
| Active cell   |      | 1                  | E-UTRAN Cell 1<br>and NR Cell 2 |                          |
| RF Channel Number   |      | 1                  | 1: Cell 1<br>2: Cell 2          |                          |
| SSB configuration   |      | 1                  | SSB.1 FR2                       |                          |
| SMTC configuration  |      | 1                  | SMTC.1                          |                          |
| SRS configuration   |      | 1                  | SRSCConf.1                      | Table A.5.6.4.1.2-4      |
| CP length   |      | 1                  | Normal                          |                          |
| i1-Threshold  | dBm  | 1                  | -103                            |                          |
| Hysteresis  | dB   | 1                  | 0                               |                          |
| Time To Trigger   | s    | 1                  | 0                               |                          |
| Filter coefficient  |      | 1                  | 0                               | L3 filtering is not used |
| DRX   | ms   | 1                  | DRX.11                          |                          |
| Time offset between DL from serving cell and SRS from test system | μs   | 1,2                | 10.67                           |                          |
| T1  | s    | 1                  | 5                               |                          |
| T2  | s    | 1                  | 1                               |                          |

**Table A.5.6.4.1.2-2: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell in FR2**

| Parameter                           | Unit | Test configuration | Cell 2              |    |
|-------------------------------------|------|--------------------|---------------------|----|
|                                     |      |                    | T1                  | T2 |
| TDD configuration                   |      | 1                  | TDDConf.3.1         |    |
| PDSCH RMC configuration             |      | 1                  | SR.3.1 TDD          |    |
| RMSI CORESET RMC configuration      |      | 1                  | CR.3.1 TDD          |    |
| Dedicated CORESET RMC configuration |      | 1                  | CCR.3.1 TDD         |    |
| OCNG Patterns                       |      | 1                  | OP.1                |    |
| TRS configuration                   |      |                    | TRS.2.1. TDD        |    |
| PDSCH/PDCCH TCI state               |      | 1                  | TCI.State.2         |    |
| Initial BWP configuration           |      | 1                  | DLBWP.0.1 ULBWP.0.1 |    |
| Active DL BWP configuration         |      | 1                  | DLBWP.1.1           |    |
| Active UL BWP configuration         |      | 1                  | ULBWP.1.1           |    |
| Propagation Condition               |      | 1                  | AWGN                |    |

**Table A.5.6.4.1.2-3: NR OTA Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell and Neighbour cell UE in FR2**

| Parameter                 | Unit   | Test configuration | Cell 2                   |        | Neighbour cell UE |        |
|---------------------------|--|--------------------|--------------------------|--------|-------------------|--------|
|                           |  |                    | T1                       | T2     | T1                | T2     |
| AoA setup                 |  | 1                  | Setup 1 defined A.3.15.1 |        |                   |        |
| Beam assumption<br>Note 4 |  | 1                  | Fine                     |        |                   |        |
| $N_{oc}$ Note 2           | dBm/15 kHz   | 1                  | -98                      |        | -98               |        |
| $N_{oc}$ Note 2           | dBm/SCS  | 1                  | -89                      |        | -89               |        |
| $\hat{E}_s / I_{ot}$      | dB   | 1                  | -                        | -      | -infinity         | 4      |
| $\hat{E}_s / N_{oc}$      | dB   | 1                  | -                        | -      | -infinity         | 4      |
| SRS-RSRP Note 3           | dBm/SCS kHz  | 1                  | -                        | -      | -infinity         | -94    |
| $I_o$                     | dBm/95.04 MHz  | 1                  | -70.01                   | -68.82 | -70.01            | -68.82 |
| Note 1:                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |                    |                          |        |                   |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |                          |        |                   |        |
| Note 3:                   | SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                    |                          |        |                   |        |
| Note 4:                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                    |                          |        |                   |        |

**Table A.5.6.4.1.2-4: SRS configuration for measurement reporting**

|                 | Field                               | SRSCnf.1          | Comments |
|-----------------|-------------------------------------|-------------------|----------|
| SRS-ResourceSet | srs-ResourceSetId                   | 0                 |          |
|                 | srs-ResourceIdList                  | 0                 |          |
|                 | resourceType                        | Periodic          |          |
|                 | Usage                               | Codebook          |          |
| SRS-Resource    | SRS-ResourceId                      | 0                 |          |
|                 | nrofSRS-Ports                       | Port1             |          |
|                 | transmissionComb                    | n2                |          |
|                 | combOffset-n2                       | 0                 |          |
|                 | cyclicShift-n2                      | 0                 |          |
|                 | resourceMapping<br>startPosition    | 0                 |          |
|                 | resourceMapping<br>nrofSymbols      | n1                |          |
|                 | resourceMapping<br>repetitionFactor | n1                |          |
|                 | freqDomainPosition                  | 0                 |          |
|                 | freqDomainShift                     | 0                 |          |
|                 | freqHopping<br>c-SRS                | 12                |          |
|                 | freqHopping<br>b-SRS                | 0                 |          |
|                 | freqHopping<br>b-hop                | 0                 |          |
|                 | groupOrSequenceHopping              | Neither           |          |
|                 | resourceType                        | Periodic          |          |
|                 | periodicityAndOffset                | sl160, 25         |          |
| sequenceld      | 0                                   | Any 10 bit number |          |

### A.5.6.4.1.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.4.2 CLI-RSSI measurement with DRX

#### A.5.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of CLI-RSSI measurement. This test will verify the CLI-RSSI measurement requirements in clause 9.7.3.5 with the testing configurations for NR cells in Table A.5.6.4.2.1-1.

**Table A.5.6.4.2.1-1: Applicable NR configurations for FR2 CLI-RSSI test**

| Configuration | Description  |
|---------------|--|
| 1             | NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |

#### A.5.6.4.2.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table A.5.6.4.2.2-1 ~ A.5.6.4.2.2-3 below and applicability for the E-UTRAN cell are defined in

A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI measurement resource and on 2 data symbols before. The CLI-RSSI measurement resource configuration is in Table A.5.6.4.2.2-4.

**Table A.5.6.4.2.2-1: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter   | Unit | Test configuration | Value                           | Comment                     |
|---|------|--------------------|---------------------------------|-----------------------------|
| Active cell   |      | 1                  | E-UTRAN Cell 1<br>and NR Cell 2 |                             |
| RF Channel Number   |      | 1                  | 1: Cell 1<br>2: Cell 2          |                             |
| SSB configuration   |      | 1                  | SSB.1 FR2                       |                             |
| SMTc configuration  |      | 1                  | SMTc.1                          |                             |
| CLI-RSSI configuration  |      | 1                  | CLI-RSSIConf.1                  | Table A.5.6.4.2.2-4         |
| CP length   |      | 1                  | Normal                          |                             |
| i1-Threshold  | dBm  | 1                  | -94.5                           |                             |
| Hysteresis  | dB   | 1                  | 0                               |                             |
| Time To Trigger   | s    | 1                  | 0                               |                             |
| Filter coefficient  |      | 1                  | 0                               | L3 filtering is not<br>used |
| DRX   |      | 1                  | DRX.11                          |                             |
| Time offset between DL from serving<br>cell and OCNG from test system | μs   | 1                  | 10.67                           |                             |
| T1  | s    | 1                  | 5                               |                             |
| T2  | s    | 1                  | 1                               |                             |

**Table A.5.6.4.2.2-2: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter  | Unit | Test configuration | Cell 2              |    |
|--|------|--------------------|---------------------|----|
|  |      |                    | T1                  | T2 |
| TDD configuration  |      | 1                  | TDDConf.3.1         |    |
| PDSCH RMC configuration  |      | 1                  | SR.3.1 TDD          |    |
| PUSCH parameters   |      | 1                  | N/A                 |    |
| RMSI CORESET RMC configuration   |      | 1                  | CR.3.1 TDD          |    |
| Dedicated CORESET RMC configuration                                    |      | 1                  | CCR.3.1 TDD         |    |
| OCNG Patterns <sup>Note 1</sup>  |      | 1                  | OP.1                |    |
| TRS configuration  |      |                    | TRS.2.1. TDD        |    |
| PDSCH/PDCCH TCI state  |      | 1                  | TCI.State.2         |    |
| Initial BWP configuration  |      | 1                  | DLBWP.0.1 ULBWP.0.1 |    |
| Active DL BWP configuration  |      | 1                  | DLBWP.1.1           |    |
| Active UL BWP configuration  |      | 1                  | ULBWP.1.1           |    |
| Propagation Condition  |      | 1                  | AWGN                |    |
| Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources. |      |                    |                     |    |

**Table A.5.6.4.2.2-3: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter  | Unit          | Test configuration | Cell 2                      |        |
|--|---------------|--------------------|-----------------------------|--------|
|  |               |                    | T1                          | T2     |
| AoA setup  |               | 1                  | Setup 1 defined in A.3.15.1 |        |
| Beam assumption <sup>Note 3</sup>  |               | 1                  | Fine                        |        |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>  | dBm/15 kHz    | 1                  | -119                        | -108   |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>  | dBm/SCS       | 1                  | -110                        | -99    |
| Io on CLI-RSSI measurement resource  | dBm/95.04 MHz | 1                  | -81.01                      | -70.01 |
| Io on CLI-RSSI measurement resource  | dBm/1.08 MHz  | 1                  | -100.46                     | -89.46 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |               |                    |                             |        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |               |                    |                             |        |
| Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  |               |                    |                             |        |

**Table A.5.6.4.2.2-4: CLI-RSSI measurement resource configuration for measurement reporting**

|               | Field                    | CLI-RSSICnf.1 |
|---------------|--------------------------|---------------|
| RSSI-Resource | rss-ResourceId           | 0             |
|               | rss-SCS                  | 120           |
|               | startPRB                 | 0             |
|               | nrofPRBs                 | 66            |
|               | startPosition            | 3             |
|               | nrofSymbols              | 11            |
|               | rss-PeriodicityAndOffset | sl160, 25     |

### A.5.6.4.2.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on  $I_o$ .

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.5.6.5 Measurements with autonomous gaps

### A.5.6.5.1 EN-DC inter-frequency CGI identification of NR neighbor cell in FR2

#### A.5.6.5.1.1 Test Purpose and Environment

This test is to verify the requirement for identification of a new CGI of NR cell with autonomous gaps in clause 9.11.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.5.1.1-1, A.5.6.5.1.1-2, and A.5.6.5.1.1-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of cell 3. Starting T2, cell 3 becomes detectable and the UE is expected to detect and send a measurement report with SSB index. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Gap pattern configuration with id #0 is configured before T2 begins to enable inter-frequency monitoring.

A RRC message implying SI reading with autonomous gap shall be sent to the UE during period T2, within 3s after the UE has reported Event A3. The RRC message shall create a measurement report configuration with *reportCGI* and *useAutonomousGaps-r16* setup. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading is sent to the UE. Measurement gaps shall be deconfigured before the start of T3.

PDCCHs indicating new transmissions shall be sent continuously to ensure that the UE would have ACK/NACK sending during identifying a new CGI of NR cell.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.5.1.1-1.

**Table A.5.6.5.1.1-1 Supported test configurations for EN-DC inter-frequency CGI identification of NR neighbor cell in FR2**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                     |
| 2       | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                     |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |



**Table A.5.6.5.1.1-2: General test parameters for EN-DC inter-frequency CGI identification of NR neighbor cell in FR2**

| Parameter                                       | Unit | Test configuration | Value                                     | Comment  |
|---|------|--------------------|---|--|
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1   | One E-UTRAN TDD carrier frequencies is used.   |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2                                      | Two FR1 NR carrier frequencies is used.  |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 (PScell) | LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3                                 | NR cell 3 is on NR RF channel number 2.  |
| Gap Pattern Id                                  |      | Config 1,2         | 0   | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2         | 39  |  |
| SMTC-SSB parameters                             |      | Config 1,2         | SSB.3 FR2                                 | As specified in clause A.3.10.2  |
| A3-Offset                                       | dB   | Config 1,2         | [-30]                                     |  |
| Hysteresis                                      | dB   | Config 1,2         | 0   |  |
| CP length                                       |      | Config 1,2         | Normal                                    |  |
| TimeToTrigger                                   | s    | Config 1,2         | 0   |  |
| Filter coefficient                              |      | Config 1,2         | 0   | L3 filtering is not used   |
| DRX   |      | Config 1,2         | OFF                                       | DRX is not used  |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 $\mu$ s                                 | Synchronous EN-DC  |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3 $\mu$ s                                 | Synchronous cells.   |
| T1  | s    | Config 1,2         | 5   |  |
| T2  | s    | Config 1,2         | 7 for PC1; 4.5 for other PC               |  |
| T3  | s    | Config 1,2         | 5   |  |

**Table A.5.6.5.1.1-3: Cell specific test parameters for EN-DC inter-frequency CGI identification of NR neighbor cell in FR2**

| Parameter   | Unit | Test configuration | Cell 2                      |        | Cell 3                      |        |
|---|------|--------------------|-----------------------------|--------|-----------------------------|--------|
|   |      |                    | T1                          | T2, T3 | T1                          | T2, T3 |
| NR RF Channel Number  |      | Config 1,2         | 1                           |        | 2                           |        |
| Duplex mode   |      | Config 1,2         | TDD                         |        | TDD                         |        |
| BW <sub>channel</sub>   | MHz  | Config 1,2         | 100: N <sub>RB,c</sub> = 66 |        | 100: N <sub>RB,c</sub> = 66 |        |
| BWP BW  | MHz  | Config 1,2         | 100: N <sub>RB,c</sub> = 66 |        | 100: N <sub>RB,c</sub> = 66 |        |
| TDD configuration   |      | Config 1,2         | TDDConf.3.1                 |        | TDDConf.3.1                 |        |
| Initial DL BWP  |      | Config 1,2         | DLBWP.0.1                   |        | NA                          |        |
| Initial UL BWP  |      | Config 1,2         | DLBWP.0.1                   |        |                             |        |
| Dedicated DL BWP  |      | Config 1,2         | DLBWP.1.1                   |        | NA                          |        |
| Dedicated UL BWP  |      | Config 1,2         | ULBWP.1.1                   |        | NA                          |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)   |      | Config 1,2         | OP.1                        |        | OP.1                        |        |
| PDSCH Reference measurement channel   |      | Config 1,2         | SR.3.1 TDD                  |        | -                           |        |
| CORESET Reference Channel   |      | Config 1,2         | CR.3.1 TDD                  |        | -                           |        |
| RMSI scheduling periodicity   | ms   | Config 1,2         | NA                          |        | 40                          |        |
| TRS configuration   |      | Config 1,2         | TRS.2.1 TDD                 |        | NA                          |        |
| TCI configuration   |      | Config 1,2         | CSI-RS.Config.0             |        | NA                          |        |
| SMTC configuration defined in A.3.11  |      | Config 1,2         | SMTC.1                      |        | SMTC.1                      |        |
| PDSCH/PDCCH subcarrier spacing  | kHz  | Config 1,2         | 120                         |        | 120                         |        |
| EPRE ratio of PSS to SSS  |      | Config 1,2         | 0                           |        | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS  |      |                    |                             |        |                             |        |
| EPRE ratio of PBCH to PBCH DMRS   |      |                    |                             |        |                             |        |
| EPRE ratio of PDCCH DMRS to SSS   |      |                    |                             |        |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                    |                             |        |                             |        |
| EPRE ratio of PDSCH DMRS to SSS   |      |                    |                             |        |                             |        |
| EPRE ratio of PDSCH to PDSCH  |      |                    |                             |        |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |      |                    |                             |        |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                    |                             |        |                             |        |
| Propagation Condition   |      |                    |                             |        |                             |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                    |                             |        |                             |        |

**Table A.5.6.5.1.1-4: OTA cell specific test parameters for EN-DC inter-frequency CGI identification of NR neighbor cell in FR2**

| Parameter                                 | Unit   | Config     | Cell 2                      |        | Cell 3    |        |
|---|--|------------|-----------------------------|--------|-----------|--------|
|   |  |            | T1                          | T2, T3 | T1        | T2, T3 |
| AoA setup                                 |  | Config 1,2 | Setup 1 defined in A.3.15.1 |        |           |        |
| Assumption for UE beams <sup>Note 4</sup> |  | Config 1,2 | Rough                       |        | Rough     |        |
| $\hat{E}_s / I_{ot}$                      | dB   | Config 1,2 | 4                           | 4      | -Infinity | -3     |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/15 KHz   | Config 1,2 | -102                        |        |           |        |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/SCS  | 1, 2       | -93                         |        |           |        |
| SS-RSRP                                   | dBm/SCS  | 1, 2       | -89                         | -89    | -Infinity | -96    |
| $\hat{E}_s / N_{oc}$                      | dB   | 1~4        | 4                           | 4      | -Infinity | -3     |
| $I_o$                                     | dBm/95.04MHz   | 1~4        | -58.56                      |        | -62.25    |        |
| Note 1:                                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |            |                             |        |           |        |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |            |                             |        |           |        |
| Note 3:                                   | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |            |                             |        |           |        |
| Note 4:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  |            |                             |        |           |        |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |            |                             |        |           |        |

### A.5.6.5.1.2 Test Requirements

The UE shall transmit a measurement report containing the cell global identifier of cell 3 within 775 milliseconds from the start of T3.

Test requirement = RRC Procedure delay +  $T_{identify\_CGI}$  + processing time for FR2 + reporting delay

= 10 + (25\*20 + 6\*40) + 20 + 2ms from the start of T3

= 772 ms, allow 775 ms.

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 775 ms the number of interrupted slots shall not exceed the allowed number as defined in clause 8.2.1.2.16.

The maximum number of interrupted slots allowed is  $6*48 + 12*49 = 876$ .

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.5.6.6 L1-SINR measurement for beam reporting

### A.5.6.6.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured when DRX is used

#### A.5.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.1, with the testing configurations for NR cells in Table A.5.6.6.1.1-1.

**Table A.5.6.6.1.1-1: Applicable NR configurations for FR2 CSI-RS based L1-SINR test**

| <b>Config</b>  | <b>Description</b>   |
|--|--|
| 1  | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.5.6.6.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.6.1.2-1 and Table A.5.6.6.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. After 480ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.6.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.5.6.6.1.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1~2    |      | freq1  |
| Duplex mode   | 1~2    |      | TDD  |
| TDD Configuration   | 1~2    |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>   | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66                  |
| PDSCH Reference measurement channel   | 1~2    |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel  | 1~2    |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel   | 1~2    |      | CCR.3.1 TDD                                  |
| SSB configuration   | 1~2    |      | SSB.1 FR2                                    |
| CSI-RS configuration  | 1~2    |      | CSI-RS.3.3 TDD                               |
| OCNG Patterns   | 1~2    |      | OP.1   |
| Initial BWP Configuration   | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration   | 1~2    |      | DLBWP.1.3<br>ULBWP.1.3                       |
| SMTC configuration  | 1~2    |      | SMTC.1                                       |
| TRS Configuration   | 1~2    |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration   | 1~2    |      | TCI.State.2                                  |
| DRX configuration   | 1~2    |      | DRX.3  |
| reportConfigType  | 1~2    |      | aperiodic                                    |
| reportQuantity-r16  | 1~2    |      | cri-SINR-r16                                 |
| Number of reported RS   | 1~2    |      | 2  |
| qcl-Info  | 1~2    |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList  | 1~2    |      | 26   |
| Propagation condition   | 1~2    |      | AWGN   |
| T1  | 1~2    | s    | 5  |
| EPRE ratio of PSS to SSS  | 1~2    | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS  |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |  |

Table A.5.6.6.1.2-1: CSI-RS specific test parameters

| Parameter  | Config | Unit         | CSI-RS#0                      | CSI-RS#1 |
|--|--------|--------------|-------------------------------|----------|
| Angle of arrival configuration   | 1~2    |              | Setup 1 according to A.3.15.1 |          |
| Beam assumption <sup>Note 3</sup>  | 1~2    |              | Rough                         |          |
| $N_{oc}$ <sup>Note1</sup>  | 1~2    | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>  | 1~2    | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s/I_{ot}$   | 1~2    | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note2</sup>   | 1~2    | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>   | 1~2    | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s/N_{oc}$   | 1~2    | dB           | 0                             | 9        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |          |

### A.5.6.6.1.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.28.1.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.5.6.6.2 L1-SINR measurement with SSB based CMR and dedicated IMR when DRX is not used

#### A.5.6.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.2, with the testing configurations for NR cells in Table A.5.6.6.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

**Table A.5.6.6.2.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 3      | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 4      | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.5.6.6.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.6.2.2-1 and Table A.5.6.6.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the SSBs and the associated CSI-RS resources, and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD measurements based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

Table A.5.6.6.2.2-1: General test parameters

| Parameter   | Config | Unit | Value                  |
|---|--------|------|------------------------|
| SSB GSCN  | 1~4    |      | freq1                  |
| Duplex mode   | 1~4    |      | TDD                    |
| TDD Configuration   | 1~4    |      | TDDConf.3.1            |
| $BW_{channel}$  | 1~4    | MHz  | 100: $N_{RB,c} = 66$   |
| PDSCH Reference measurement channel   | 1~4    |      | SR.3.1 TDD             |
| RMSI CORESET Reference Channel  | 1~4    |      | CR.3.1 TDD             |
| Dedicated CORESET Reference Channel   | 1~4    |      | CCR.3.1 TDD            |
| SSB configuration   | 1,2    |      | SSB.1 FR2              |
|   | 3,4    |      | SSB.2 FR2              |
| CSI-RS configuration  | 1~4    |      | CSI-RS.3.1A TDD        |
| OCNG Patterns   | 1~4    |      | OP.1                   |
| Initial BWP Configuration   | 1~4    |      | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration   | 1~4    |      | DLBWP.1.3<br>ULBWP.1.3 |
| SMTc configuration  | 1~4    |      | SMTc.1                 |
| TRS Configuration   | 1~4    |      | TRS.2.1 TDD            |
| PDCCH/PDSCH TCI Configuration   | 1~4    |      | TCI.State.2            |
| DRX configuration   | 1~4    |      | off                    |
| reportConfigType  | 1~4    |      | periodic               |
| reportQuantity-r16  | 1~4    |      | ssb-Index-SINR-r16     |
| Number of reported RS   | 1~4    |      | 2                      |
| L1-SINR reporting period  | 1~4    | slot | 640                    |
| T1  | 1~4    | s    | 5                      |
| T2  | 1~4    | s    | 3                      |
| EPRE ratio of PSS to SSS  | 1~4    | dB   | 0                      |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                        |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                        |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                        |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                        |
| Propagation condition   | 1~4    |      | AWGN                   |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                        |



Table A.5.6.6.2.2-2: SSB specific test parameters

| Parameter   | Config | Unit         | SSB#0                         |        | SSB#1     |       |
|---|--------|--------------|-------------------------------|--------|-----------|-------|
|   |        |              | T1                            | T2     | T1        | T2    |
| Angle of arrival configuration  |        |              | Setup 1 according to A.3.15.1 |        |           |       |
| Beam assumption <sup>Note 4</sup>   |        |              | Rough                         |        |           |       |
| $N_{oc}$ <sup>Note2</sup>   | 1~4    | dBm/15kHz    | -105                          |        |           |       |
| $N_{oc}$ <sup>Note2</sup>   | 1,2    | dBm/SSB SCS  | -96                           |        |           |       |
|   | 3,4    |              | -93                           |        |           |       |
| $\hat{E}_s/I_{ot}$  | 1~4    | dB           | 0                             | 0      | -Infinity | 9     |
| SSB RSRP <sup>Note3</sup>   | 1,2    | dBm/SSB SCS  | -96                           | -96    | -Infinity | -87   |
|   | 3,4    |              | -93                           | -93    | -Infinity | -84   |
| $I_o$ <sup>Note3</sup>  | 1,2    | dBm/95.04MHz | -63.97                        | -63.97 | -67       | -57.5 |
|   | 3,4    |              | -63.97                        | -63.97 | -67       | -57.5 |
| $\hat{E}_s/N_{oc}$  | 1~4    | dB           | 0                             | 0      | -Infinity | 9     |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |        |           |       |

Table A.5.6.6.2.2-3: CSI-RS specific test parameters

| Parameter  | Config | Unit            | CSI-RS#0                      |        | CSI-RS#1  |       |
|--|--------|-----------------|-------------------------------|--------|-----------|-------|
|  |        |                 | T1                            | T2     | T1        | T2    |
| Angle of arrival configuration   |        |                 | Setup 1 according to A.3.15.1 |        |           |       |
| Beam assumption <sup>Note 4</sup>  |        |                 | Rough                         |        |           |       |
| $N_{oc}$ <sup>Note2</sup>  | 1~4    | dBm/15kHz       | -105                          |        |           |       |
| $N_{oc}$ <sup>Note2</sup>  | 1~4    | dBm/CSI-RS SCS  | -96                           |        |           |       |
| $\hat{E}_s/I_{ot}$   | 1~4    | dB              | 0                             | 0      | -Infinity | 9     |
| $\hat{E}_s/N_{oc}$   | 1~4    | dB              | 0                             | 0      | -Infinity | 9     |
| CSI-RS RSRP <sup>Note3</sup>   | 1~4    | dBm/ CSI-RS SCS | -96                           | -96    | -Infinity | -87   |
| $I_o$ <sup>Note3</sup>   | 1~4    | dBm/95.04MHz    | -63.97                        | -63.97 | -67       | -57.5 |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |                 |                               |        |           |       |

### A.5.6.6.2.3 Test Requirements

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2, 3 or 4.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.5.6.6.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR configured when DRX is not used

#### A.5.6.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with CSI-RS based CMR and dedicated IMR configured in clause 9.8.4.3, with the testing configurations for NR cells in Table A.5.6.6.3.1-1.

**Table A.5.6.6.3.1-1: Applicable NR configurations for FR2 L1-SINR test with CMR and dedicated IMR**

| Config   | Description   |
|--|---|
| 1  | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

#### A.5.6.6.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.6.3.2-1 and Table A.5.6.6.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the configured CSI-RS as CMR and an associated CSI-IM as IMR, and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources and the associated IMR. UE is also configured to measure L1-SINR based on SSB. After 480ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.6.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs, and UE is configured to perform L1-SINR measurement based on the CSI-RS as CMR and the CSI-IM as IMR.

Table A.5.6.3.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1~2    |      | freq1  |
| Duplex mode   | 1~2    |      | TDD  |
| TDD Configuration   | 1~2    |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>   | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66                  |
| PDSCH Reference measurement channel   | 1~2    |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel  | 1~2    |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel   | 1~2    |      | CCR.3.1 TDD                                  |
| SSB configuration   | 1~2    |      | SSB.1 FR2                                    |
| CSI-RS configuration  | 1~2    |      | CSI-RS.3.3 TDD                               |
| CSI-IM configuration  | 1~2    |      | CSI-IM.3.2 TDD                               |
| OCNG Patterns   | 1~2    |      | OP.1   |
| Initial BWP Configuration   | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration   | 1~2    |      | DLBWP.1.3<br>ULBWP.1.3                       |
| SMTc configuration  | 1~2    |      | SMTc.1                                       |
| TRS Configuration   | 1~2    |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration   | 1~2    |      | TCI.State.2                                  |
| DRX configuration   | 1~2    |      | Off  |
| reportConfigType  | 1~2    |      | aperiodic                                    |
| reportQuantity-r16  | 1~2    |      | cri-SINR-r16                                 |
| Number of reported RS   | 1~2    |      | 2  |
| qcl-Info  | 1~2    |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList  | 1~2    |      | 26   |
| T1  | 1~2    | s    | 5  |
| EPRE ratio of PSS to SSS  | 1~2    | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS  |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |  |
| Propagation condition   | 1~2    |      | AWGN   |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |  |

Table A.5.6.6.3.2-2: CSI-RS specific test parameters

| Parameter  | Config | Unit         | CSI-RS#0                      | CSI-RS#1 |
|--|--------|--------------|-------------------------------|----------|
| Angle of arrival configuration   | 1~2    |              | Setup 1 according to A.3.15.1 |          |
| Assumption for UE beams <sup>Note 3</sup>  | 1~2    |              | Rough                         |          |
| $N_{oc}$ <sup>Note1</sup>  | 1~2    | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>  | 1~2    | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s / I_{ot}$   | 1~2    | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note2</sup>   | 1~2    | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>   | 1~2    | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s / N_{oc}$   | 1~2    | dB           | 0                             | 9        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |          |

### A.5.6.6.3.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR while meeting the accuracy requirements defined in clause 10.1.28.3. The reported L1-SINR value shall consider the Rx antenna gain in the range of [-10 ~ +20] dB when calculated.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

## A.5.6.7 CSI-RS based Intra-frequency Measurements

### A.5.6.7.1 EN-DC event triggered reporting test without gap under non-DRX

#### A.5.6.7.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification requirements in clause e. Supported test configurations are shown in table A.5.6.7.1.1-1.

Table 5.6.7.1.1-1: supported test configurations

| Configuration   | Description   |
|---|---|
| 1   | LTE FDD, 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD, 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.7.1.1-2, A.5.6.7.1.1-3 and A.5.6.7.1.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

**Table A.5.6.7.1.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter                             | Unit | Config | Value                                     | Comment   |
|---------------------------------------|------|--------|---|---|
| Active cell                           |      | 1,2    | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) |   |
| Neighbour cell                        |      | 1,2    | Cell 3                                    | Cell to be identified.  |
| RF Channel Number                     |      | 1,2    | 1: Cell 1<br>2: Cell 2 and Cell 3         | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTC configuration                    |      | 1,2    | SMTC.1                                    |   |
| A3-Offset                             | dB   | 1,2    | -6  |   |
| CP length                             |      | 1,2    | Normal                                    |   |
| Hysteresis                            | dB   | 1,2    | 0   |   |
| Time To Trigger                       | s    | 1,2    | 0   |   |
| Filter coefficient                    |      | 1,2    | 0   | L3 filtering is not used  |
| DRX                                   |      | 1,2    | OFF                                       |   |
| Time offset between Cell 1 and Cell 2 | μs   | 1,2    | 3   | Synchronous EN-DC   |
| Time offset between Cell 2 and Cell 3 | μs   | 1,2    | 0.58                                      | Synchronous cells   |
| T1                                    | s    | 1,2    | 5   |   |
| T2                                    | s    | 1,2    | 5   |   |

**Table A.5.6.7.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter                           | Unit | Config | Cell 2                      |    | Cell 3                      |    |
|-------------------------------------|------|--------|-----------------------------|----|-----------------------------|----|
|                                     |      |        | T1                          | T2 | T1                          | T2 |
| TDD configuration                   |      | 1,2    | TDDConf.3.1                 |    | TDDConf.3.1                 |    |
| BW <sub>channel</sub>               | MHz  | 1,2    | 100: N <sub>RB,c</sub> = 66 |    | 100: N <sub>RB,c</sub> = 66 |    |
| Initial BWP configuration           |      | 1,2    | DLBWP.0.1<br>ULBWP.0.1      |    | DLBWP.0.1<br>ULBWP.0.1      |    |
| Active DL BWP configuration         |      | 1,2    | DLBWP.1.1                   |    | DLBWP.1.1                   |    |
| Active UL BWP configuration         |      | 1,2    | ULBWP.1.1                   |    | ULBWP.1.1                   |    |
| RLM-RS                              |      | 1,2    | SSB                         |    | SSB                         |    |
| PDSCH RMC configuration             |      | 1,2    | SR.3.1 TDD                  |    | N/A                         |    |
| RMSI CORESET RMC configuration      |      | 1,2    | CR.3.1 TDD                  |    | CR.3.1 TDD                  |    |
| Dedicated CORESET RMC configuration |      | 1,2    | CCR.3.1 TDD                 |    | CCR.3.1 TDD                 |    |
| OCNG Patterns                       |      | 1,2    | OP.1                        |    | OP.1                        |    |
| TRS configuration                   |      | 1,2    | TRS.2.1 TDD                 |    | N/A                         |    |
| PDSCH/PDCCH TCI state               |      | 1,2    | TCI.State.2                 |    | N/A                         |    |
| SMTC configuration                  |      | 1, 2   | SMTC.1                      |    | SMTC.1                      |    |
| SSB configuration                   |      | 1,2    | SSB.3 FR2                   |    | SSB.3 FR2                   |    |
| CSI-RS RRM configuration            |      | 1,2    | CSI-RS.RRM.FR2.1<br>TDD     |    | CSI-RS.RRM.FR2.1<br>TDD     |    |
| Propagation Condition               |      | 1,2    | AWGN                        |    |                             |    |

**Table A.5.6.7.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter                                 | Unit   | Config | Cell 2                      |     | Cell 3      |     |
|---|--|--------|-----------------------------|-----|-------------|-----|
|   |  |        | T1                          | T2  | T1          | T2  |
| AoA setup                                 |  | 1,2    | Setup 3 defined in A.3.15.3 |     |             |     |
|   |  |        | <b>AoA1</b>                 |     | <b>AoA2</b> |     |
| Assumption for UE beams <sup>Note 4</sup> |  | 1,2    | Rough                       |     | Rough       |     |
| $\hat{E}_s/I_{ot}$                        | dB   | 1,2    | 4                           | 4   | -Infinity   | 8   |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/15 KHz   | 1,2    | -102                        |     |             |     |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/SCS  | 1,2    | -93                         |     |             |     |
| SS-RSRP                                   | dBm/SCS  | 1,2    | -89                         | -89 | -Infinity   | -85 |
| CSI-RSRP                                  | dBm/SCS  | 1,2    | -89                         | -89 | -Infinity   | -85 |
| $\hat{E}_s/N_{oc}$                        | dB   | 1,2    | 4                           | 4   | -Infinity   | 8   |
| $I_o$                                     | dBm/95.04MHz   | 1,2    | -58.56                      |     | -55.38      |     |
| Note 1:                                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |        |                             |     |             |     |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |        |                             |     |             |     |
| Note 3:                                   | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |        |                             |     |             |     |
| Note 4:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  |        |                             |     |             |     |

### A.5.6.7.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,
- 2.16s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test in order to detect associated SSB for the CSI-RS resource of Cell 3.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.5.6.8 CSI-RS based Inter-frequency Measurements

### A.5.6.8.1 EN-DC event triggered reporting tests for NR FR2 cell when DRX is used

#### A.5.6.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.10.3.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.8.1.1-1, A. 5.6.5.1.1-2, and A.5.6.8.1.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.8.1.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A. 5.6.5.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.8.1.1-1.

**Table A.5.6.8.1.1-1 EN-DC event triggered reporting tests for FR2-FR2**

| Config   | Description  |
|--|--|
| 1  | LTE FDD, 120 kHz SSB SCS, 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD, 120 kHz SSB SCS, 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |
| Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell           |  |

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.8.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection with DRX**

| Parameter                                       | Unit | Test configuration | Value                                     |                                 | Comment   |
|---|------|--------------------|---|---------------------------------|---|
|   |      |                    | Test 1                                    | Test 3                          |   |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1   |                                 | One E-UTRAN TDD carrier frequencies is used.  |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2                                      |                                 | Two FR2 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 (PScell) |                                 | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3                                 |                                 | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2         | 0   | 13                              | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2         | 39  | 39                              |   |
| SMTC-SSB parameters                             |      | Config 1,2         | SSB.3 FR2                                 |                                 | As specified in clause A.3.10.2   |
| A3-Offset                                       | dB   | Config 1,2         | -6  |                                 |   |
| Hysteresis                                      | dB   | Config 1,2         | 0   |                                 |   |
| CP length                                       |      | Config 1,2         | Normal                                    |                                 |   |
| TimeToTrigger                                   | s    | Config 1,2         | 0   |                                 |   |
| Filter coefficient                              |      | Config 1,2         | 0   |                                 | L3 filtering is not used  |
| DRX   |      | Config 1,2         | DRX.1                                     |                                 | As specified in clause A.3.3.3  |
| Time offset between PCell and PScell            | µs   | Config 1,2         | 3   |                                 | Synchronous EN-DC   |
| Time offset between serving and neighbour cells | µs   | Config 1,2         | 0.58                                      |                                 | Synchronous cells   |
| T1  | s    | Config 1,2         | 5   |                                 |   |
| T2  | s    | Config 1,2         | 11 for PC1;<br>6.5 for other PC           | 11 for PC1;<br>6.5 for other PC |   |

**Table A.5.6.8.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 | Unit                   | Test configuration | Cell 2                                |    | Cell 3                      |    |
|---|------------------------|--------------------|---------------------------------------|----|-----------------------------|----|
|   |                        |                    | T1                                    | T2 | T1                          | T2 |
| AoA setup                                 |                        | Config 1,2         | Setup 1 as specified in clause A.3.15 |    |                             |    |
| Assumption for UE beams <sup>Note 7</sup> |                        | Config 1,2         | Rough                                 |    | Rough                       |    |
| NR RF Channel Number                      |                        | Config 1,2         | 1                                     |    | 2                           |    |
| Duplex mode                               |                        | Config 1,2         | TDD                                   |    | TDD                         |    |
| BW <sub>channel</sub>                     | MHz                    | Config 1,2         | 10: N <sub>RB,c</sub> = 66            |    | 100: N <sub>RB,c</sub> = 66 |    |
| BWP BW                                    | MHz                    | Config 1,2         | 10: N <sub>RB,c</sub> = 66            |    | 100: N <sub>RB,c</sub> = 66 |    |
| TDD configuration                         |                        | Config 1,2         | TDDConf.3.1                           |    | TDDConf.3.1                 |    |
| Initial DL BWP                            |                        | Config 1,2         | DLBWP.0.1                             |    | NA                          |    |
| Initial UL BWP                            |                        | Config 1,2         | ULBWP.0.1                             |    | NA                          |    |
| Dedicated DL BWP                          |                        | Config 1,2         | DLBWP.1.1                             |    | NA                          |    |
| Dedicated UL BWP                          |                        | Config 1,2         | ULBWP.1.1                             |    | NA                          |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                        | Config 1,2         | OP.1                                  |    | OP.1                        |    |
| PDSCH Reference measurement channel       |                        | Config 1,2         | SR.3.1 TDD                            |    | -                           |    |
| PDSCH/PDCCH subcarrier spacing            | kHz                    | Config 1,2         | 120                                   |    | 120                         |    |
| CORESET Reference Channel                 |                        | Config 1,2         | CR.3.1 TDD                            |    | -                           |    |
| TRS configuration                         |                        | Config 1,2         | TRS.2.1 TDD                           |    | NA                          |    |
| TCI configuration                         |                        | Config 1,2         | CSI-RS.Config.0                       |    | NA                          |    |
| SMTTC configuration defined in A.3.11     |                        | Config 1,2         | SMTTC.1                               |    | SMTTC.1                     |    |
| CSI-RS RRM configuration                  |                        | Config 1,2         | CSI-RS.RRM.FR2.1 TDD                  |    | CSI-RS.RRM.FR2.1 TDD        |    |
| firstOFDMSymbolInTimeDomain               |                        | Config 1,2         | 7                                     |    | 12                          |    |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/1<br>5kHz<br>Note5 |                    | -104.7                                |    | -104.7                      |    |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/S<br>CS<br>Note4   | Config 1,2         | -95.7                                 |    | -95.7                       |    |



|   |  |                       |       |       |           |       |
|---|--|-----------------------|-------|-------|-----------|-------|
| CSI-RSRP <sup>Note 3</sup>  | dBm/S<br>CS<br><sup>Note5</sup>          | Config 1,2            | -89.7 | -89.7 | -Infinity | -86.7 |
| SS-RSRP <sup>Note 3</sup>   | dBm/S<br>CS<br><sup>Note5</sup>          | Config 1,2            | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$  | dB                                       | Config 1,2            | 6     | 6     | -Infinity | 9     |
| $\hat{E}_s / N_{oc}$  | dB                                       | Config 1,2            | 6     | 6     | -Infinity | 9     |
| $I_o$ <sup>Note3</sup>  | dBm/9<br>5.04<br>MHz<br><sup>Note5</sup> | Config 1,2            | -59.7 | -59.7 | -66.7     | -57.2 |
| Propagation Condition   |  | Config<br>1,2,3,4,5,6 | AWGN  |       |           |       |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP, CSI-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |  |                       |       |       |           |       |

#### A.5.6.8.1.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X1$  ms from the beginning of time period T2, where  $X1$  is

10080 ms for UE supporting power class 1, or

6240 ms for UE supporting other power class.

In test 1, and 2 UE is required to report SSB time index. The UE is required to read the neighbour cell SSB index in this test in order to detect associated SSB for the CSI-RS resource of Cell 3.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.7 Measurement Performance requirements

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in Clause 10 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in Clause 10 for at least 90% of the reported cases.
- Measurements are performed in RRC\_CONNECTED state.
- The reference channels assume transmission of PDSCH with a maximum number of 5 HARQ transmissions unless otherwise specified.

## A.5.7.1 SS-RSRP

### A.5.7.1.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.3.1.1 and 10.1.3.1.2 for intra-frequency measurements.

#### A.5.7.1.1.2 Test parameters

In this set of test cases, all NR cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.5.7.1.1.2-2 and A.5.7.1.1.2-3. The E-UTRA PCell is configured as specified in clause A.3.7.2.2. In all test cases, Cell 1 is the PCell, cell 2 is the PSCell and Cell 3 is the target cell. The test consists of two time phases T1 and T2.

**Table A.5.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations |   |

**Table A.5.7.1.1.2-2: SS-RSRP Intra frequency general test parameters**

| Parameter <sup>Note 5</sup> | Unit | T1     |        | T2     |        |
|-----------------------------|------|--------|--------|--------|--------|
|                             |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID            |      | 489    | 0      | 489    | 0      |

|  |                  |             |           |                             |           |
|--|------------------|-------------|-----------|-----------------------------|-----------|
| SSB ARFCN  |                  | freq1       |           | freq1                       |           |
| Duplex mode  |                  | TDD         |           | TDD                         |           |
| TDD configuration  |                  | TDDConf.3.1 |           | TDDConf.3.1                 |           |
| BW <sub>channel</sub>  |                  | MHz         |           | 100: N <sub>RB,C</sub> = 66 |           |
| Data RBs allocated   |                  | 24          |           | 24                          |           |
| BWP configuration  | Initial DL BWP   | DLBWP.0.1   |           |                             |           |
|  | Dedicated DL BWP | DLBWP.1.1   |           |                             |           |
|  | Initial UL BWP   | ULBWP.0.1   |           |                             |           |
|  | Dedicated UL BWP | ULBWP.1.1   |           |                             |           |
| TRS configuration  |                  | TRS.2.1 TDD | -         | TRS.2.1 TDD                 | -         |
| TCI state  |                  | TCI.State.0 | -         | TCI.State.0                 | -         |
| PDSCH Reference measurement channel  |                  | SR.3.2 TDD  | -         | SR.3.2 TDD                  | -         |
| RMSI CORESET Reference Channel   |                  | CR.3.1 TDD  | -         | CR.3.1 TDD                  | -         |
| Dedicated CORESET Reference Channel  |                  | CCR.3.1 TDD | -         | CCR.3.1 TDD                 | -         |
| OCNG Patterns  |                  | OP.3        | OP.3      | OP.3                        | OP.3      |
| SSB configuration  |                  | SSB.3 FR2   | SSB.3 FR2 | SSB.3 FR2                   | SSB.3 FR2 |
| SMTC configuration   |                  | SMTC.1      | SMTC.1    | SMTC.1                      | SMTC.1    |
| Time offset with Cell 2  |                  | μs          | -         | 3                           | -         |
| PDSCH/PDCCH subcarrier spacing   |                  | kHz         | 120       | 120                         | 120       |
| EPRE ratio of PSS to SSS   |                  | dB          | 0         | 0                           | 0         |
| EPRE ratio of PBCH_DMRS to SSS   |                  |             |           |                             |           |
| EPRE ratio of PBCH to PBCH_DMRS  |                  |             |           |                             |           |
| EPRE ratio of PDCCH_DMRS to SSS  |                  |             |           |                             |           |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                  |             |           |                             |           |
| EPRE ratio of PDSCH_DMRS to SSS  |                  |             |           |                             |           |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                  |             |           |                             |           |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |                  |             |           |                             |           |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |                  |             |           |                             |           |
| Propagation conditions   |                  |             |           |                             |           |
| Antenna configuration  |                  | 1x2         | 1x2       | 1x2                         | 1x2       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: Void</p> <p>Note 4: Void</p> <p>Note 5: All parameters apply for configuration 1 and 2</p> <p>Note 6: Void</p> |                  |             |           |                             |           |

Table A.5.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters

| Parameter                                 | Unit  | T1                                   |        | T2                                    |                                     |
|---|---|--------------------------------------|--------|---------------------------------------|-------------------------------------|
|   |   | Cell 2                               | Cell 3 | Cell 2                                | Cell 3                              |
| Angle of arrival configuration            |   | Setup 1 according to clause A.3.15.1 |        |                                       |                                     |
| Assumption for UE beams <sup>Note 8</sup> |   | Rough                                |        |                                       |                                     |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sub>z</sub> <sup>Note4</sup>   | -91.6                                |        | N/A                                   |                                     |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sub>Note4</sub>  | -82.6                                |        | N/A                                   |                                     |
| $\hat{E}_s/N_{oc}$                        | dB  | 6.0                                  | 1.0    | N/A                                   | N/A                                 |
| $E_s$                                     | dBm/SCS <sub>Note4</sub>  |                                      |        | (Table B.2.2-2 Rx Beam Peak +2.1dB)   | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| SSB_RP <sup>Note2</sup>                   | dBm/SCS   | -76.6                                | -81.6  | (Table B.2.2-2 Rx Beam Peak +2.1dB)   | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| $\hat{E}_s/I_{ot\ BB}$ <sup>Note6</sup>   | dB  | 2.44                                 | -5.98  | -5.98                                 | -5.98                               |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sub>Note4</sub>  | -50.05                               |        | (Table B.2.2-2 Rx Beam Peak +29.70dB) |                                     |
| Note 1:                                   | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |                                      |        |                                       |                                     |
| Note 2:                                   | SSB_RP, $E_s/I_{ot}$ and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |        |                                       |                                     |
| Note 3:                                   | Void  |                                      |        |                                       |                                     |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |                                      |        |                                       |                                     |
| Note 5:                                   | Void  |                                      |        |                                       |                                     |
| Note 6:                                   | Calculation of $E_s/I_{ot\ BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                                      |        |                                       |                                     |
| Note 7:                                   | All parameters apply for configurations 1 and 2   |                                      |        |                                       |                                     |
| Note 8:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |                                      |        |                                       |                                     |

### A.5.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2. The following requirements are to be verified:

During T1:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.5.7.1.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T2:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.5.7.1.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T1 and T2:

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1

Relative accuracy of Cell 3 during T2 compared with Cell 3 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

**Table A.5.7.1.1.3-1: SS-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <sup>Notes1,2,3</sup>   |
|---------|---|
| Cell 2  | $SSB\_RP2 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP2 + \delta + G_{max}$   |
| Cell 3  | $SSB\_RP3 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP3 + \delta + G_{max}$   |
| Note 1: | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.3.1.1-1, selected according to the $\delta$ used in the test                                 |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                             |

### A.5.7.1.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.1.1 and 10.1.5.1.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.5.7.1.2.1-1.

**Table A.5.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | FDD LTE PCell, cells 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2                    | TDD LTE PCell, cells 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3                    | FDD LTE PCell, cells 2&3 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4                    | TDD LTE PCell, cells 2&3 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

#### A.5.7.1.2.2 Test parameters

In this set of test cases, there are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.2.2-1 and Table A.5.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP intrer-frequency measurements are tested by using the parameters in Table A.5.7.1.2.2-1 and Table A.5.7.1.2.2-2. The inter-frequency measurements are supported by a measurement gap.

**Table A.5.7.1.2.2-1: SS-RSRP inter-frequency test parameters**

| Parameter  | Config     | Unit | Test 1                         |        | Test 2                         |        |
|--|------------|------|--------------------------------|--------|--------------------------------|--------|
|  |            |      | Cell 2                         | Cell 3 | Cell 2                         | Cell 3 |
| SSB ARFCN  | 1~4        |      | freq1                          | freq2  | freq1                          | freq2  |
| BW <sub>channel</sub>  | 1~4        |      | 100:<br>N <sub>RB,c</sub> = 66 |        | 100:<br>N <sub>RB,c</sub> = 66 |        |
| Data RBs allocated   | 1,2<br>3,4 |      | 24<br>48                       |        | 24<br>48                       |        |
| Duplex mode  | 1~4        |      | TDD                            |        | TDD                            |        |
| TDD configuration  | 1~4        |      | TDDConf.3.1                    |        | TDDConf.3.1                    |        |
| PDSCH Reference measurement channel  | 1,2<br>3,4 |      | SR.3.2<br>TDD<br>SR.3.3 TDD    | -      | SR.3.2<br>TDD<br>SR.3.3 TDD    | -      |
| RMSI CORESET Reference Channel   | 1,2<br>3,4 |      | CR.3.1 TDD<br>CR.3.2 TDD       | -      | CR.3.1 TDD<br>CR.3.2 TDD       | -      |
| Dedicated CORESET Reference Channel  | 1,2<br>3,4 |      | CCR.3.1 TDD<br>CCR.3.7 TDD     | -      | CCR.3.1 TDD<br>CCR.3.7 TDD     | -      |
| SSB configuration  | 1,2<br>3,4 |      | SSB.3 FR2<br>SSB.4 FR2         |        | SSB.3 FR2<br>SSB.4 FR2         |        |
| PDSCH/PDCCH subcarrier spacing   | 1~4        | kHz  | 120                            |        | 120                            |        |
| OCNG Patterns  | 1~4        |      | OP.3                           |        | OP.3                           |        |
| Initial BWP Configuration  | 1~4        |      | DLBWP.0.1<br>ULBWP.0.1         |        | DLBWP.0.1<br>ULBWP.0.1         |        |
| Dedicated BWP configuration  | 1~4        |      | DLBWP.1.3<br>ULBWP.1.3         |        | DLBWP.1.3<br>ULBWP.1.3         |        |
| TRS Configuration  | 1~4        |      | TRS.2.1 TDD                    |        | TRS.2.1 TDD                    |        |
| PDCCH/PDSCH TCI Configuration  | 1~4        |      | TCI.State.2                    |        | TCI.State.2                    |        |
| SMTc configuration   | 1~4        |      | SMTc.1                         |        | SMTc.1                         |        |
| Time offset between Cell 2 and Cell 3  | 1~4        | µs   | 3                              |        | 3                              |        |
| EPRE ratio of PSS to SSS   | 1~4        | dB   | 0                              | 0      | 0                              | 0      |
| EPRE ratio of PBCH DMRS to SSS   |            |      |                                |        |                                |        |
| EPRE ratio of PBCH to PBCH DMRS  |            |      |                                |        |                                |        |
| EPRE ratio of PDCCH DMRS to SSS  |            |      |                                |        |                                |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |      |                                |        |                                |        |
| EPRE ratio of PDSCH DMRS to SSS  |            |      |                                |        |                                |        |
| EPRE ratio of PDSCH to PDSCH DMRS  |            |      |                                |        |                                |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |            |      |                                |        |                                |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |            |      |                                |        |                                |        |
| Propagation condition  | 1~4        | -    | AWGN                           | AWGN   | AWGN                           | AWGN   |
| Antenna configuration  | 1~4        | -    | 1x2                            | 1x2    | 1x2                            | 1x2    |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |            |      |                                |        |                                |        |
| Note 2: Void   |            |      |                                |        |                                |        |

**Table A.5.7.1.2.2-2: SS-RSRP inter frequency OTA related test parameters**

| Parameter  | Config | Unit                           | Test 1                                  |                   | Test 2  |   |
|--|--------|--------------------------------|---|-------------------|---|---|
|  |        |                                | Cell 2                                  | Cell 3            | Cell 2  | Cell 3  |
| Angle of arrival configuration                         | 1~4    |                                | Setup 4b according to clause A.3.15.4.2 |                   | Setup 4b according to clause A.3.15.4.2                 |   |
|  |        |                                | AoA1 Spherical coverage                 | AoA2 Rx Beam Peak | AoA1 Spherical coverage                                 | AoA2 Rx Beam Peak                                       |
| Assumption for UE beams <sup>Note 7</sup>              | 1~4    |                                | Rough                                   |                   | Rough   |   |
| $N_{oc}$ <sup>Note1</sup>                              | 1, 2   | dBm/15kHz <sup>Note4</sup>     | -90.6                                   | -90.6             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +1.97dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> -3.03dB)  |
|  | 3, 4   |                                | -93.7                                   | -93.7             |   |   |
| $N_{oc}$ <sup>Note1</sup>                              | 1, 2   | dBm/SCS <sup>Note4</sup>       | -81.6                                   | -81.6             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +11.0dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +6.0dB)   |
|  | 3, 4   |                                | -81.7                                   | -81.7             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +14.0dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +9.0dB)   |
| $\hat{E}_s/N_{oc}$                                     | 1~4    | dB                             | 6.0                                     | 6.0               | 17.0  | -1.0  |
| SSB_RP <sup>Note2</sup>                                | 1, 2   | dBm/SCS                        | -75.6                                   | -75.6             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +28.0dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +5.0dB)   |
|  | 3, 4   |                                | -75.7                                   | -75.7             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +31.0dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +8.0dB)   |
| (SSB_RP <sub>Cell 2</sub> – SSB_RP <sub>Cell 3</sub> ) | 1~4    | dB                             | 0                                       |                   | 23.00   |   |
| $\hat{E}_s/I_{ot\ BB}$ <sup>Note6</sup>                | 1, 2   | dB                             | 5.26                                    | 5.96              | 9.53  | -3.46   |
|  | 3, 4   |                                | 4.61                                    | 5.91              |   |   |
| $I_o$ <sup>Note2</sup>                                 | 1, 2   | dBm/95.04 MHz <sup>Note4</sup> | -50.00                                  | -50.00            | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +52.68dB) | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +33.13dB) |
|  | 3, 4   |                                | -50.09                                  | -50.09            | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +55.69dB) | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +36.14dB) |
| ( $I_{ofreq 1} - I_{ofreq 2}$ )                        | 1~4    | dB                             | 0                                       |                   | 19.55   |   |



|         |  |
|---------|--|
| Note 1: | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |
| Note 2: | SSB_RP, Es/lot, Io, (SSB_RP <sub>Cell 3</sub> – SSB_RP <sub>Cell 2</sub> ) and (Iofreq 2 – Iofreq 1) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 3: | Void   |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |
| Note 5: | Void   |
| Note 6: | Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB <sub>P</sub> or ΔMB <sub>S</sub> from TS 38.101-2 [19] Table 6.2.1.3-4. |
| Note 7: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |
| Note 8: | The value in Table B.2.3-2 is the Minimum SSB_RP for SCS <sub>SSB</sub> = 120 kHz, selected according to the operating band of Cell 3 and UE power class, without ΔMB <sub>P,n</sub> adjustment.   |

**A.5.7.1.2.3 Test Requirements**

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the absolute requirements in clause 10.1.5.1.1 and the relative requirements in clause 10.1.5.1.2.

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.2.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.5.7.1.2.3-2.

Test 2:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.2.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.5.7.1.2.3-2.

**Table A.5.7.1.2.3-1: SS-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <small>Notes1,2,3,4</small>  |
|---------|--|
| Cell 2  | $SSB\_RP2 - \delta + G_{min} + X \leq \text{Reported RSRP(dBm)} \leq SSB\_RP2 + \delta + G_{max}$  |
| Cell 3  | $SSB\_RP3 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP3 + \delta + G_{max}$  |
| Note 1: | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2: | δ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the Io used in the test   |
| Note 3: | G <sub>min</sub> and G <sub>max</sub> are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  |
| Note 4: | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |

**Table A.5.7.1.2.3-2: SS-RSRP relative accuracy test requirement**

| <b>Test requirement</b> <small>Notes 1,2,3,4, 5, 6</small> |  |
|--|--|
| Cell 3 – Cell 2  | $SSB\_RP3 - SSB\_RP2 - \delta - D - G_{inter} \leq \text{Reported RSRP(dB)} \leq SSB\_RP3 - SSB\_RP2 + \delta + G_{inter} - (X)$   |
| Note 1:  | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2:  | $\delta$ is the RSRP relative accuracy requirement from Table 10.1.5.1.2-1   |
| Note 3:  | Void   |
| Note 4:  | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |
| Note 5:  | D = [5.5dB]. D is the <a href="#">margin due to mis-alignment between fine beam and rough beam</a> .   |
| Note 6:  | $G_{inter}$ = [3dB]. $G_{inter}$ is the <a href="#">margin due to different antenna gain caused by frequency separation</a> .  |

### A.5.7.1.3 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell

#### A.5.7.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.5.7.1.3.1-1.

**Table A.5.7.1.3.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test**

| Config   | Description of serving cell                                   | Description of target cell                          |
|--|---|---|
| 1  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 3  | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| 4  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |   |
| 5  | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 6  | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| Note: The UE is only required to be tested in one of the supported test configurations |   |   |

#### A.5.7.1.3.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2 below. Absolute accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2. The inter-frequency measurements are supported by a measurement gap.

**Table A.5.7.1.3.2-1: SS-RSRP inter-frequency test parameters**

| Parameter   | Config         | Unit | Test 1                         |                                | Test 2                         |                                |
|---|----------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|   |                |      | Cell 2                         | Cell 3                         | Cell 2                         | Cell 3                         |
| SSB ARFCN   | 1~6            |      | freq1                          | freq2                          | freq1                          | freq2                          |
| BW <sub>channel</sub>                             | 1,4            | MHz  | 10:<br>N <sub>RB,c</sub> = 52  | 100:<br>N <sub>RB,c</sub> = 66 | 10:<br>N <sub>RB,c</sub> = 52  | 100:<br>N <sub>RB,c</sub> = 66 |
|   | 2,5            |      | 10:<br>N <sub>RB,c</sub> = 52  |                                | 10:<br>N <sub>RB,c</sub> = 52  |                                |
|   | 3,6            |      | 40:<br>N <sub>RB,c</sub> = 106 |                                | 40:<br>N <sub>RB,c</sub> = 106 |                                |
| Data RBs allocated                                | 1,2,4,5<br>3,6 |      | 52<br>106                      | 24                             | 52<br>106                      | 66                             |
| Gap pattern ID                                    |                |      | 0                              |                                | 0                              |                                |
| Duplex mode                                       | 1,4            |      | FDD                            | TDD                            | FDD                            | TDD                            |
|   | 2,5            |      | TDD                            |                                | TDD                            |                                |
|   | 3,6            |      | TDD                            |                                | TDD                            |                                |
| TDD configuration                                 | 1,4            |      | N/A                            | TDDConf.<br>3.1                | N/A                            | TDDConf.<br>3.1                |
|   | 2,5            |      | TDDConf.<br>1.1                |                                | TDDConf.<br>1.1                |                                |
|   | 3,6            |      | TDDConf.<br>2.1                |                                | TDDConf.<br>2.1                |                                |
| PDSCH Reference measurement channel               | 1,4            |      | SR.1.1 FDD                     | -                              | SR.1.1 FDD                     | -                              |
|   | 2,5            |      | SR.1.1 TDD                     |                                | SR.1.1 TDD                     |                                |
|   | 3,6            |      | SR.2.1 FDD                     |                                | SR.2.1 FDD                     |                                |
| RMSI CORESET Reference Channel                    | 1,4            |      | CR.1.1 FDD                     | -                              | CR.1.1 FDD                     | -                              |
|   | 2,5            |      | CR.1.1 TDD                     |                                | CR.1.1 TDD                     |                                |
|   | 3,6            |      | CR.2.1 FDD                     |                                | CR.2.1 FDD                     |                                |
| Dedicated CORESET Reference Channel               | 1,4            |      | CCR.1.1 FDD                    | -                              | CCR.1.1 FDD                    | -                              |
|   | 2,5            |      | CCR.1.1 TDD                    |                                | CCR.1.1 TDD                    |                                |
|   | 3,6            |      | CCR.2.1 TDD                    |                                | CCR.2.1 TDD                    |                                |
| SSB configuration                                 | 1,4            |      | SSB.1<br>FR1                   | SSB.3<br>FR2                   | SSB.1<br>FR1                   | SSB.3<br>FR2                   |
|   | 2,5            |      | SSB.1<br>FR1                   |                                | SSB.1<br>FR1                   |                                |
|   | 3,6            |      | SSB.2<br>FR1                   |                                | SSB.2<br>FR1                   |                                |
| OCNG Patterns                                     | 1~6            |      | OP.1                           | OP.3                           | OP.1                           | OP.1                           |
| Initial BWP Configuration                         | 1~6            |      | DLBWP.0.1<br>ULBWP.0.1         |                                | DLBWP.0.1<br>ULBWP.0.1         |                                |
| Dedicated BWP configuration                       | 1~6            |      | DLBWP.1.3<br>ULBWP.1.3         |                                | DLBWP.1.3<br>ULBWP.1.3         |                                |
| TRS Configuration                                 | 1~6            |      | TRS.2.1 TDD                    |                                | TRS.2.1 TDD                    |                                |
| PDCCH/PDSCH TCI Configuration                     | 1~6            |      | TCI.State.2                    |                                | TCI.State.2                    |                                |
| SMTc configuration                                | 1~6            |      | SMTc.1                         |                                | SMTc.1                         |                                |
| Time offset between Cell 2 and Cell 3             | 1~6            | µs   | 3                              |                                | 3                              |                                |
| EPRE ratio of PSS to SSS                          | 1~6            | dB   | 0                              | 0                              | 0                              | 0                              |
| EPRE ratio of PBCH DMRS to SSS                    |                |      |                                |                                |                                |                                |
| EPRE ratio of PBCH to PBCH DMRS                   |                |      |                                |                                |                                |                                |
| EPRE ratio of PDCCH DMRS to SSS                   |                |      |                                |                                |                                |                                |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                |      |                                |                                |                                |                                |
| EPRE ratio of PDSCH DMRS to SSS                   |                |      |                                |                                |                                |                                |
| EPRE ratio of PDSCH to PDSCH DMRS                 |                |      |                                |                                |                                |                                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                |      |                                |                                |                                |                                |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |                |      |                                |                                |                                |                                |
| Propagation condition                             | 1~6            | -    | NA<br>Link only,               | AWGN                           | NA<br>Link only,               | AWGN                           |
| Antenna configuration                             | 1~6            | -    | see clause<br>A.3.7A           | 1x2                            | see clause<br>A.3.7A           | 1x2                            |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  
 Note 2: Void

**Table A.5.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters**

| Parameter   | Config | Unit          | Test 1                       |          | Test 2 <sup>NOTE 3</sup>     |   |
|---|--------|---------------|------------------------------|----------|------------------------------|---|
|   |        |               | Cell 2                       | Cell 3   | Cell 2                       | Cell 3                                  |
| Angle of arrival configuration according to clause A.3.15   |        |               | NA                           | Setup 2b | NA                           | Setup 2b                                |
| Assumption for UE beams <sup>Note 4</sup>   |        |               | N/A                          | Rough    | N/A                          | Rough                                   |
| $N_{oc}$  | 1~6    | dBm/15 kHz    | Link only, see clause A.3.7A | -90      | Link only, see clause A.3.7A | NA                                      |
| $N_{oc}$  | 1~6    | dBm/SS B SCS  |                              | -80.97   |                              | NA                                      |
| $\hat{E}_s/N_{oc}$  | 1~6    | dB            |                              | 5        |                              | NA                                      |
| $E_s$   | 1~6    | dBm/SC S      |                              |          |                              | Table B.2.3-2 Spherical coverage +1dB)  |
| SSB_RP <sup>Note 1</sup>  | 1~6    | dBm/SC S      |                              | -76.0    |                              | (Table B.2.3-2 Spherical coverage +1dB) |
| $\hat{E}_s/I_{ot\ BB}$ <sup>Note 6</sup>  | 1~6    | dB            |                              | 4.35     |                              | -3.81                                   |
| $I_o$ <sup>Note 1</sup>   | 1~6    | dBm/95.04M Hz |                              | -50.18   |                              | SSB_R P+28.98                           |
| <p>Note 1: <math>E_s/I_o</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br/>           Note 2: Void<br/>           Note 3: No additional noise is added by the test system in Test 2.<br/>           Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br/>           Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.<br/>           Note 6: Calculation of <math>E_s/I_o</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_S</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |        |               |                              |          |                              |   |

### A.5.7.1.3.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 3 shall fulfil the Absolute requirement in clause 10.1.5.1.1.

Test 1:

Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.3.3.

Test 2:

Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.3.3.

**Table A.5.7.1.3.3: SS-RSRP absolute accuracy test requirement**

|         | Test requirement <sup>Notes1,2,3,4</sup>   |
|---------|--|
| Cell 3  | $SSB\_RP2 - \delta + G_{min} + X \leq \text{Reported RSRP(dBm)} \leq SSB\_RP2 + \delta + G_{max}$  |
| Note 1: | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the $I_0$ used in the test   |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  |
| Note 4: | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |

## A.5.7.2 SS-RSRQ

### A.5.7.2.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.8.1.1.

#### A.5.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.5.7.2.1.2-2 and Table A.5.7.2.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

**Table A.5.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note:         | The UE is only required to pass in one of the supported test configurations |

**Table A.5.7.2.1.2-2: SS-RSRQ Intra frequency test parameters**

| Parameter   |                  | Unit | Test 1                      |              | Test 2                      |              |
|---|------------------|------|-----------------------------|--------------|-----------------------------|--------------|
|   |                  |      | Cell 2                      | Cell 3       | Cell 2                      | Cell 3       |
| SSB ARFCN   |                  |      | Freq1                       |              | Freq1                       |              |
| Duplex mode   |                  |      | TDD                         |              | TDD                         |              |
| TDD configuration   |                  |      | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>   |                  | MHz  | 100: N <sub>RB,c</sub> = 66 |              | 100: N <sub>RB,c</sub> = 66 |              |
| Data RBs allocated  |                  |      | 66                          |              | 66                          |              |
| BWP configuration   | Initial DL BWP   |      | DLBWP.0.1                   |              |                             |              |
|   | Dedicated DL BWP |      | DLBWP.1.1                   |              |                             |              |
|   | Initial UL BWP   |      | ULBWP.0.1                   |              |                             |              |
|   | Dedicated UL BWP |      | ULBWP.1.1                   |              |                             |              |
| TRS configuration   |                  |      | TRS.2.1<br>TDD              |              | TRS.2.1<br>TDD              |              |
| TCI state   |                  |      | TCI.State<br>.0             |              | TCI.State<br>.0             |              |
| PDSCH Reference measurement channel   |                  |      | SR.3.1<br>TDD               |              | SR.3.1<br>TDD               |              |
| RMSI CORESET Reference Channel  |                  |      | CR.3.1<br>TDD               | -            | CR.3.1<br>TDD               | -            |
| Control channel RMC   |                  |      | CCR.3.1<br>TDD              | -            | CCR.3.1<br>TDD              | -            |
| OCNG Patterns   |                  |      | OP.1                        | OP.1         | OP.1                        | OP.1         |
| SMTC configuration  |                  |      | SMTC.1                      |              |                             |              |
| SSB configuration   |                  |      | SSB.3<br>FR2                | SSB.3<br>FR2 | SSB.3<br>FR2                | SSB.3<br>FR2 |
| PDSCH/PDCCH subcarrier spacing  |                  | kHz  | 120                         | 120          | 120                         | 120          |
| SS-RSSI-Measurement   |                  |      | Not Applicable              |              |                             |              |
| EPRE ratio of PSS to SSS  |                  | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS  |                  |      |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |                  |      |                             |              |                             |              |
| Propagation condition   |                  |      | AWGN                        |              | AWGN                        |              |
| Antenna Configuration   |                  |      | 1x2                         | 1x2          | 1x2                         | 1x2          |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: Void |                  |      |                             |              |                             |              |

Table A.5.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters

| Parameter  | Unit                           | Test 1                               |        | Test 2                               |        |
|--|--------------------------------|--------------------------------------|--------|--------------------------------------|--------|
|  |                                | Cell 2                               | Cell 3 | Cell 2                               | Cell 3 |
| Angle of arrival configuration   |                                | Setup 1 according to clause A.3.15.1 |        | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 9</sup>  |                                | Rough                                |        |                                      |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -95                                  |        | -95                                  |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -86                                  |        | -86                                  |        |
| $\hat{E}_s / N_{oc}$   | dB                             | 3                                    | 3      | -3                                   | -3     |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -83                                  | -83    | -89                                  | -89    |
| SS-RSRQ <sup>Note2</sup>   | dB                             | -14.77                               | -14.77 | -16.81                               | -16.81 |
| $\hat{E}_s / I_{ot}$   | dB                             | -1.76                                | -1.76  | -4.76                                | -4.76  |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -50                                  |        | -54                                  |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRQ, SSB_RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |                                      |        |

### A.5.7.2.1.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ -2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ +3.5dB to Nominal SS-RSRQ -3.5dB according to the requirements in clause 10.1.8.1.1. Nominal SS-RSRQ is the value shown in table A.5.7.2.1.2-3.



## A.5.7.2.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

### A.5.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter-frequency measurement.

### A.5.7.2.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test setup in Table A.5.7.2.2.2-2 and Table A.5.7.2.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.5.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.5.7.2.2.2-2: SS-RSRQ Inter frequency general test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        |
|-----------|------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

|  |                  |     |                             |             |                             |             |
|--|------------------|-----|-----------------------------|-------------|-----------------------------|-------------|
| SSB ARFCN  |                  |     | Freq1                       | freq2       | freq1                       | Freq2       |
| Duplex mode  |                  |     | TDD                         |             | TDD                         |             |
| TDD configuration  |                  |     | TDDConf.3.1                 |             | TDDConf.3.1                 |             |
| BW <sub>channel</sub>  |                  | MHz | 100: N <sub>RB,c</sub> = 66 |             | 100: N <sub>RB,c</sub> = 66 |             |
| Data RBs allocated   |                  |     | 66                          |             | 66                          |             |
| BWP configuration  | Initial DL BWP   |     | DLBWP.0.1                   |             |                             |             |
|  | Dedicated DL BWP |     | DLBWP.1.1                   |             |                             |             |
|  | Initial UL BWP   |     | ULBWP.0.1                   |             |                             |             |
|  | Dedicated UL BWP |     | ULBWP.1.1                   |             |                             |             |
| TRS configuration  |                  |     | TRS.2.1 TDD                 | -           | TRS.2.1 TDD                 | -           |
| TCI state  |                  |     | TCI.State.0                 | -           | TCI.State.0                 | -           |
| PDSCH Reference measurement channel  |                  |     | SR.3.1 TDD                  | -           | SR.3.1 TDD                  | -           |
| RMSI CORESET Reference Channel   |                  |     | CR.3.1 TDD                  | -           | CR.3.1 TDD                  | -           |
| OCNG Patterns  |                  |     | OP.1                        | OP.1        | OP.1                        | OP.1        |
| SSB configuration  |                  |     | SSB.3 FR2                   | SSB.3 FR2   | SSB.3 FR2                   | SSB.3 FR2   |
| SMTTC configuration  |                  |     | SMTTC.1 FR2                 | SMTTC.1 FR2 | SMTTC.1 FR2                 | SMTTC.1 FR2 |
| PDSCH/PDCCH subcarrier spacing   |                  | kHz | 120                         | 120         | 120                         | 120         |
| EPRE ratio of PSS to SSS   |                  | dB  | 0                           | 0           | 0                           | 0           |
| EPRE ratio of PBCH_DMRS to SSS   |                  |     |                             |             |                             |             |
| EPRE ratio of PBCH to PBCH_DMRS  |                  |     |                             |             |                             |             |
| EPRE ratio of PDCCH_DMRS to SSS  |                  |     |                             |             |                             |             |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                  |     |                             |             |                             |             |
| EPRE ratio of PDSCH_DMRS to SSS  |                  |     |                             |             |                             |             |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                  |     |                             |             |                             |             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |                  |     |                             |             |                             |             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |                  |     |                             |             |                             |             |
| Propagation conditions   |                  |     | AWGN                        | AWGN        | AWGN                        | AWGN        |
| Antenna configuration  |                  |     | 1x2                         | 1x2         | 1x2                         | 1x2         |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: Void</p> <p>Note 4: Void</p> |                  |     |                             |             |                             |             |

**Table A.5.7.2.2-3: SS-RSRQ Inter frequency OTA related test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        |
|-----------|------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

| AoA setup  |                                | Setup 1 in clause A.3.15 |        | Setup 1 in clause A.3.15 |        |
|--|--------------------------------|--------------------------|--------|--------------------------|--------|
| Assumption for UE beams <sup>Note 8</sup>  |                                | Rough                    |        | Rough                    |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -94.03                   | -94.03 | -94.03                   | -94.03 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -85.0                    | -85.0  | -85.0                    | -85.0  |
| $\hat{E}_s / N_{oc}$   | dB                             | -1.75                    | -1.75  | -3                       | -3     |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -86.75                   | -86.75 | -88                      | -88    |
| SS-RSRQ <sup>Note2</sup>   | dB                             | -14.75                   | -14.75 | -15.56                   | -15.56 |
| $\hat{E}_s / I_{ot}$   | dB                             | -1.75                    | -1.75  | -3                       | -3     |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -53.8                    | -53.8  | -54.25                   | -54.25 |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRQ, SSB_RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                          |        |                          |        |

### A.5.7.2.2.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ-2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ+3.5dB to Nominal SS-RSRQ-3.5dB according to the requirements in clause 10.1.10.1.1.

The SS-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.1.2.

## A.5.7.3 SS-SINR

### A.5.7.3.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.13.1.1.

#### A.5.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.5.7.3.1.2-2 and Table A.5.7.3.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

**Table A.5.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations |   |

**Table A.5.7.3.1.2-2: SS-SINR Intra frequency test parameters**

| Parameter   | Unit | Test 1                      |              | Test 2                      |              |
|---|------|-----------------------------|--------------|-----------------------------|--------------|
|   |      | Cell 2                      | Cell 3       | Cell 2                      | Cell 3       |
| SSB ARFCN   |      | Freq2                       |              | Freq2                       |              |
| Duplex mode   |      | TDD                         |              | TDD                         |              |
| TDD configuration   |      | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |              | 100: N <sub>RB,c</sub> = 66 |              |
| Data RBs allocated  |      | 66                          |              | 66                          |              |
| Downlink initial BWP configuration  |      | DLBWP.0.1                   |              |                             |              |
| Downlink dedicated BWP configuration  |      | DLBWP.1.1                   |              |                             |              |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   |              |                             |              |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   |              |                             |              |
| DRX cycle configuration   | ms   | Not applicable              |              |                             |              |
| TRS configuration   |      | TRS.2.1 TDD                 |              |                             |              |
| TCI state   |      | TCI.State.0                 |              |                             |              |
| PDSCH Reference measurement channel   |      | SR.3.1<br>TDD               |              | SR.3.1<br>TDD               |              |
| RMSI CORESET Reference Channel  |      | CR.3.1<br>TDD               | -            | CR.3.1<br>TDD               | -            |
| Dedicated RMSI CORESET Reference Channel  |      | CCR.3<br>.1 TDD             | -            | CCR.3.<br>1 TDD             | -            |
| OCNG Patterns   |      | OP.1                        | OP.1         | OP.1                        | OP.1         |
| SMTc configuration  |      | SMTc.1                      |              |                             |              |
| SSB configuration   |      | SSB.1<br>FR2                | SSB.1<br>FR2 | SSB.1<br>FR2                | SSB.1<br>FR2 |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120          | 120                         | 120          |
| SS-RSSI-Measurement   |      | Not Applicable              |              |                             |              |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |              |                             |              |
| Propagation conditions  |      | AWGN                        |              | AWGN                        |              |
| Antenna configuration   |      | 1x2                         | 1x2          | 1x2                         | 1x2          |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |              |                             |              |
| Note 2: Void  |      |                             |              |                             |              |
| Note 3: Void Note 4: Void   |      |                             |              |                             |              |

Table A.5.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

| Parameter                                 | Unit   | Test 1                               |        | Test 2                               |        |
|---|--|--------------------------------------|--------|--------------------------------------|--------|
|   |  | Cell 2                               | Cell 3 | Cell 2                               | Cell 3 |
| Angle of arrival configuration            |  | Setup 1 according to clause A.3.15.1 |        | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 9</sup> |  | Rough                                |        | Rough                                |        |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz<br><sup>Note4</sup>  | -105                                 |        | -105                                 |        |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS<br><sup>Note3</sup>  | -96                                  |        | -96                                  |        |
| $\hat{E}_s / N_{oc}$                      | dB   | 4.54                                 | 2.66   | -3                                   | -3     |
| SS-RSRP <sup>Note2</sup>                  | dBm/SCS<br><sup>Note4</sup>  | -91.46                               | -93.34 | -99                                  | -99    |
| SS-SINR <sup>Note2</sup>                  | dB   | 0                                    | -3.2   | -4.76                                | -4.76  |
| $\hat{E}_s / I_{ot}$                      | dB   | 0                                    | -3.2   | -4.76                                | -4.76  |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04<br>MHz<br><sup>Note4</sup>   | -59.43                               |        | -64                                  |        |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                      |        |                                      |        |
| Note 2:                                   | SS-SINR, SSB_RP, and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                                      |        |                                      |        |
| Note 3:                                   | SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                      |        |                                      |        |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                                      |        |                                      |        |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |                                      |        |                                      |        |
| Note 6:                                   | Void   |                                      |        |                                      |        |
| Note 7:                                   | Void   |                                      |        |                                      |        |
| Note 8:                                   | Void   |                                      |        |                                      |        |
| Note 9:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                      |        |                                      |        |

### A.5.7.3.1.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3B to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.10.13.1. Nominal SS-SINR is the value shown in table A.5.7.3.1.2-3.

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.13.1.1.

### A.5.7.3.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

#### A.5.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test setup in Table A.5.7.3.2.2-2 and Table A.5.7.3.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.5.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.5.7.3.2.2-2: SS-SINR Inter frequency general test parameters**

| Parameter   | Unit | Test 1                      |            | Test 2                      |            | Test 3                      |            |
|---|------|-----------------------------|------------|-----------------------------|------------|-----------------------------|------------|
|   |      | Cell 2                      | Cell 3     | Cell 2                      | Cell 3     | Cell 2                      | Cell 3     |
| SSB ARFCN   |      | Freq1                       | freq2      | freq1                       | Freq2      | freq1                       | Freq2      |
| Duplex mode   |      | TDD                         |            | TDD                         |            | TDD                         |            |
| TDD configuration   |      | TDDConf.3.1                 |            | TDDConf.3.1                 |            | TDDConf.3.1                 |            |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,C</sub> = 66 |            | 100: N <sub>RB,C</sub> = 66 |            | 100: N <sub>RB,C</sub> = 66 |            |
| Data RBs allocated  |      | 66                          |            | 66                          |            | 66                          |            |
| Downlink initial BWP configuration  |      | DLBWP.0.1                   |            |                             |            |                             |            |
| Downlink dedicated BWP configuration  |      | DLBWP.1.1                   |            |                             |            |                             |            |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   |            |                             |            |                             |            |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   |            |                             |            |                             |            |
| DRX cycle configuration   | ms   | Not applicable              |            |                             |            |                             |            |
| TRS configuration   |      | TRS.2.1 TDD                 |            |                             |            |                             |            |
| TCI state   |      | TCI.State.0                 |            |                             |            |                             |            |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  | -          | SR.3.1 TDD                  | -          | SR.3.1 TDD                  | -          |
| RMSI CORESET Reference Channel  |      | CR.3.1 TDD                  | -          | CR.3.1 TDD                  | -          | CR.3.1 TDD                  | -          |
| OCNG Patterns   |      | OP.1                        | OP.1       | OP.1                        | OP.1       | OP.1                        | OP.1       |
| SMTc configuration  |      | SMTc.1 FR2                  | SMTc.1 FR2 | SMTc.1 FR2                  | SMTc.1 FR2 | SMTc.1 FR2                  | SMTc.1 FR2 |
| SSB configuration   |      | SSB.3 FR2                   | SSB.3 FR2  | SSB.3 FR2                   | SSB.3 FR2  | SSB.3 FR2                   | SSB.3 FR2  |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120        | 120                         | 120        | 120                         | 120        |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0          | 0                           | 0          | 0                           | 0          |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |            |                             |            |                             |            |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |            |                             |            |                             |            |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |            |                             |            |                             |            |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |            |                             |            |                             |            |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |            |                             |            |                             |            |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |            |                             |            |                             |            |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |            |                             |            |                             |            |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |            |                             |            |                             |            |
| Propagation conditions  |      | AWGN                        | AWGN       | AWGN                        | AWGN       | AWGN                        | AWGN       |
| Antenna configuration   |      | 1x2                         | 1x2        | 1x2                         | 1x2        | 1x2                         | 1x2        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void |      |                             |            |                             |            |                             |            |

**Table A.5.7.3.2.2-3: SS-SINR Inter frequency OTA related test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        | Test 3 |        |
|-----------|------|--------|--------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

| Angle of arrival configuration  | degrees                        | Setup 1 according to A.3.15.1 |       | Setup 1 according to A.3.15.1 |       | Setup 1 according to A.3.15.1 |        |
|---|--------------------------------|-------------------------------|-------|-------------------------------|-------|-------------------------------|--------|
| Assumption for UE beams <sup>Note 10</sup>  |                                | Rough                         |       | Rough                         |       | Rough                         |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -105                          | -105  | -105                          | -105  | -105                          | -105   |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -96                           | -96   | -96                           | -96   | -96                           | -96    |
| $\hat{E}_s / N_{oc}$  | dB                             | -0.5                          | -0.5  | 11                            | 11    | -3.0                          | -3.0   |
| SS-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -96.5                         | -96.5 | -85                           | -85   | -99                           | -99    |
| SS-SINR <sup>Note2</sup>  | dB                             | -0.5                          | -0.5  | 11                            | 11    | -3.0                          | -3.0   |
| $\hat{E}_s / I_{ot}$  | dB                             | -0.5                          | -0.5  | 11                            | 11    | -3.0                          | -3.0   |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -69.3                         | -69.3 | -55.4                         | -55.4 | -65.24                        | -65.24 |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-SINR, SSB_RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Void</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                               |       |                               |       |                               |        |

### A.5.7.3.2.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3dB to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR+3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.15.1.1. Nominal SS-SINR is the value shown in table A.5.7.2.2.2-3

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.1.2.

## A.5.7.4 L1-RSRP measurement for beam reporting

### A.5.7.4.1 SSB based L1-RSRP measurement

#### A.5.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.5.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.4.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 3             | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 4             | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| Note:         | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.5.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.



Table A.5.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters

| Parameter   | Config | Unit | Test 1                      | Test 2                      |
|---|--------|------|-----------------------------|-----------------------------|
| SSB GSCN  | 1~4    |      | freq1                       | freq1                       |
| Duplex mode   | 1~4    |      | TDD                         | TDD                         |
| TDD Configuration   | 1~4    |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1~4    | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated  | 1~4    |      | 66                          | 66                          |
| PDSCH Reference measurement channel   | 1,2    |      | SR.3.2 TDD                  | SR.3.2 TDD                  |
|   | 3,4    |      | SR.3.3 TDD                  | SR.3.3 TDD                  |
| RMSI CORESET Reference Channel  | 1,2    |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
|   | 3,4    |      | CR.3.2 TDD                  | CR.3.2 TDD                  |
| Dedicated CORESET Reference Channel   | 1,2    |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|   | 3,4    |      | CCR.3.7 TDD                 | CCR.3.7 TDD                 |
| SSB configuration   | 1,2    |      | SSB.1 FR2                   | SSB.1 FR2                   |
|   | 3,4    |      | SSB.2 FR2                   | SSB.2 FR2                   |
| OCNG Patterns   | 1~4    |      | OP.1                        | OP.1                        |
| Initial BWP Configuration   | 1~4    |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~4    |      | DLBWP.1.3<br>ULBWP.1.3      | DLBWP.1.3<br>ULBWP.1.3      |
| TRS Configuration   | 1~4    |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1~4    |      | TCI.State.2                 | TCI.State.2                 |
| SMTc configuration  | 1~4    |      | SMTc.1                      | SMTc.1                      |
| reportConfigType  | 1~4    |      | periodic                    | periodic                    |
| reportQuantity  | 1~4    |      | ssb-Index-RSRP              | ssb-Index-RSRP              |
| Number of reported RS   | 1~4    |      | 2                           | 2                           |
| L1-RSRP reporting period  | 1~4    |      | slot320                     | slot320                     |
| Propagation condition   | 1~4    |      | AWGN                        | AWGN                        |
| Antenna configuration   |        |      | 1x2                         | 1x2                         |
| EPRE ratio of PSS to SSS  | 1~4    | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |        |      |                             |                             |

**Table A.5.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters**

| Parameter  | Config | Unit          | Test 1                        |      | Test 2 <sup>NOTE 3</sup>      |      |
|--|--------|---------------|-------------------------------|------|-------------------------------|------|
|  |        |               | SSB0                          | SSB1 | SSB0                          | SSB1 |
| Angle of arrival configuration   |        |               | Setup 1 according to A.3.15.1 |      | Setup 1 according to A.3.15.1 |      |
| Assumption for UE beams <sup>Note 4</sup>  |        |               | Rough                         |      | Rough                         |      |
| $N_{oc}$   | 1~4    | dBm/15 kHz    | -100                          |      | n.a.                          |      |
| $N_{oc}$   | 1,2    | dBm/SS        | -91                           |      | n.a.                          |      |
|  | 3,4    | B SCS         | -88                           |      | n.a.                          |      |
| $\hat{E}_s / I_{ot}$   | 1~4    | dB            | 10                            | -2   | n.a.                          |      |
| SSB_RP <sup>Note1</sup>  | 1,2    | dBm/SC        | -81                           | -93  | As in Table B.2.4-2           |      |
|  | 3,4    | S             | -78                           | -90  | As in Table B.2.4-2           |      |
| $I_o$ <sup>Note1</sup>   | 1~4    | dBm/95.04M Hz | -51.57                        |      | SSB_RP+28.98                  |      |
| $\hat{E}_s / N_{oc}$   | 1~4    | dB            | 10                            | -2   | n.a.                          |      |
| Note 1: SSB_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: Void<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |        |               |                               |      |                               |      |

### A.5.7.4.1.3 Test Requirements

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB0 and absolute accuracy of SSB1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

For Test 2:

Absolute accuracy of SSB0 and absolute accuracy of SSB1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

**Table A.5.7.4.1.3-1: L1-RSRP absolute accuracy test requirement**

|         | Test requirement <sup>Notes1,2,3</sup>   |
|---------|--|
| SSB0    | $SSB\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP0 + \delta + G_{max}$  |
| SSB1    | $SSB\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP1 + \delta + G_{max}$  |
| Note 1: | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.20.1.1-1, selected according to the $I_o$ used in the test                                  |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                            |

### A.5.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

#### A.5.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.5.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.4.2.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                                      |
| 2      | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                                      |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.5.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.5.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters

| Parameter   | Config   | Unit | Test 1                      | Test 2                      |
|---|--|------|-----------------------------|-----------------------------|
| SSB GSCN  | 1~2  |      | freq1                       | freq1                       |
| Duplex mode                                       | 1~2  |      | TDD                         | TDD                         |
| TDD Configuration                                 | 1~2  |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>                             | 1~2  | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel               | 1~2  |      | SR.3.1 TDD                  | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel                    | 1~2  |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel               | 1~2  |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
| SSB configuration                                 | 1~2  |      | SSB.1 FR2                   | SSB.1 FR2                   |
| OCNG Patterns                                     | 1~2  |      | OP.1                        | OP.1                        |
| Initial BWP Configuration                         | 1~2  |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration                       | 1~2  |      | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |
| TRS Configuration                                 | 1~2  |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration                     | 1~2  |      | TCI.State.2                 | TCI.State.2                 |
| SMTc configuration                                | 1~2  |      | SMTc.1                      | SMTc.1                      |
| CSI-RS  | 1~2  |      | CSI-RS.3.2 TDD              | CSI-RS.3.2 TDD              |
| reportConfigType                                  | 1~2  |      | periodic                    | periodic                    |
| reportQuantity                                    | 1~2  |      | cri-RSRP                    | cri-RSRP                    |
| Number of reported RS                             | 1~2  |      | 2                           | 2                           |
| L1-RSRP reporting period                          | 1~2  |      | slot320                     | slot320                     |
| Propagation condition                             | 1~2  |      | AWGN                        | AWGN                        |
| Antenna configuraion                              | 1~2  |      | 1x2                         | 1x2                         |
| EPRE ratio of PSS to SSS                          | 1~2  | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS                    |  |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS                   |  |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS                   |  |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                 |  |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS                   |  |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |      |                             |                             |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |                             |                             |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |                             |                             |

Table A.5.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters

| Parameter  | Config | Unit          | Test 1                        |         | Test 2 <sup>NOTE 3</sup>      |         |
|--|--------|---------------|-------------------------------|---------|-------------------------------|---------|
|  |        |               | CSI-RS0                       | CSI-RS1 | CSI-RS0                       | CSI-RS1 |
| Angle of arrival configuration   |        |               | Setup 1 according to A.3.15.1 |         | Setup 1 according to A.3.15.1 |         |
| Assumption for UE beams <sup>Note 4</sup>  |        |               | Rough                         |         | Rough                         |         |
| $N_{oc}$   | 1~2    | dBm/15 kHz    | -100                          |         | n.a.                          |         |
| $N_{oc}$   | 1~2    | dBm/SS B SCS  | -91                           |         | n.a.<br>n.a.                  |         |
| $\hat{E}_s / I_{ot}$   | 1~2    | dB            | 10                            | -2      | n.a.                          |         |
| CSI-RS-RSRP <sup>Note1</sup>   | 1~2    | dBm/SC S      | -81                           | -93     | As in Table B.2.4-2           |         |
| $I_o$ <sup>Note1</sup>   | 1~2    | dBm/95.04M Hz | -59.86                        |         | SS-RSRP+28.98                 |         |
| $\hat{E}_s / N_{oc}$   | 1~2    | dB            | -51.57                        | -2      | n.a.                          |         |
| <p>Note 1: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 3: No additional noise is added by the test system in Test 2.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |               |                               |         |                               |         |

### A.5.7.4.2.3 Test Requirements

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

For Test 2:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.5.7.4.2.3-1: L1-RSRP absolute accuracy test requirement

|         | Test requirement <sup>Notes1,2,3</sup>   |
|---------|--|
| CSI-RS0 | $CSI-RS\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP0 + \delta + G_{max}$  |
| CSI-RS1 | $CSI-RS\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP1 + \delta + G_{max}$  |
| Note 1: | CSI-RS_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the $I_o$ used in the test  |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                                  |

## A.5.7.5 CLI measurements

### A.5.7.5.1 EN-DC SRS-RSRP measurement accuracy with FR2 serving cell

#### A.5.7.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.1.1 with the testing configurations for NR cells in Table A.5.7.5.1.1-1.

**Table A.5.7.5.1.1-1: Applicable NR configurations for FR2 SRS-RSRP accuracy test**

| Config  | Description   |
|---|---|
| 1   | LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band |   |

#### A.5.7.5.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.5.1.2-1 and A.5.7.5.1.2-2 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table A.5.7.5.1.2-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table A.5.7.5.1.2-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

Table A.5.7.5.1.2-1: FR2 test parameters for SRS-RSRP accuracy

| Parameter  | Config | Unit          | Test 1                 | Test 2                 |
|--|--------|---------------|------------------------|------------------------|
| SSB GSCN   | 1~2    |               | freq1                  | freq1                  |
| Duplex mode  | 1~2    |               | TDD                    | TDD                    |
| TDD configuration  | 1~2    |               | TDDConf.3.1            | TDDConf.3.1            |
| $BW_{\text{channel}}$  | 1~2    | MHz           | 100: $N_{RB,c} = 66$   | 100: $N_{RB,c} = 66$   |
| PDSCH Reference measurement channel  | 1~2    |               | SR.3.1 TDD             | SR.3.1 TDD             |
| RMSI CORESET Reference Channel   | 1~2    |               | CR.3.1 TDD             | CR.3.1 TDD             |
| Dedicated CORESET Reference Channel  | 1~2    |               | CCR.3.1 TDD            | CCR.3.1 TDD            |
| SSB configuration  | 1~2    |               | SSB.3 FR2              | SSB.3 FR2              |
| OCNG Patterns  | 1~2    |               | OP.1                   | OP.1                   |
| TRS configuration  | 1~2    |               | TRS.2.1 TDD            | TRS.2.1 TDD            |
| Initial BWP Configuration  | 1~2    |               | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration  | 1~2    |               | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| SMTc configuration   | 1~2    |               | SMTc.1                 | SMTc.1                 |
| Time offset between DL from serving cell and SRS from test system  | 1~2    | $\mu\text{s}$ | 10.76                  | 10.67                  |
| EPRE ratio of PSS to SSS   | 1~2    | dB            | 0                      | 0                      |
| EPRE ratio of PBCH DMRS to SSS   |        |               |                        |                        |
| EPRE ratio of PBCH to PBCH DMRS  |        |               |                        |                        |
| EPRE ratio of PDCCH DMRS to SSS  |        |               |                        |                        |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |               |                        |                        |
| EPRE ratio of PDSCH DMRS to SSS  |        |               |                        |                        |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |               |                        |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |               |                        |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |               |                        |                        |
| Propagation condition  | 1~2    |               | AWGN                   | AWGN                   |
| Antenna configuration  | 1~2    |               | 1x2                    | 1x2                    |
| SRS configuration  | 1~2    |               | SRSCConf.1             | SRSCConf.1             |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |               |                        |                        |

**Table A.5.7.5.1.2-2: SRS-RSRP accuracy OTA related test parameters for PSCell and Neighbour cell UE in FR2**

| Parameter   | Unit                   | T1                          | T2                                       |
|---|------------------------|-----------------------------|--|
| Angle of arrival configuration  |                        | Setup 1 defined<br>A.3.15.1 | Setup 1 defined<br>A.3.15.1              |
| Beam assumption<br>Note 5   |                        | Fine                        | Fine                                     |
| $N_{oc}$ Note1  | dBm/15kHz<br>$z$ Note3 | -100                        | N/A                                      |
| $N_{oc}$ Note1  | dBm/SCS<br>Note3       | -91                         | N/A                                      |
| $\hat{E}_s / N_{oc}$  | dB                     | 2                           | N/A                                      |
| $E_s$   | dBm/SCS<br>Note3       |                             | (Table B.2.7-2 Rx<br>Beam Peak)          |
| SRS_RP Note2  | dBm/SCS                | -89                         | (Table B.2.7-2 Rx<br>Beam Peak)          |
| $\hat{E}_s / I_{ot\ BB}$ Note4  | dB                     | >1                          | 1  |
| $I_o$ Note2   | dBm/95.04<br>MHz Note3 | -57.89                      | (Table B.2.7-2 Rx<br>Beam Peak +50.79dB) |
| <p>Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SRS_RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 4: Calculation of <math>E_s/I_{ot\ BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsers requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor <math>\sum MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                        |                             |  |



**Table A.5.7.5.1.2-3: SRS configuration parameters for FR2 SRS-RSRP accuracy**

|                 | Field                            | SRSCnf.1 |
|-----------------|----------------------------------|----------|
| SRS-ResourceSet | srs-ResourceSetId                | 0        |
|                 | srs-ResourceSetList              | 0        |
|                 | resourceType                     | Periodic |
|                 | Usage                            | Codebook |
| SRS-Resource    | SRS-ResourceId                   | 0        |
|                 | nrofSRS-Ports                    | Port1    |
|                 | transmissionComb                 | n2       |
|                 | combOffset-n2                    | 0        |
|                 | cyclicShift-n2                   | 0        |
|                 | resourceMapping startPosition    | 0        |
|                 | resourceMapping nrofSymbols      | n1       |
|                 | resourceMapping repetitionFactor | n1       |
|                 | freqDomainPosition               | 0        |
|                 | freqDomainShift                  | 0        |
|                 | freqHopping c-SRS                | 12       |
|                 | freqHopping b-SRS                | 0        |
|                 | freqHopping b-hop                | 0        |
|                 | groupOrSequenceHopping           | Neither  |
|                 | resourceType                     | Periodic |
|                 | periodicityAndOffset-p           | s160,25  |
|                 | sequenceld                       | 0        |

### A.5.7.5.1.3 Test Requirements

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.1.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table A.5.7.5.1.3-1.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table A.5.7.5.1.3-1.

**Table A.5.7.5.1.3-1: SRS-RSRP absolute accuracy test requirement**

| SRS     | Test requirement <sup>Notes1,2,3</sup>  |
|---------|---|
|         | $SRS\_RP - \delta + G_{min} \leq \text{Reported SRS-RSRP(dBm)} \leq SRS\_RP + \delta + G_{max}$                                     |
| Note 1: | SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test         |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the $I_o$ used in the test       |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class |

### A.5.7.5.2 EN-DC CLI-RSSI measurement accuracy with FR2 serving cell

#### A.5.7.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.2.1 with the testing configurations for NR cells in Table A.5.7.5.2.1-1.

**Table A.5.7.5.2.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test**

| Config  | Description   |
|---|---|
| 1   | LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band |   |

### A.5.7.5.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.5.2.2-1 and A.5.7.5.2.2-2 below.

Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 2 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.5.7.5.2.2-3.

**Table A.5.7.5.2.2-1: FR2 test parameters for CLI-RSSI accuracy**

| Parameter  | Config | Unit | Test 1                      | Test 2                      |
|--|--------|------|-----------------------------|-----------------------------|
| SSB GSCN   | 1~2    |      | freq1                       | freq1                       |
| Duplex mode  | 1~2    |      | TDD                         | TDD                         |
| TDD configuration  | 1~2    |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>  | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel  | 1~2    |      | SR.3.1 TDD                  | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | 1~2    |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel  | 1~2    |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
| SSB configuration  | 1~2    |      | SSB.3 FR2                   | SSB.3 FR2                   |
| OCNG Patterns <sup>Note2</sup>   | 1~2    |      | OP.1                        | OP.1                        |
| TRS configuration  | 1~2    |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| Initial BWP Configuration  | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~2    |      | DLBWP.1.3<br>ULBWP.1.3      | DLBWP.1.3<br>ULBWP.1.3      |
| SMTc configuration   | 1~2    |      | SMTc.1                      | SMTc.1                      |
| Time offset between DL from serving cell and OCNG from test system   | 1~2    | µs   | 10.67                       | 10.67                       |
| EPRE ratio of PSS to SSS   | 1~2    | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                             |                             |
| Propagation condition  | 1~2    |      | AWGN                        | AWGN                        |
| Antenna configuration  | 1~2    |      | 1x2                         | 1x2                         |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |                             |
| Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources.   |        |      |                             |                             |

**Table A.5.7.5.2.2-2: CLI-RSSI accuracy OTA related test parameters**

| Parameter  | Unit  | T1                       | T2        |
|--|---|--------------------------|-----------|
| Angle of arrival configuration   |   | Setup 1 defined A.3.15.1 |           |
| Beam assumption <sup>Note 5</sup>                                      |   | Fine                     |           |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note1</sup>             | dBm/15kHz<br><sub><math>z</math><sup>Note3</sup></sub>  |                          | -100      |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note1</sup>             | dBm/SCS <sup>N</sup><br><sub>ote3</sub>   |                          | -91       |
| $\hat{E}_s/N_{oc}$ on CLI-RSSI measurement resource                    | dB  |                          | -Infinity |
| RSRP on CLI-RSSI measurement resource <sup>Note2</sup>                 | dBm/SCS   |                          | -Infinity |
| $\hat{E}_s/I_{otBB}$ on CLI-RSSI measurement resource <sup>Note4</sup> | dB  |                          | -Infinity |
| Io on CLI-RSSI measurement resource <sup>Note2</sup>                   | dBm/95.04 MHz<br><sub>Note3</sub>   |                          | -62.01    |
| Io on CLI-RSSI measurement resource <sup>Note2</sup>                   | dBm/1.08 MHz  |                          | -81.46    |
| Note 1:  | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |                          |           |
| Note 2:  | SRS_RP, Es/lot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                          |           |
| Note 3:  | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |                          |           |
| Note 4:  | Calculation of Es/Iot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                          |           |
| Note 5:  | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.   |                          |           |

**Table A.5.7.5.2.2-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy**

|                               | Field                    | SRSCConf.1 |
|-------------------------------|--------------------------|------------|
| CLI-RSSI measurement resource | rsi-ResourceId           | 0          |
|                               | rsi-SCS                  | 120kHz     |
|                               | startPRB                 | 0          |
|                               | nrofPRBs                 | 66         |
|                               | startPosition            | 3          |
|                               | nrofSymbols              | 11         |
|                               | rsi-PeriodicityAndOffset | sl160, 25  |

### A.5.7.5.2.3 Test Requirements

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table A.5.7.5.2.3-1.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table A.5.7.5.2.3-1..

**Table A.5.7.5.2.3-1: CLI-RSSI absolute accuracy test requirement**

|         |  | Test requirement <sup>Notes1,2,3</sup>  |
|---------|--|---|
|         |  | $I_o - \delta + G_{min} \leq \text{Reported CLI-RSSI(dBm)} \leq I_o + \delta + G_{max}$ |
| Note 1: | $I_o$ is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz |   |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the $I_o$ used in the test          |   |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class    |   |

## A.5.7.6 L1-SINR measurement for beam reporting

### A.5.7.6.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

#### A.5.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.1 and clause 10.1.28.1 for FR2 L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.5.7.6.1.1-1, which configures the measurement resources for the CSI-RS based CMR and no dedicated IMR.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.6.1.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                                      |
| 2      | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                                      |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.5.7.6.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.6.1.2-1 and Table A.5.7.6.1.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.1.2-1 and Table A.5.7.6.1.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

**Table A.5.7.6.1.2-1: FR2 CSI-RS based L1-SINR general test parameters**

| Parameter   | Config   | Unit | Test 1                      |
|---|--|------|-----------------------------|
| SSB GSCN  | 1~2  |      | freq1                       |
| Duplex mode                                       | 1~2  |      | TDD                         |
| TDD Configuration                                 | 1~2  |      | TDDConf.3.1                 |
| BW <sub>channel</sub>                             | 1~2  | MHz  | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel               | 1~2  |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel                    | 1~2  |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel               | 1~2  |      | CCR.3.1 TDD                 |
| SSB configuration                                 | 1~2  |      | SSB.1 FR2                   |
| OCNG Patterns                                     | 1~2  |      | OP.1                        |
| Initial BWP Configuration                         | 1~2  |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration                       | 1~2  |      | DLBWP.1.1<br>ULBWP.1.1      |
| TRS Configuration                                 | 1~2  |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration                     | 1~2  |      | TCI.State.2                 |
| SMTc configuration                                | 1~2  |      | SMTc.1                      |
| CSI-RS  | 1~2  |      | CSI-RS.3.2 TDD              |
| reportConfigType                                  | 1~2  |      | periodic                    |
| reportQuantity-r16                                | 1~2  |      | cri-SINR-r16                |
| nrofReportedRS                                    | 1~2  |      | 2                           |
| L1-RSRP reporting period                          | 1~2  |      | slot640                     |
| Propagation condition                             | 1~2  |      | AWGN                        |
| Antenna configuration                             | 1~2  |      | 1x2                         |
| EPRE ratio of PSS to SSS                          |  |      |                             |
| EPRE ratio of PBCH DMRS to SSS                    |  |      |                             |
| EPRE ratio of PBCH to PBCH DMRS                   |  |      |                             |
| EPRE ratio of PDCCH DMRS to SSS                   |  |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                 | 1~2  | dB   | 0                           |
| EPRE ratio of PDSCH DMRS to SSS                   |  |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |      |                             |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |                             |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |                             |

**Table A.5.7.6.1.2-1-2: FR2 CSI-RS based L1-SINR OTA related test parameters**

| Parameter   | Config | Unit          | Test 1                        |         |
|---|--------|---------------|-------------------------------|---------|
|   |        |               | CSI-RS0                       | CSI-RS1 |
| Angle of arrival configuration  |        |               | Setup 1 according to A.3.15.1 |         |
| Assumption for UE beams <sup>Note 4</sup>   |        |               | Rough                         |         |
| $N_{oc}$  | 1~2    | dBm/15 kHz    | -100                          |         |
| $N_{oc}$  | 1~2    | dBm/SS B SCS  | -91                           |         |
| $\hat{E}_s / I_{ot}$  | 1~2    | dB            | 10                            | -2      |
| CSI-RS-RSRP <sup>Note1</sup>  | 1~2    | dBm/SC S      | -81                           | -93     |
| $I_o$ <sup>Note1</sup>  | 1~2    | dBm/95.04M Hz | -51.57                        | -59.86  |
| $\hat{E}_s / N_{oc}$  | 1~2    | dB            | 10                            | -2      |
| <p>Note 1: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 3: Void.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |               |                               |         |

### A.5.7.6.1.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.1.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.1.2-1.

**Table A.5.7.6.1.3-1: L1-SINR absolute accuracy test requirement**

|         | Test requirement <sup>Notes1,2</sup>  |
|---------|---|
| CSI-RS0 | $L1-SINR0 - \delta \leq \text{Reported SINR (dB)} \leq L1-SINR0 + \delta$   |
| CSI-RS1 | $L1-SINR1 - \delta \leq \text{Reported SINR (dB)} \leq L1-SINR1 + \delta$   |
| Note 1: | L1-SINRn is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration |
| Note 2: | $\delta$ is the SINR absolute accuracy requirement from Table 10.1.28.1.1-1, selected according to the $I_o$ used in the test                                     |

### A.5.7.6.2 L1-SINR measurement with SSB based CMR and dedicated IMR

#### A.5.7.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.2 and clause 10.1.28.2 for L1-SINR measurements with SSB based CMR and dedicated CSI-RS based IMR, with the testing configurations for NR cells in Table A.5.7.6.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.6.2.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 3             | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 4             | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| Note:         | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.5.7.6.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.6.2.2-1 and Table A.5.7.6.2.2-2 below. The absolute accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.2.2-1 and Table A.5.7.6.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-RS resource set with two CSI-RS resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

**Table A.5.7.6.2.2-1: FR2 L1-SINR measurement test parameters with SSB based CMR and CSI-IM based IMR**

| Parameter   | Config | Unit | Test 1                      |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1~4    |      | freq1                       |
| Duplex mode   | 1~4    |      | TDD                         |
| TDD Configuration   | 1~4    |      | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1~4    | MHz  | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel   | 1~4    |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel  | 1~4    |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1~4    |      | CCR.3.1 TDD                 |
| SSB configuration   | 1,2    |      | SSB.1 FR2                   |
|   | 3,4    |      | SSB.2 FR2                   |
| CSI-RS configuration  | 1~4    |      | CSI-RS 3.1A TDD             |
| OCNG Patterns   | 1~4    |      | OP.1                        |
| Initial BWP Configuration   | 1~4    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~4    |      | DLBWP.1.3<br>ULBWP.1.3      |
| TRS Configuration   | 1~4    |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1~4    |      | TCI.State.2                 |
| SMTc configuration  | 1~4    |      | SMTc.1                      |
| reportConfigType  | 1~4    |      | periodic                    |
| reportQuantity-r16  | 1~4    |      | ssb-Index-SINR-r16          |
| Number of reported RS   | 1~4    |      | 2                           |
| L1-SINR reporting period  | 1~4    |      | slot640                     |
| Propagation condition   | 1~4    |      | AWGN                        |
| Antenna configuration   | 1~4    |      | 1x2                         |
| EPRE ratio of PSS to SSS  | 1~4    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |        |      |                             |



Table A.5.7.6.2.2-2: FR2 SSB specific test parameters

| Parameter  | Config | Unit                 | Test 1                        |       |
|--|--------|----------------------|-------------------------------|-------|
|  |        |                      | SSB#0                         | SSB#1 |
| Angle of arrival configuration   |        |                      | Setup 1 according to A.3.15.1 |       |
| Assumption for UE beams <sup>Note 4</sup>  |        |                      | Rough                         |       |
| $N_{oc}$   | 1~4    | dBm/15 kHz           | -100                          |       |
| $N_{oc}$   | 1,2    | dBm/SS               | -91                           |       |
|  | 3,4    | B SCS                | -88                           |       |
| $\hat{E}_s / I_{ot}$   | 1~4    | dB                   | 10                            | 0     |
| SSB RSRP <sup>Note1</sup>  | 1,2    | dBm/SC               | -81                           | -91   |
|  | 3,4    | S                    | -78                           | -88   |
| $I_o$ <sup>Note1</sup>   | 1~4    | dBm/<br>95.04M<br>Hz | -51.57                        |       |
| $\hat{E}_s / N_{oc}$   | 1~4    | dB                   | 10                            | 0     |
| <p>Note 1: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |                      |                               |       |

Table A.5.7.6.2.2-3: FR2 CSI-RS specific test parameters

| Parameter  | Config | Unit             | Test 1                        |          |
|--|--------|------------------|-------------------------------|----------|
|  |        |                  | CSI-RS#0                      | CSI-RS#1 |
| Angle of arrival configuration   |        |                  | Setup 1 according to A.3.15.1 |          |
| Assumption for UE beams <sup>Note 4</sup>  |        |                  | Rough                         |          |
| $N_{oc}$   | 1~4    | dBm/15k Hz       | -100                          |          |
| $N_{oc}$   | 1~4    | dBm/CSI-RS SCS   | -91                           |          |
| $\hat{E}_s / I_{ot}$   | 1~4    | dB               | 10                            | 0        |
| CSI-RS RSRP <sup>Note1</sup>   | 1~4    | dBm/SCS          | -81                           | -91      |
| $I_o$ <sup>Note1</sup>   | 1~4    | dBm/<br>95.04MHz | -51.57                        | -59.86   |
| $\hat{E}_s / N_{oc}$   | 1~4    | dB               | 10                            | 0        |
| <p>Note 1: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |                  |                               |          |

### A.5.7.6.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB#0+CSI-RS#0 and absolute accuracy of SSB#1+CSI-RS#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.2.3-1.

Relative accuracy of SSB#0+CSI-RS#0 compared with SSB#1+CSI-RS#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.2.2-1.

**Table A.5.7.6.2.3-1: L1-SINR absolute accuracy test requirement**

|                | <b>Test requirement</b> <sup>Notes1,2</sup>   |
|----------------|---|
| SSB#0+CSI-RS#0 | $L1\_SINR0 - \delta + \leq \text{Reported SINR (dB)} \leq L1\_SINR0 + \delta$   |
| SSB#1+CSI-RS#1 | $L1\_SINR1 - \delta + \leq \text{Reported SINR (dB)} \leq L1\_SINR1 + \delta$   |
| Note 1:        | L1_SINRn is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB#n+CSI-RS#n under consideration |
| Note 2:        | $\delta$ is the SINR absolute accuracy requirement from Table 10.1.28.2.1-1, selected according to the $I_0$ used in the test   |

### A.5.7.6.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

#### A.5.7.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8.4.3 and clause 10.1.28.3 for L1-SINR measurements based on CSI-RS as CMR and CSI-IM as IMR with the testing configurations for NR cells in Table A.5.7.6.3.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.6.3.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                                      |
| 2             | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                                      |
| Note:         | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.5.7.6.3.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.6.3.2-1 and A.5.7.6.3.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.3.2-1 and A.5.7.6.3.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR.

Table A.5.7.6.3.2-1: FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR

| Parameter  | Config | Unit | Test 1                 |
|--|--------|------|------------------------|
| SSB GSCN   | 1~2    |      | freq1                  |
| Duplex mode  | 1~2    |      | TDD                    |
| TDD Configuration  | 1~2    |      | TDDConf.3.1            |
| $BW_{channel}$   | 1~2    | MHz  | 100: $N_{RB,c} = 66$   |
| PDSCH Reference measurement channel  | 1~2    |      | SR.3.1 TDD             |
| RMSI CORESET Reference Channel   | 1~2    |      | CR.3.1 TDD             |
| Dedicated CORESET Reference Channel  | 1~2    |      | CCR.3.1 TDD            |
| SSB configuration  | 1~2    |      | SSB.1 FR2              |
| OCNG Patterns  | 1~2    |      | OP.1                   |
| Initial BWP Configuration  | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration  | 1~2    |      | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration  | 1~2    |      | TRS.2.1 TDD            |
| PDCCH/PDSCH TCI Configuration  | 1~2    |      | TCI.State.2            |
| SMTc configuration   | 1~2    |      | SMTc.1                 |
| CSI-RS configuration as CMR  | 1~2    |      | CSI-RS.3.2 TDD         |
| CSI-IM configuration as IMR  | 1~2    |      | CSI-IM.3.3 TDD         |
| reportConfigType   | 1~2    |      | periodic               |
| reportQuantity-r16   | 1~2    |      | cri-SINR-r16           |
| nrofReportedRS   | 1~2    |      | 2                      |
| L1-RSRP reporting period   | 1~2    |      | slot640                |
| Propagation condition  | 1~2    |      | AWGN                   |
| Antenna configuraion   | 1~2    |      | 1x2                    |
| EPRE ratio of PSS to SSS   | 1~2    | dB   | 0                      |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                        |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                        |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                        |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                        |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                        |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |        |      |                        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |        |      |                        |

Table A.5.7.6.3.2-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters

| Parameter  | Config | Unit          | Test 1                        |         |
|--|--------|---------------|-------------------------------|---------|
|  |        |               | CSI-RS0                       | CSI-RS1 |
| Angle of arrival configuration   |        |               | Setup 1 according to A.3.15.1 |         |
| Assumption for UE beams <sup>Note 4</sup>  |        |               | Rough                         |         |
| $N_{oc}$   | 1~2    | dBm/15 kHz    | -100                          |         |
| $N_{oc}$   | 1~2    | dBm/SS B SCS  | -91                           |         |
| $\hat{E}_s / I_{ot}$   | 1~2    | dB            | 10                            | -2      |
| CSI-RS-RSRP <sup>Note1</sup>   | 1~2    | dBm/SC S      | -81                           | -93     |
| $I_o$ <sup>Note1</sup>   | 1~2    | dBm/95.04M Hz | -51.57                        | -59.86  |
| $\hat{E}_s / N_{oc}$   | 1~2    | dB            | 10                            | -2      |
| Note 1: RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |        |               |                               |         |

### A.5.7.6.3.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.3. The following requirements are to be verified:

Absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.3.3-1.

Relative accuracy of CSI-RS#0 compared with CSI-RS#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.3.2-2.

Table A.5.7.6.3.3-1: L1-SINR absolute accuracy test requirement

|          | Test requirement <sup>Notes1,2</sup>  |
|----------|---|
| CSI-RS#0 | $L1-SINR_0 - \delta \leq \text{Reported SINR (dBm)} \leq L1-SINR_0 + \delta$  |
| CSI-RS#1 | $L1-SINR_1 - \delta \leq \text{Reported SINR (dBm)} \leq L1-SINR_1 + \delta$  |
| Note 1:  | L1-SINR <sub>n</sub> is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS#n under consideration |
| Note 2:  | $\delta$ is the SINR absolute accuracy requirement from Table 10.1.28.3.1-2.  |

## A.5.7.7 CSI-RSRP

### A.5.7.7.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RS based RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.3.1.1 and 10.1.3.1.2 for intra-frequency measurements.

#### A.5.7.7.1.2 Test parameters

In this set of test cases, all NR cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.7.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.5.7.7.1.2-2 and A.5.7.7.1.2-3. The E-UTRA PCell is configured as specified in clause A.3.7.2.2. In all test cases, cell 1 is the PCell, cell 2 is the PSCell and cell 3 is the target cell. The test consists of two time phases T1 and T2.

**Table A.5.7.7.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Configuration   | Description  |
|---|--|
| 1   | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations |  |

**Table A.5.7.7.1.2-2: CSI-RSRP Intra frequency general test parameters**

| Parameter <sup>Note 5</sup>   | Unit | T1                               |                                  | T2                               |                                  |
|---|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
|   |      | Cell 2                           | Cell 3                           | Cell 2                           | Cell 3                           |
| Physical cell ID  |      | 489                              | 0                                | 489                              | 0                                |
| SSB ARFCN   |      | freq1                            |                                  | freq1                            |                                  |
| Duplex mode   |      | TDD                              |                                  | TDD                              |                                  |
| TDD configuration   |      | TDDConf.3.1                      |                                  | TDDConf.3.1                      |                                  |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66      |                                  | 100: N <sub>RB,c</sub> = 66      |                                  |
| PDSCH Reference measurement channel   |      | SR.3.1<br>TDD                    | -                                | SR.3.1<br>TDD                    | -                                |
| RMSI CORESET Reference Channel  |      | CR.3.1<br>TDD                    | -                                | CR.3.1<br>TDD                    | -                                |
| Dedicated CORESET Reference Channel   |      | CCR.3.1<br>TDD                   | -                                | CCR.3.1<br>TDD                   | -                                |
| OCNG Patterns   |      | OP.3                             | OP.3                             | OP.3                             | OP.3                             |
| SSB configuration   |      | SSB.3<br>FR2                     | SSB.3<br>FR2                     | SSB.3<br>FR2                     | SSB.3<br>FR2                     |
| SMTC configuration  |      | SMTC.<br>1                       | SMTC.<br>1                       | SMTC.<br>1                       | SMTC.<br>1                       |
| CSI-RS configuration for RRM  |      | CSI-<br>RS.RR<br>M.FR2.<br>1 TDD | CSI-<br>RS.RR<br>M.FR2.<br>1 TDD | CSI-<br>RS.RR<br>M.FR2.<br>1 TDD | CSI-<br>RS.RR<br>M.FR2.<br>1 TDD |
| Time offset with Cell 2   | µs   | -                                | 0.58                             | -                                | 0.58                             |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                              | 120                              | 120                              | 120                              |
| EPRE ratio of PSS to SSS  | dB   | 0                                | 0                                | 0                                | 0                                |
| EPRE ratio of PBCH_DMRS to SSS  |      |                                  |                                  |                                  |                                  |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                                  |                                  |                                  |                                  |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                                  |                                  |                                  |                                  |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                                  |                                  |                                  |                                  |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                                  |                                  |                                  |                                  |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                                  |                                  |                                  |                                  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                                  |                                  |                                  |                                  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                                  |                                  |                                  |                                  |
| Propagation conditions  |      | AWGN                             | AWGN                             | AWGN                             | AWGN                             |
| Antenna configuration   |      | 1x2                              | 1x2                              | 1x2                              | 1x2                              |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: All parameters apply for configuration 1 and 2<br>Note 6: Void |      |                                  |                                  |                                  |                                  |

Table A.5.7.7.1.2-3: CSI-RSRP Intra frequency OTA related test parameters

| Parameter                                 | Unit  | T1                                   |        | T2                                    |                                     |
|---|---|--------------------------------------|--------|---------------------------------------|-------------------------------------|
|   |   | Cell 2                               | Cell 3 | Cell 2                                | Cell 3                              |
| Angle of arrival configuration            |   | Setup 1 according to clause A.3.15.1 |        |                                       |                                     |
| Assumption for UE beams <sup>Note 8</sup> |   | Rough                                |        |                                       |                                     |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sub>z</sub> <sup>Note4</sup>   | -91.6                                |        | N/A                                   |                                     |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sub>Note4</sub>  | -82.6                                |        | N/A                                   |                                     |
| $\hat{E}_s/N_{oc}$                        | dB  | 6.0                                  | 1.0    | N/A                                   | N/A                                 |
| $E_s$                                     | dBm/SCS <sub>Note4</sub>  |                                      |        | (Table B.2.2-2 Rx Beam Peak +2.1dB)   | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| SSB_RP <sup>Note2</sup>                   | dBm/SCS   | -76.6                                | -81.6  | (Table B.2.2-2 Rx Beam Peak +2.1dB)   | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| $\hat{E}_s/I_{ot\ BB}$ <sup>Note6</sup>   | dB  | 2.44                                 | -5.98  | -5.98                                 | -5.98                               |
| CSI_RP                                    | dBm/SCS   | -76.6                                | -81.6  | (Table B.2.2-2 Rx Beam Peak +2.1dB)   | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sub>Note4</sub>  | -50.05                               |        | (Table B.2.2-2 Rx Beam Peak +29.70dB) |                                     |
| Note 1:                                   | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |                                      |        |                                       |                                     |
| Note 2:                                   | SSB_RP, $E_s/I_{ot}$ and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |        |                                       |                                     |
| Note 3:                                   | Void  |                                      |        |                                       |                                     |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |                                      |        |                                       |                                     |
| Note 5:                                   | Void  |                                      |        |                                       |                                     |
| Note 6:                                   | Calculation of $E_s/I_{ot\ BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                                      |        |                                       |                                     |
| Note 7:                                   | All parameters apply for configurations 1 and 2   |                                      |        |                                       |                                     |
| Note 8:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |                                      |        |                                       |                                     |

### A.5.7.7.1.3 Test Requirements

The CSI-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2. The following requirements are to be verified:

During T1:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in table A.5.7.7.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T2:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in table A.5.7.7.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T1 and T2:

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.1.2-1

Relative accuracy of Cell 3 during T2 compared with Cell 3 during T1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.1.2-1.

**Table A.5.7.7.1.3-1: CSI-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <sup>Notes1,2,3</sup>   |
|---------|---|
| Cell 2  | $CSI\_RP2 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI\_RP2 + \delta + G_{max}$   |
| Cell 3  | $CSI\_RP3 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI\_RP3 + \delta + G_{max}$   |
| Note 1: | CSI_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.3.1.1-1, selected according to the $l_0$ used in the test                                    |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                             |

## A.5.7.7.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

### A.5.7.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RS based RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.3.1 and 10.1.5.3.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.5.7.7.2.1-1.

**Table A.5.7.7.2.1-1: Applicable NR configurations for FR2 inter-frequency CSI-RSRP accuracy test**

| <b>Configuration</b> | <b>Description</b>  |
|----------------------|---|
| 1                    | FDD LTE PCell, cells 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2                    | TDD LTE PCell, cells 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

### A.5.7.7.2.2 Test parameters

In this set of test cases, there are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.7.2.2-1 and Table A.5.7.7.2.2-2 below. Both absolute and relative accuracy of RSRP intrer-frequency measurements are tested by using the parameters in Table A.5.7.7.2.2-1 and Table A.5.7.7.2.2-2. The inter-frequency measurements are supported by a measurement gap.

Table A.5.7.7.2.2-1: CSI-RSRP inter-frequency general test parameters

| Parameter   | Config | Unit | Test 1                         |                            | Test 2                         |                            |
|---|--------|------|--------------------------------|----------------------------|--------------------------------|----------------------------|
|   |        |      | Cell 2                         | Cell 3                     | Cell 2                         | Cell 3                     |
| Physical cell ID  |        |      | 489                            | 0                          | 489                            | 0                          |
| SSB ARFCN   | 1,2    |      | freq1                          | freq2                      | freq1                          | freq2                      |
| BW <sub>channel</sub>   | 1,2    |      | 100:<br>N <sub>RB,c</sub> = 66 |                            | 100:<br>N <sub>RB,c</sub> = 66 |                            |
| Gap pattern ID  |        |      | 0                              |                            | 0                              |                            |
| Duplex mode   | 1,2    |      | TDD                            | TDD                        | TDD                            | TDD                        |
| TDD configuration   | 1,2    |      | TDDConf.3.1                    |                            | TDDConf.3.1                    |                            |
| PDSCH Reference measurement channel   | 1,2    |      | SR.3.1<br>TDD                  | -                          | SR.3.1<br>TDD                  | -                          |
| RMSI CORESET Reference Channel  | 1,2    |      | CR.3.1<br>TDD                  | -                          | CR.3.1<br>TDD                  | -                          |
| Dedicated CORESET Reference Channel   | 1,2    |      | CCR.3.1<br>TDD                 | -                          | CCR.3.1<br>TDD                 | -                          |
| SSB configuration   | 1,2    |      | SSB.3 FR2                      |                            | SSB.3 FR2                      |                            |
| OCNG Patterns   | 1,2    |      | OP.3                           |                            | OP.3                           |                            |
| Initial BWP Configuration   | 1,2    |      | DLBWP.0.1<br>ULBWP.0.1         |                            | DLBWP.0.1<br>ULBWP.0.1         |                            |
| Dedicated BWP configuration   | 1,2    |      | DLBWP.1.3<br>ULBWP.1.3         |                            | DLBWP.1.3<br>ULBWP.1.3         |                            |
| TRS Configuration   | 1,2    |      | TRS.2.1 TDD                    |                            | TRS.2.1 TDD                    |                            |
| PDCCH/PDSCH TCI Configuration   | 1,2    |      | TCI.State.2                    |                            | TCI.State.2                    |                            |
| SMTTC configuration   | 1,2    |      | SMTTC.1                        |                            | SMTTC.1                        |                            |
| CSI-RS configuration for RRM  | 1,2    |      | CSI-<br>RS.RRM.3<br>.1 TDD     | CSI-<br>RS.RRM.3<br>.2 TDD | CSI-<br>RS.RRM.3<br>.1 TDD     | CSI-<br>RS.RRM.3<br>.2 TDD |
| Time offset between Cell 2 and Cell 3   | 1,2    | µs   | 0.58                           |                            | 0.58                           |                            |
| EPRE ratio of PSS to SSS  | 1,2    | dB   | 0                              | 0                          | 0                              | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                                |                            |                                |                            |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                                |                            |                                |                            |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                                |                            |                                |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                                |                            |                                |                            |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                                |                            |                                |                            |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                                |                            |                                |                            |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                                |                            |                                |                            |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                                |                            |                                |                            |
| Propagation condition   | 1,2    | -    | AWGN                           | AWGN                       | AWGN                           | AWGN                       |
| Antenna configuration   | 1,2    | -    | 1x2                            | 1x2                        | 1x2                            | 1x2                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                                |                            |                                |                            |
| Note 2: Void  |        |      |                                |                            |                                |                            |



Table A.5.7.7.2.2-2: CSI-RSRP inter-frequency OTA related test parameters

| Parameter   | Unit                                    | Test 1                                  |                   | Test 2                                    |                                       |
|---|---|---|-------------------|---|---------------------------------------|
|   |   | Cell 2                                  | Cell 3            | Cell 2                                    | Cell 3                                |
| Angle of arrival configuration  |   | Setup 4b according to clause A.3.15.4.2 |                   | Setup 4b according to clause A.3.15.4.2   |                                       |
|   |   | AoA1 Spherical coverage                 | AoA2 Rx Beam Peak | AoA1 Spherical coverage                   | AoA2 Rx Beam Peak                     |
| Assumption for UE beams <sup>Note 7</sup>   |   | Rough                                   | Rough             | Assumption for UE beams <sup>Note 7</sup> |                                       |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sub>z</sub> <sup>Note4</sup> | -90.6                                   | -90.6             | (Table B.2.3-2 Rx Beam Peak +1.97dB)      | (Table B.2.3-2 Rx Beam Peak - 3.03dB) |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note4</sup>                | -81.6                                   | -81.6             | (Table B.2.3-2 Rx Beam Peak +11.0dB)      | (Table B.2.3-2 Rx Beam Peak +6.0dB)   |
| $\hat{E}_s / N_{oc}$  | dB                                      | 6.0                                     | 6.0               | 17.0                                      | -1.0                                  |
| SSB_RP <sup>Note2</sup>   | dBm/SCS                                 | -75.60                                  | -75.60            | (Table B.2.3-2 Rx Beam Peak +28.0dB)      | (Table B.2.3-2 Rx Beam Peak +5.0dB)   |
| (SSB_RP <sub>Cell 1</sub> – SSB_RP <sub>Cell 2</sub> )  | dB                                      | 0                                       |                   | 23.00                                     |                                       |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note6</sup>   | dB                                      | 5.29                                    | 5.96              | 8.86                                      | -3.92                                 |
| CSI_RP  | dBm/SCS                                 | -75.60                                  | -75.60            | (Table B.2.2-2 Rx Beam Peak +2.1dB)       | (Table B.2.2-2 Rx Beam Peak +2.1dB)   |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup>          | -50.03                                  | -50.03            | (Table B.2.3-2 Rx Beam Peak +52.68dB)     | (Table B.2.3-2 Rx Beam Peak +33.13dB) |
| ( $I_{ofreq 1} - I_{ofreq 2}$ )   | dB                                      | 0                                       |                   | 19.55                                     |                                       |
| <p>Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP, <math>E_s/I_{ot}</math>, <math>I_o</math>, (SSB_RP<sub>Cell 2</sub> – SSB_RP<sub>Cell 1</sub>) and (<math>I_{ofreq 2} - I_{ofreq 1}</math>) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: Void</p> <p>Note 6: Calculation of <math>E_s/I_{ot\_BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> or <math>\Delta MB_S</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |   |   |                   |   |                                       |

### A.5.7.7.2.3 Test Requirements

The CSI-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the absolute requirements in clause 10.1.5.3.1 and the relative requirements in clause 10.1.5.3.2.

Test 1:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table A.5.7.7.2.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table A.5.7.7.2.3-2.

Test 2:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table A.5.7.7.2.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table A.5.7.7.2.3-2.

**Table A.5.7.7.2.3-1: CSI-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <sup>Notes1,2,3,4</sup>  |
|---------|--|
| Cell 2  | $CSI\_RP2 - \delta + G_{min} + X \leq \text{Reported RSRP(dBm)} \leq CSI\_RP2 + \delta + G_{max}$  |
| Cell 3  | $CSI\_RP3 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI\_RP3 + \delta + G_{max}$  |
| Note 1: | CSI_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the lo used in the test  |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  |
| Note 4: | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |

**Table A.5.7.7.2.3-2: CSI-RSRP relative accuracy test requirement**

|                 | <b>Test requirement</b> <sup>Notes1,2,3,4</sup>  |
|-----------------|--|
| Cell 3 – Cell 2 | $CSI\_RP3 - CSI\_RP2 - \delta \leq \text{Reported RSRP(dB)} \leq CSI\_RP3 - CSI\_RP2 + \delta - (X)$   |
| Note 1:         | CSI_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2:         | $\delta$ is the RSRP relative accuracy requirement from Table 10.1.5.1.2-1   |
| Note 3:         | Void   |
| Note 4:         | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |

## A.5.7.8 CSI-RSRQ

### A.5.7.8.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.8 for inter-frequency measurement.

#### A.5.7.8.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.5.7.8.1.2-1. The absolute accuracy of CSI-RSRQ intra-frequency measurement is test by using the parameters in Table A.5.7.8.1.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1.

**Table A.5.7.8.1.2-1: CSI-RSRQ Intra frequency CSI-RSRQ supported test configurations**

| Config  | Description  |
|---|--|
| 1   | FDD LTE PCell, Cell 2&3 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | TDD LTE PCell, Cell 2&3 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band |  |

**Table A.5.7.8.1.2-2: CSI-RSRQ Intra frequency test parameters**

| Parameter   |                  | Unit | Test 1                      |              | Test 2                      |              |
|---|------------------|------|-----------------------------|--------------|-----------------------------|--------------|
|   |                  |      | Cell 2                      | Cell 3       | Cell 2                      | Cell 3       |
| SSB ARFCN   |                  |      | Freq1                       |              | Freq1                       |              |
| Duplex mode   |                  |      | TDD                         |              | TDD                         |              |
| TDD configuration   |                  |      | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>   |                  | MHz  | 100: N <sub>RB,c</sub> = 66 |              | 100: N <sub>RB,c</sub> = 66 |              |
| BWP configuration   | Initial DL BWP   |      | DLBWP.0.1                   |              |                             |              |
|   | Dedicated DL BWP |      | DLBWP.1.1                   |              |                             |              |
|   | Initial UL BWP   |      | ULBWP.0.1                   |              |                             |              |
|   | Dedicated UL BWP |      | ULBWP.1.1                   |              |                             |              |
| TRS configuration   |                  |      | TRS.2.1<br>TDD              |              | TRS.2.1<br>TDD              |              |
| CSI-RS configuration for RRM  |                  |      | CSI-RS.RRM.FR2.1 TDD        |              |                             |              |
| TCI state   |                  |      | TCI.State<br>.0             |              | TCI.State<br>.0             |              |
| PDSCH Reference measurement channel   |                  |      | SR.3.1<br>TDD               |              | SR.3.1<br>TDD               |              |
| RMSI CORESET Reference Channel  |                  |      | CR.3.1<br>TDD               | -            | CR.3.1<br>TDD               | -            |
| Control channel RMC   |                  |      | CCR.3.1<br>TDD              | -            | CCR.3.1<br>TDD              | -            |
| OCNG Patterns   |                  |      | OP.1                        | OP.1         | OP.1                        | OP.1         |
| SMTC configuration  |                  |      | SMTC.1                      |              |                             |              |
| SSB configuration   |                  |      | SSB.1<br>FR2                | SSB.1<br>FR2 | SSB.1<br>FR2                | SSB.1<br>FR2 |
| Time offset with Cell 2   |                  | µs   | -                           | 0.58         | -                           | 0.58         |
| PDSCH/PDCCH subcarrier spacing  |                  | kHz  | 120                         | 120          | 120                         | 120          |
| SS-RSSI-Measurement   |                  |      | Not Applicable              |              |                             |              |
| EPRE ratio of PSS to SSS  |                  | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS  |                  |      |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |                  |      |                             |              |                             |              |
| $\hat{E}_s/N_{oc}$  |                  | dB   | 3                           | 3            | -3                          | -3           |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RSRQ, CSI-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Void</p> |                  |      |                             |              |                             |              |

**Table A.5.7.8.1.2-3: CSI-RSRQ Intra frequency OTA related test parameters**

| Parameter   | Unit                           | Test 1                               |        | Test 2 |        |
|---|--------------------------------|--------------------------------------|--------|--------|--------|
|   |                                | Cell 2                               | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |        |        |        |
| Assumption for UE beams <sup>Note 9</sup>   |                                | Rough                                |        |        |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -95                                  |        | -95    |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -86                                  |        | -86    |        |
| CSI-RSRP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -83                                  | -83    | -89    | -89    |
| CSI-RSRQ <sup>Note2</sup>   | dB                             | -14.77                               | -14.77 | -16.81 | -16.81 |
| $\hat{E}_s/I_{ot}$  | dB                             | -1.76                                | -1.76  | -4.76  | -4.76  |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -50                                  |        | -54    | -54    |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RSRQ, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |        |        |

### A.5.7.8.1.3 Test Requirements

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ +2.5dB to Nominal CSI-RSRQ -3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ -4.5dB according to the requirements in clause 10.1.8 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test. Nominal CSI-RSRQ is the value shown in table A.5.7.8.1.2-3.

### A.5.7.8.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.10 for inter-frequency measurement.

#### A.5.7.8.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.8.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test setup in Table A.5.7.8.2.2-2 and Table A.5.7.8.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.5.7.8.2.2-1: CSI-RSRQ Inter frequency CSI-RSRQ supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.5.7.8.2.2-2: CSI-RSRQ Inter frequency general test parameters

| Parameter  | Unit   | Test 1               |                | Test 2               |                |
|--|--|----------------------|----------------|----------------------|----------------|
|  |  | Cell 2               | Cell 3         | Cell 2               | Cell 3         |
| SSB ARFCN  |  | Freq1                | freq2          | freq1                | Freq2          |
| Duplex mode                                      |  | TDD                  |                | TDD                  |                |
| TDD configuration                                |  | TDDConf.3.1          |                | TDDConf.3.1          |                |
| $BW_{channel}$                                   | MHz  | 100: $N_{RB,c} = 66$ |                | 100: $N_{RB,c} = 66$ |                |
| PDSCH Reference measurement channel              |  | SR.3.1<br>TDD        | -              | SR.3.1<br>TDD        | -              |
| RMSI CORESET Reference Channel                   |  | CR.3.1<br>TDD        | -              | CR.3.1<br>TDD        | -              |
| OCNG Patterns                                    |  | OP.1                 | OP.1           | OP.1                 | OP.1           |
| SMTC configuration                               |  | SMTC.<br>1 FR2       | SMTC.<br>1 FR2 | SMTC.<br>1 FR2       | SMTC.<br>1 FR2 |
| CSI-RS configuration for RRM                     |  | CSI-RS.RRM.FR2.1 TDD |                |                      |                |
| PDSCH/PDCCH subcarrier spacing                   | kHz  | 120                  | 120            | 120                  | 120            |
| Time offset with Cell 2                          | $\mu$ s  | -                    | 0.58           | -                    | 0.58           |
| EPRE ratio of PSS to SSS                         | dB   | 0                    | 0              | 0                    | 0              |
| EPRE ratio of PBCH_DMRS to SSS                   |  |                      |                |                      |                |
| EPRE ratio of PBCH to PBCH_DMRS                  |  |                      |                |                      |                |
| EPRE ratio of PDCCH_DMRS to SSS                  |  |                      |                |                      |                |
| EPRE ratio of PDCCH to PDCCH_DMRS                |  |                      |                |                      |                |
| EPRE ratio of PDSCH_DMRS to SSS                  |  |                      |                |                      |                |
| EPRE ratio of PDSCH to PDSCH_DMRS                |  |                      |                |                      |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> |  |                      |                |                      |                |
| $\hat{E}_s / N_{oc}$                             | dB   | -1.75                | -1.75          | -3                   | -3             |
| Note 1:  | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                      |                |                      |                |
| Note 2:  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                      |                |                      |                |
| Note 3:  | CSI-RSRQ, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                      |                |                      |                |
| Note 4:  | CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                      |                |                      |                |

Table A.5.7.8.2.2-3: CSI-RSRQ Inter frequency OTA related test parameters

| Parameter | Unit | Test 1 |        | Test 2 |        |
|-----------|------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

| AoA setup   |                                | Setup 1 in clause A.3.15 |        | Setup 1 in clause A.3.15 |        |
|---|--------------------------------|--------------------------|--------|--------------------------|--------|
| Assumption for UE beams <sup>Note 8</sup>   |                                | Rough                    |        | Rough                    |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -94.03                   |        | -94.03                   |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -85.0                    |        | -85.0                    |        |
| CSI-RP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -86.75                   | -86.75 | -88                      | -88    |
| CSI-RSRQ <sup>Note2</sup>   | dB                             | -14.75                   | -14.75 | -15.56                   | -15.56 |
| $\hat{E}_s/I_{ot}$  | dB                             | -1.75                    | -1.75  | -3                       | -3     |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -53.8                    | -53.8  | -54.25                   | -54.25 |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RSRQ, CSI-RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-RSRQ and CSI-RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                          |        |                          |        |

### A.5.7.8.2.3 Test Requirements

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ +2.5dB to Nominal CSI-RSRQ -3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ -4.5dB according to the requirements in clause 10.1.10 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test.

The CSI-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.

## A.5.7.9 CSI-SINR

### A.5.7.9.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.13.2.1.

#### A.5.7.9.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.9.1.2-1. The absolute accuracy of CSI-SINR intra-frequency measurement is test by using the parameters in Table A.5.7.9.1.2-2 and Table A.5.7.9.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.5.7.9.1.2-1: CSI-SINR Intra frequency CSI-SINR supported test configurations

| Configuration | Description  |
|---------------|--|
| 1             | FDD LTE PCell, Cell 2&3 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | TDD LTE PCell, Cell 2&3 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to pass in one of the supported test configurations

Table A.5.7.9.1.2-2: CSI-SINR Intra frequency test parameters

| Parameter   | Unit | Test 1                      |                       | Test 2                      |                       |
|---|------|-----------------------------|-----------------------|-----------------------------|-----------------------|
|   |      | Cell 2                      | Cell 3                | Cell 2                      | Cell 3                |
| SSB ARFCN   |      | Freq2                       |                       | Freq2                       |                       |
| Duplex mode   |      | TDD                         |                       | TDD                         |                       |
| TDD configuration   |      | TDDConf.3.1                 |                       | TDDConf.3.1                 |                       |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |                       | 100: N <sub>RB,c</sub> = 66 |                       |
| Downlink initial BWP configuration  |      | DLBWP.0.1                   |                       |                             |                       |
| Downlink dedicated BWP configuration  |      | DLBWP.1.1                   |                       |                             |                       |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   |                       |                             |                       |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   |                       |                             |                       |
| DRX cycle configuration   | ms   | Not applicable              |                       |                             |                       |
| TRS configuration   |      | TRS.2.1 TDD                 |                       |                             |                       |
| TCI state   |      | TCI.State.0                 |                       |                             |                       |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  |                       | SR.3.1 TDD                  |                       |
| RMSI CORESET Reference Channel  |      | CR.3.1 TDD                  | -                     | CR.3.1 TDD                  | -                     |
| Dedicated RMSI CORESET Reference Channel  |      | CCR.3.1 TDD                 | -                     | CCR.3.1 TDD                 | -                     |
| OCNG Patterns   |      | OP.1                        | OP.1                  | OP.1                        | OP.1                  |
| SMTc configuration  |      | SMTc.1                      |                       |                             |                       |
| SSB configuration   |      | SSB.1 FR2                   | SSB.1 FR2             | SSB.1 FR2                   | SSB.1 FR2             |
| CSI-RS for mobility   |      | -                           | CSI-RS.RR M.FR2.1 TDD | -                           | CSI-RS.RR M.FR2.1 TDD |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120                   | 120                         | 120                   |
| Time offset with Cell 2   | µs   | -                           | 0.29                  | -                           | 0.29                  |
| CSI-RSSI-Measurement  |      | Not Applicable              |                       |                             |                       |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0                     | 0                           | 0                     |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |                       |                             |                       |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |                       |                             |                       |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |                       |                             |                       |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |                       |                             |                       |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |                       |                             |                       |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |                       |                             |                       |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |                       |                             |                       |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |                       |                             |                       |
| $\hat{E}_s / N_{oc}$  | dB   | 4.54                        | 2.66                  | -3                          | -3                    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-SINR, CSI-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |      |                             |                       |                             |                       |

**Table A.5.7.9.1.2-3: CSI-SINR Intra frequency OTA related test parameters**

| Parameter   | Unit                                 | Test 1                               |        | Test 2                               |        |
|---|--------------------------------------|--------------------------------------|--------|--------------------------------------|--------|
|   |                                      | Cell 2                               | Cell 3 | Cell 2                               | Cell 3 |
| Angle of arrival configuration  |                                      | Setup 1 according to clause A.3.15.1 |        | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 7</sup>   |                                      | Rough                                |        | Rough                                |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz<br><sup>Note4</sup>        | -105                                 |        | N/A                                  |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS<br><sup>Note3</sup>          | -96                                  |        | N/A                                  |        |
| $\hat{E}_s / N_{oc}$  | dB                                   | 4.54                                 | 2.66   | -3                                   | -3     |
| CSI-RSRP <sup>Note2</sup>   | dBm/SCS<br><sup>Note4</sup>          | -91.46                               | -93.34 | -99                                  | -99    |
| CSI-SINR <sup>Note2</sup>   | dB                                   | 0                                    | -3.2   | -4.76                                | -4.76  |
| $\hat{E}_s / I_{ot}$  | dB                                   | 0                                    | -3.2   | -4.76                                | -4.76  |
| $I_o$ <sup>Note2</sup>  | dBm/95.04<br>MHz<br><sup>Note4</sup> | -59.2                                |        | -64                                  |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-SINR, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                      |                                      |        |                                      |        |

### A.5.7.9.1.3 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+3dB to Nominal CSI-SINR -4dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR +3.5dB to Nominal CSI-SINR -4.5dB according to the requirements in clause 10.13.2 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal CSI-SINR is the value shown in table A.5.7.9.1.2-3.

### A.5.7.9.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.9.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.15.2.1 and 10.1.15.2.2 for inter-frequency measurement.

#### A.5.7.9.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.9.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test setup in Table A.5.7.9.2.2-2 and Table A.5.7.9.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.



**Table A.5.7.9.2.2-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.5.7.9.2.2-2: CSI-SINR Inter frequency general test parameters**

| Parameter  | Unit | Test 1                      |                       | Test 2                      |                       | Test 3                      |                       |
|--|------|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|
|  |      | Cell 2                      | Cell 3                | Cell 2                      | Cell 3                | Cell 2                      | Cell 3                |
| SSB ARFCN  |      | Freq1                       | freq2                 | freq1                       | Freq2                 | freq1                       | Freq2                 |
| Duplex mode  |      | TDD                         |                       | TDD                         |                       | TDD                         |                       |
| TDD configuration  |      | TDDConf.3.1                 |                       | TDDConf.3.1                 |                       | TDDConf.3.1                 |                       |
| BW <sub>channel</sub>  | MHz  | 100: N <sub>RB,c</sub> = 66 |                       | 100: N <sub>RB,c</sub> = 66 |                       | 100: N <sub>RB,c</sub> = 66 |                       |
| Downlink initial BWP configuration   |      | DLBWP.0.1                   |                       |                             |                       |                             |                       |
| Downlink dedicated BWP configuration   |      | DLBWP.1.1                   |                       |                             |                       |                             |                       |
| Uplink initial BWP configuration   |      | ULBWP.0.1                   |                       |                             |                       |                             |                       |
| Uplink dedicated BWP configuration   |      | ULBWP.1.1                   |                       |                             |                       |                             |                       |
| DRX cycle configuration  | ms   | Not applicable              |                       |                             |                       |                             |                       |
| TRS configuration  |      | TRS.2.1 TDD                 |                       |                             |                       |                             |                       |
| TCI state  |      | TCI.State.0                 |                       |                             |                       |                             |                       |
| PDSCH Reference measurement channel  |      | SR.3.1 TDD                  | -                     | SR.3.1 TDD                  | -                     | SR.3.1 TDD                  | -                     |
| RMSI CORESET Reference Channel   |      | CR.3.1 TDD                  | -                     | CR.3.1 TDD                  | -                     | CR.3.1 TDD                  | -                     |
| OCNG Patterns  |      | OP.1                        | OP.1                  | OP.1                        | OP.1                  | OP.1                        | OP.1                  |
| Time offset with cell 2  | μs   | -                           | 0.29                  | -                           | 0.29                  | -                           | 0.29                  |
| SMTC configuration   |      | SMTC.1 FR2                  | SMTC.1 FR2            | SMTC.1 FR2                  | SMTC.1 FR2            | SMTC.1 FR2                  | SMTC.1 FR2            |
| CSI-RS for mobility  |      | -                           | CSI-RS.RR M.FR2.1 TDD | -                           | CSI-RS.RR M.FR2.1 TDD | -                           | CSI-RS.RR M.FR2.1 TDD |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 120                         | 120                   | 120                         | 120                   | 120                         | 120                   |
| EPRE ratio of PSS to SSS   | dB   | 0                           | 0                     | 0                           | 0                     | 0                           | 0                     |
| EPRE ratio of PBCH_DMRS to SSS   |      |                             |                       |                             |                       |                             |                       |
| EPRE ratio of PBCH to PBCH_DMRS  |      |                             |                       |                             |                       |                             |                       |
| EPRE ratio of PDCCH_DMRS to SSS  |      |                             |                       |                             |                       |                             |                       |
| EPRE ratio of PDCCH to PDCCH_DMRS  |      |                             |                       |                             |                       |                             |                       |
| EPRE ratio of PDSCH_DMRS to SSS  |      |                             |                       |                             |                       |                             |                       |
| EPRE ratio of PDSCH to PDSCH_DMRS  |      |                             |                       |                             |                       |                             |                       |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |      |                             |                       |                             |                       |                             |                       |
| $\hat{E}_s / N_{oc}$   | dB   | -0.5                        | -0.5                  | 11.0                        | 11.0                  | -3.0                        | -3.0                  |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-SINR, CSI-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |      |                             |                       |                             |                       |                             |                       |

**Table A.5.7.9.2.2-3: CSI-SINR Inter frequency OTA related test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        | Test 3 |        |
|-----------|------|--------|--------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

| Angle of arrival configuration  | degrees                           | Setup 1 according to A.3.15.1 |       | Setup 1 according to A.3.15.1 |      | Setup 1 according to A.3.15.1 |      |
|---|-----------------------------------|-------------------------------|-------|-------------------------------|------|-------------------------------|------|
| Assumption for UE beams <sup>Note 7</sup>   |                                   | Rough                         |       | Rough                         |      | Rough                         |      |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz<br><sup>Note4</sup>     | -105                          |       | -105                          |      | -105                          |      |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS<br><sup>Note3</sup>       | -96                           |       | -96                           |      | -96                           |      |
| $\hat{E}_s / N_{oc}$  | dB                                | -0.5                          | -0.5  | 11.0                          | 11.0 | -3.0                          | -3.0 |
| CSI-RSRP <sup>Note2</sup>   | dBm/SCS<br><sup>Note4</sup>       | -96.5                         | -96.5 | -85                           | -85  | -99                           | -99  |
| CSI-SINR <sup>Note2</sup>   | dB                                | -0.5                          | -0.5  | 11                            | 11   | -3.0                          | -3.0 |
| $\hat{E}_s / I_{ot}$  | dB                                | -0.5                          | -0.5  | 11                            | 11   | -3.0                          | -3.0 |
| $I_o$ <sup>Note2</sup>  | dBm/95.04<br>MHz <sup>Note4</sup> | -69.3                         |       | -55.4                         |      | -65.24                        |      |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-SINR, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                   |                               |       |                               |      |                               |      |

#### A.5.7.9.2.3 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+3dB to Nominal CSI-SINR -4dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR+3.5dB to Nominal CSI-SINR -4.5dB according to the requirements in clause 10.1.15.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal CSI-SINR is the value shown in table A.5.7.2.2.2-3

The CSI-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.2.2.

## A.5.8 Void

## A.6 NR standalone tests with all NR cells in FR1

### A.6.1 SA: RRC\_IDLE state mobility

#### A.6.1.1 Cell re-selection to NR

##### A.6.1.1.1 Cell reselection to FR1 intra-frequency NR case

###### A.6.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

###### A.6.1.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.1.1.1.2-1, A.6.1.1.1.2-2 and A.6.1.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

**Table A.6.1.1.1.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

Table A.6.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case

| Parameter                  |                 | Unit   | Test configuration | Value          | Comment   |
|----------------------------|-----------------|--------|--------------------|----------------|---|
| Initial condition          | Active cell     |        | 1, 2, 3            | Cell1          |   |
| T2 end condition           | Active cell     |        | 1, 2, 3            | Cell2          |   |
|                            | Neighbour cells |        | 1, 2, 3            | Cell1          |   |
| Final condition            | Active cell     |        | 1, 2, 3            | Cell1          |   |
|                            | Neighbour cells |        | 1, 2, 3            | Cell2          |   |
| RF Channel Number          |                 |        | 1, 2, 3            | 1              |   |
| Time offset between cells  |                 |        | 1                  | 3 ms           | Asynchronous cells  |
|                            |                 |        | 2                  | 3 $\mu$ s      | Synchronous cells   |
|                            |                 |        | 3                  | 3 $\mu$ s      | Synchronous cells   |
| Access Barring Information |                 | -      | 1, 2, 3            | Not Sent       | No additional delays in random access procedure.  |
| SSB configuration          |                 |        | 1                  | SSB.1 FR1      |   |
|                            |                 |        | 2                  | SSB.1 FR1      |   |
|                            |                 |        | 3                  | SSB.2 FR1      |   |
| SMTC configuration         |                 |        | 1                  | SMTC.2         | Configured in SIB2 of Cell 1  |
|                            |                 |        |                    | SMTC.6         | Configured in SIB2 of Cell 2  |
|                            |                 |        | 2                  | SMTC.1         |   |
|                            | 3               | SMTC.1 |                    |                |   |
| DRX cycle length           |                 | s      | 1, 2, 3            | 1.28           | The value shall be used for all cells in the test.  |
| PRACH configuration index  |                 |        | 1, 2, 3            | 102            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2   |
| rangeToBestCell            |                 |        | 1, 2, 3            | Not configured |   |
| T1                         |                 | s      | 1, 2, 3            | >7             | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2                         |                 | s      | 1, 2, 3            | 40             | T2 needs to be defined so that cell re-selection reaction time is taken into account.   |
| T3                         |                 | s      | 1, 2, 3            | 15             | T3 needs to be defined so that cell re-selection reaction time is taken into account.   |

**Table A.6.1.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN**

| Parameter  | Unit          | Test configuration | Cell 1                  |        |        | Cell 2  |      |       |
|--|---------------|--------------------|-------------------------|--------|--------|---|------|-------|
|  |               |                    | T1                      | T2     | T3     | T1  | T2   | T3    |
| TDD configuration  |               | 1                  | N/A                     |        |        | N/A   |      |       |
|  |               | 2                  | TDDConf.1.1             |        |        | TDDConf.1.1                                     |      |       |
|  |               | 3                  | TDDConf.2.1             |        |        | TDDConf.2.1                                     |      |       |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD              |        |        | SR.1.1 FDD                                      |      |       |
|  |               | 2                  | SR.1.1 TDD              |        |        | SR.1.1 TDD                                      |      |       |
|  |               | 3                  | SR.2.1 TDD              |        |        | SR.2.1 TDD                                      |      |       |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD              |        |        | CR.1.1 FDD                                      |      |       |
|  |               | 2                  | CR.1.1 TDD              |        |        | CR.1.1 TDD                                      |      |       |
|  |               | 3                  | CR.2.1 TDD              |        |        | CR.2.1 TDD                                      |      |       |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD             |        |        | CCR.1.1 FDD                                     |      |       |
|  |               | 2                  | CCR.1.1 TDD             |        |        | CCR.1.1 TDD                                     |      |       |
|  |               | 3                  | CCR.2.1 TDD             |        |        | CCR.2.1 TDD                                     |      |       |
| OCNG Pattern   |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        |        | OP.1 defined in A.3.2.1                         |      |       |
| Initial DL BWP configuration   |               | 1, 2, 3            | DLBWP.0.1               |        |        | DLBWP.0.1                                       |      |       |
| Initial UL BWP configuration   |               | 1, 2, 3            | ULBWP.0.1               |        |        | ULBWP.0.1                                       |      |       |
| RLM-RS   |               | 1, 2, 3            | SSB                     |        |        | SSB   |      |       |
| Qrxlevmin  | dBm/SCS       | 1, 2               | -130                    |        |        | -130  |      |       |
|  |               | 3                  | -127                    |        |        | -127  |      |       |
| Pcompensation  | dB            | 1, 2, 3            | 0                       |        |        | 0   |      |       |
| Qhysts   | dB            | 1, 2, 3            | 0                       |        |        | 0   |      |       |
| Qoffsets <sub>s, n</sub>   | dB            | 1, 2, 3            | 0                       |        |        | 0   |      |       |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2, 3            | SS-RSRP                 |        |        | SS-RSRP   |      |       |
| $\hat{E}_s / I_{ot}$   | dB            | 1                  | 16                      | -3.11  | 2.79   | -infinity                                       | 2.79 | -3.11 |
|  |               | 2                  |                         |        |        |   |      |       |
|  |               | 3                  |                         |        |        |   |      |       |
| $N_{oc}$ Note2   | dBm/SCS       | 1                  | -98                     |        |        |   |      |       |
|  |               | 2                  | -98                     |        |        |   |      |       |
|  |               | 3                  | -95                     |        |        |   |      |       |
| $N_{oc}$ Note2   | dBm/15 kHz    | 1                  | -98                     |        |        |   |      |       |
|  |               | 2                  |                         |        |        |   |      |       |
|  |               | 3                  |                         |        |        |   |      |       |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 16                      | 13     | 16     | -infinity                                       | 16   | 13    |
|  |               | 2                  |                         |        |        |   |      |       |
|  |               | 3                  |                         |        |        |   |      |       |
| SS-RSRP Note3  | dBm/SCS       | 1                  | -82                     | -85    | -82    | -infinity                                       | -82  | -85   |
|  |               | 2                  | -82                     | -85    | -82    | -infinity                                       | -82  | -85   |
|  |               | 3                  | -79                     | -82    | -79    | -infinity                                       | -79  | -82   |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -53.94                  | -52.21 | -52.21 | Same as parameters specified in Cell 1 columns- |      |       |
|  | dBm/9.36 MHz  | 2                  | -53.94                  | -52.21 | -52.21 |   |      |       |
|  | dBm/38.16 MHz | 3                  | -47.85                  | -46.12 | -46.12 |   |      |       |
| Treselection   | s             | 1, 2, 3            | 0                       | 0      | 0      | 0   | 0    | 0     |
| SintrasearchP  | dB            | 1, 2, 3            | 60                      |        |        | 60  |      |       |
| Propagation Condition  |               | 1, 2, 3            | AWGN                    |        |        |   |      |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                         |        |        |   |      |       |

### A.6.1.1.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as:  $T_{\text{detect, NR\_Intra}} + T_{\text{SI-NR}}$ , and to an already detected cell can be expressed as:  $T_{\text{evaluate, NR\_intra}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{detect, NR\_Intra}}$  See Table 4.2.2.3-1 in clause 4.2.2.3

$T_{\text{evaluate, NR\_intra}}$  See Table 4.2.2.3-1 in clause 4.2.2.3

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case.

This gives a total of 33.28 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.68 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

### A.6.1.1.2 Cell reselection to FR1 inter-frequency NR case

#### A.6.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

#### A.6.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.6.1.1.2.2-1, A.6.1.1.2.2-2 and A.6.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

**Table A.6.1.1.2.2-1: Supported test configurations**

| Configuration | Description of serving cell                       | Description of target cell                        |
|---------------|---|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations.

**Table A.6.1.1.2.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case**

| Parameter                  |                 | Unit | Test configuration | Value          | Comment  |
|----------------------------|-----------------|------|--------------------|----------------|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell2          | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1  |
|                            | Neighbour cell  |      | 1, 2, 3            | Cell 1         |  |
| T1 end condition           | Active cell     |      | 1, 2, 3            | Cell1          | The UE shall perform reselection to cell 1 during T1   |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2          |  |
| T3 end condition           | Active cell     |      | 1, 2, 3            | Cell2          | The UE shall perform reselection to cell 2 with higher priority during T3  |
|                            | Neighbour cell  |      | 1, 2, 3            | Cell 1         |  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1, 2           |  |
| Time offset between cells  |                 |      | 1                  | 3 ms           | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s      | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s      | Synchronous cells  |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent       | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | SSB.1 FR1      |  |
|                            |                 |      | 2                  | SSB.1 FR1      |  |
|                            |                 |      | 3                  | SSB.2 FR1      |  |
| SMTC configuration         |                 |      | 1                  | SMTC.2         | Configured in SIB4 of Cell 1   |
|                            |                 |      |                    | SMTC.6         | Configured in SIB4 of Cell 2   |
|                            |                 |      | 2                  | SMTC.1         |  |
|                            |                 |      | 3                  | SMTC.1         |  |
| DRX cycle length           |                 | s    | 1, 2, 3            | 1.28           | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                 |      | 1, 2, 3            | 102            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| rangeToBestCell            |                 |      | 1, 2, 3            | Not configured |  |
| T1                         |                 | s    | 1, 2, 3            | 15             | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2                         |                 | s    | 1, 2, 3            | >7             | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3                         |                 | s    | 1, 2, 3            | 75             | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

**Table A.6.1.1.2.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN**

| Parameter  | Unit          | Test configuration | Cell 1                  |        |        | Cell 2                  |           |        |
|--|---------------|--------------------|-------------------------|--------|--------|-------------------------|-----------|--------|
|  |               |                    | T1                      | T2     | T3     | T1                      | T2        | T3     |
| TDD configuration  |               | 1                  | N/A                     |        |        | N/A                     |           |        |
|  |               | 2                  | TDDConf.1.1             |        |        | TDDConf.1.1             |           |        |
|  |               | 3                  | TDDConf.2.1             |        |        | TDDConf.2.1             |           |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD              |        |        | SR.1.1 FDD              |           |        |
|  |               | 2                  | SR.1.1 TDD              |        |        | SR.1.1 TDD              |           |        |
|  |               | 3                  | SR.2.1 TDD              |        |        | SR.2.1 TDD              |           |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD              |        |        | CR.1.1 FDD              |           |        |
|  |               | 2                  | CR.1.1 TDD              |        |        | CR.1.1 TDD              |           |        |
|  |               | 3                  | CR.2.1 TDD              |        |        | CR.2.1 TDD              |           |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD             |        |        | CCR.1.1 FDD             |           |        |
|  |               | 2                  | CCR.1.1 TDD             |        |        | CCR.1.1 TDD             |           |        |
|  |               | 3                  | CCR.2.1 TDD             |        |        | CCR.2.1 TDD             |           |        |
| OCNG Pattern   |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        |        | OP.1 defined in A.3.2.1 |           |        |
| Initial DL BWP configuration   |               | 1, 2, 3            | DLBWP.0.1               |        |        | DLBWP.0.1               |           |        |
| Initial UL BWP configuration   |               | 1, 2, 3            | ULBWP.0.1               |        |        | ULBWP.0.1               |           |        |
| RLM-RS   |               | 1, 2, 3            | SSB                     |        |        | SSB                     |           |        |
| Qrxlevmin  | dBm/SCS       | 1, 2               | -140                    |        |        | -140                    |           |        |
|  |               | 3                  | -137                    |        |        | -137                    |           |        |
|  |               |                    |                         |        |        |                         |           |        |
| Pcompensation  | dB            | 1, 2, 3            | 0                       |        |        | 0                       |           |        |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2, 3            | SS-RSRP                 |        |        | SS-RSRP                 |           |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
|  |               | 2                  |                         |        |        |                         |           |        |
|  |               | 3                  |                         |        |        |                         |           |        |
| $N_{oc}$ Note2   | dBm/SCS       | 1                  | -98                     |        |        |                         |           |        |
|  |               | 2                  | -98                     |        |        |                         |           |        |
|  |               | 3                  | -95                     |        |        |                         |           |        |
| $N_{oc}$ Note2   | dBm/15 kHz    | 1                  | -98                     |        |        |                         |           |        |
|  |               | 2                  |                         |        |        |                         |           |        |
|  |               | 3                  |                         |        |        |                         |           |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
|  |               | 2                  |                         |        |        |                         |           |        |
|  |               | 3                  |                         |        |        |                         |           |        |
| SS-RSRP Note3  | dBm/SCS       | 1                  | -84                     | -84    | -84    | -102                    | -infinity | -86    |
|  |               | 2                  | -84                     | -84    | -84    | -102                    | -infinity | -86    |
|  |               | 3                  | -81                     | -81    | -81    | -99                     | -infinity | -83    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -55.88                  | -55.88 | -55.88 | -68.60                  | -70.05    | -57.78 |
|  | dBm/9.36 MHz  | 2                  | -55.88                  | -55.88 | -55.88 | -68.60                  | -70.05    | -57.78 |
|  | dBm/38.16 MHz | 3                  | -49.79                  | -49.79 | -49.79 | -62.50                  | -63.96    | -51.69 |
| Treselection   | s             | 1, 2, 3            | 0                       | 0      | 0      | 0                       | 0         | 0      |
| SnonintrasearchP   | dB            | 1, 2, 3            | 50                      |        |        | 50                      |           |        |
| Thresh <sub>x, highP</sub>   | dB            | 1, 2, 3            | 48                      |        |        | 48                      |           |        |
| Thresh <sub>serv, lowP</sub>   | dB            | 1, 2, 3            | 44                      |        |        | 44                      |           |        |
| Thresh <sub>x, lowP</sub>  | dB            | 1, 2, 3            | 50                      |        |        | 50                      |           |        |
| Propagation Condition  |               | 1, 2, 3            | AWGN                    |        |        |                         |           |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |               |                    |                         |        |        |                         |           |        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |               |                    |                         |        |        |                         |           |        |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |               |                    |                         |        |        |                         |           |        |



### A.6.1.1.2.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{\text{higher\_priority\_search}} + T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$ , and to a lower priority cell can be expressed as:  $T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$ .

Where:

$T_{\text{higher\_priority\_search}}$  See clause 4.2.2.7

$T_{\text{evaluate, NR\_inter}}$  See Table 4.2.2.4-1 in clause 4.2.2.4

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

### A.6.1.1.3 Cell reselection to FR1 intra-frequency NR case for UE fulfilling low mobility relaxed measurement criterion

#### A.6.1.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in clause 4.2.2.9.2

#### A.6.1.1.3.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.1.1.3.2-1, A.6.1.1.3.2-2 and A.6.1.1.3.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

**Table A.6.1.1.3.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.1.1.3.2-2: General test parameters for FR1 intra frequency NR cell re-selection test case for UE fulfilling low mobility criterion**

| Parameter | Unit | Test configuration | Value | Comment |
|-----------|------|--------------------|-------|---------|
|-----------|------|--------------------|-------|---------|

|                            |                 |   |         |                |   |
|----------------------------|-----------------|---|---------|----------------|---|
| Initial condition          | Active cell     |   | 1, 2, 3 | Cell1          | The UE camps on cell 1 in the initial phase   |
|                            | Neighbour cells |   | 1, 2, 3 | Cell2          |   |
| T1 end condition           | Active cell     |   | 1, 2, 3 | Cell2          | The UE reselects to cell 2 during T1 period   |
|                            | Neighbour cells |   | 1, 2, 3 | Cell1          |   |
| Final condition            | Active cell     |   | 1, 2, 3 | Cell1          | The UE reselects to cell 1 during T2 period   |
|                            | Neighbour cells |   | 1, 2, 3 | Cell2          |   |
| RF Channel Number          |                 |   | 1, 2, 3 | 1              |   |
| Time offset between cells  |                 |   | 1       | 3 ms           | Asynchronous cells  |
|                            |                 |   | 2       | 3 $\mu$ s      | Synchronous cells   |
|                            |                 |   | 3       | 3 $\mu$ s      | Synchronous cells   |
| Access Barring Information |                 | - | 1, 2, 3 | Not Sent       | No additional delays in random access procedure.                                      |
| SSB configuration          |                 |   | 1       | SSB.1 FR1      |   |
|                            |                 |   | 2       | SSB.1 FR1      |   |
|                            |                 |   | 3       | SSB.2 FR1      |   |
| SMTC configuration         |                 |   | 1       | SMTC pattern 2 | Configured in SIB2 of Cell 1  |
|                            |                 |   |         | SMTC pattern 6 | Configured in SIB2 of Cell 2  |
|                            |                 |   | 2       | SMTC pattern 1 |   |
|                            |                 |   |         | 3              | SMTC pattern 1  |
| DRX cycle length           |                 | s | 1, 2, 3 | 0.64           | The value shall be used for all cells in the test.                                    |
| PRACH configuration index  |                 |   | 1, 2, 3 | 102            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                   |
| rangeToBestCell            |                 |   | 1, 2, 3 | Not configured |   |
| T1                         |                 | s | 1, 2, 3 | 25             | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2                         |                 | s | 1, 2, 3 | 25             | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

**Table A.6.1.1.3.2-3: Cell specific test parameters for FR1 intra frequency NR cell re-selection test case in AWGN for UE fulfilling low mobility criterion**

| Parameter  | Unit          | Test configuration | Cell 1                  |        | Cell 2                       |       |
|--|---------------|--------------------|-------------------------|--------|------------------------------|-------|
|  |               |                    | T1                      | T2     | T1                           | T2    |
| TDD configuration                                  |               | 1                  | N/A                     |        | N/A                          |       |
|  |               | 2                  | TDDConf.1.1             |        | TDDConf.1.1                  |       |
|  |               | 3                  | TDDConf.2.1             |        | TDDConf.2.1                  |       |
| PDSCH RMC configuration                            |               | 1                  | SR.1.1 FDD              |        | N/A                          |       |
|  |               | 2                  | SR.1.1 TDD              |        |                              |       |
|  |               | 3                  | SR.2.1 TDD              |        |                              |       |
| RMSI CORESET RMC configuration                     |               | 1                  | CR.1.1 FDD              |        | CR.1.1 FDD                   |       |
|  |               | 2                  | CR.1.1 TDD              |        | CR.1.1 TDD                   |       |
|  |               | 3                  | CR.2.1 TDD              |        | CR.2.1 TDD                   |       |
| Dedicated CORESET RMC configuration                |               | 1                  | CCR.1.1 FDD             |        | CCR.1.1 FDD                  |       |
|  |               | 2                  | CCR.1.1 TDD             |        | CCR.1.1 TDD                  |       |
|  |               | 3                  | CCR.2.1 TDD             |        | CCR.2.1 TDD                  |       |
| OCNG Pattern                                       |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        | OP.1 defined in A.3.2.1      |       |
| Initial DL BWP configuration                       |               | 1, 2, 3            | DLBWP.0.1               |        | DLBWP.0.1                    |       |
| Initial UL BWP configuration                       |               | 1, 2, 3            | ULBWP.0.1               |        | ULBWP.0.1                    |       |
| RLM-RS   |               | 1, 2, 3            | SSB                     |        | SSB                          |       |
| Qrxlevmin  | dBm/SCS       | 1, 2               | -140                    |        | -140                         |       |
|  |               | 3                  | -137                    |        | -137                         |       |
| Pcompensation                                      | dB            | 1, 2, 3            | 0                       |        | 0                            |       |
| Qhysts   | dB            | 1, 2, 3            | 0                       |        | 0                            |       |
| Qoffsets, n  | dB            | 1, 2, 3            | 0                       |        | 0                            |       |
| S <sub>SearchDeltaP</sub>                          | dB            | 1, 2, 3            | 3                       |        | 3                            |       |
| T <sub>SearchDeltaP</sub>                          | s             | 1, 2, 3            | 5                       |        | 5                            |       |
| Cell_selection_and_reselection_quality_measurement |               | 1, 2, 3            | SS-RSRP                 |        | SS-RSRP                      |       |
| $\hat{E}_s / I_{ot}$                               | dB            | 1, 2, 3            | -3.11                   | 2.79   | 2.79                         | -3.11 |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/SCS       | 1                  | -98                     |        |                              |       |
|  |               | 2                  | -98                     |        |                              |       |
|  |               | 3                  | -95                     |        |                              |       |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/15 kHz    | 1, 2, 3            | -98                     |        |                              |       |
| $\hat{E}_s / N_{oc}$                               | dB            | 1, 2, 3            | 13                      | 16     | 16                           | 13    |
| SS-RSRP <sup>Note3</sup>                           | dBm/SCS       | 1                  | -85                     | -82    | -82                          | -85   |
|  |               | 2                  | -85                     | -82    | -82                          | -85   |
|  |               | 3                  | -82                     | -79    | -79                          | -82   |
| I <sub>o</sub>                                     | dBm/9.36 MHz  | 1                  | -52.21                  | -52.21 | specified in Cell 1 columns- |       |
|  | dBm/9.36 MHz  | 2                  | -52.21                  | -52.21 |                              |       |
|  | dBm/38.16 MHz | 3                  | -46.12                  | -46.12 |                              |       |
| T <sub>reselction</sub>                            | s             | 1, 2, 3            | 0                       | 0      | 0                            | 0     |
| SintrasearchP                                      | dB            | 1, 2, 3            | 60                      |        | 60                           |       |
| Propagation Condition                              |               | 1, 2, 3            | AWGN                    |        |                              |       |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |

### A.6.1.1.3.3 Test Requirements

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected cell shall be less than 17 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than 17 s.

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

NOTE: The cell re-selection delay to an already detected cell can be expressed as:  $T_{\text{evaluate,NR\_Intra}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{evaluate,NR\_Intra}}$  See Table 4.2.2.9.2-1 in clause 4.2.2.9.2 for reselection to Cell 2 during T1 with UE fulfilling low mobility criterion. 15.36s.

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

### A.6.1.1.4 Cell reselection to FR1 intra-frequency NR case for UE fulfilling not-at-cell edge relaxed measurement criterion

#### A.6.1.1.4.1 Test Purpose and Environment

This test is to verify the relaxed cell re-selection requirement for UEs configured with not-at-cell edge criterion specified in clause 4.2.2.9.3.

#### A.6.1.1.4.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.1.1.4.2-1, A.6.1.1.4.2-2 and A.6.1.1.4.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas.

**Table A.6.1.1.4.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.1.1.4.2-2: General test parameters for FR1 intra frequency NR cell re-selection test case for UE fulfilling not-at-cell edge criterion**

| Parameter                  |                 | Unit | Test configuration | Value          | Comment   |
|----------------------------|-----------------|------|--------------------|----------------|---|
| Initial condition          | Active Cell     |      | 1, 2, 3            | Cell1          | The UE camps on Cell 1 in the initial phase   |
|                            | Neighbour Cells |      | 1, 2, 3            | Cell2          |   |
| T1 end condition           | Active Cell     |      | 1, 2, 3            | Cell2          | The UE shall fulfil the not-at-cell edge criterion and reselect to cell 2 during T1 period during T1. |
|                            | Neighbour Cells |      | 1, 2, 3            | Cell1          |   |
| T2 end condition           | Active Cell     |      | 1, 2, 3            | Cell1          | The UE shall perform reselection to Cell 1 during T2  |
|                            | Neighbour Cells |      | 1, 2, 3            | Cell2          |   |
| RF Channel Number          |                 |      | 1, 2, 3            | 1              |   |
| Time offset between Cells  |                 |      | 1                  | 3 ms           | Asynchronous Cells  |
|                            |                 |      | 2                  | 3 $\mu$ s      | Synchronous Cells   |
|                            |                 |      | 3                  | 3 $\mu$ s      | Synchronous Cells   |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent       | No additional delays in random access procedure.  |
| SSB configuration          |                 |      | 1                  | SSB.1 FR1      |   |
|                            |                 |      | 2                  | SSB.1 FR1      |   |
|                            |                 |      | 3                  | SSB.2 FR1      |   |
| SMTC configuration         |                 |      | 1                  | SMTC pattern 2 | Configured in SIB2 of Cell 1  |
|                            |                 |      |                    | SMTC pattern 6 | Configured in SIB2 of Cell 2  |
|                            |                 |      | 2                  | SMTC pattern 1 |   |
|                            |                 |      |                    | 3              | SMTC pattern 1  |
| DRX cycle length           |                 | s    | 1, 2, 3            | 0.64           | The value shall be used for all Cells in the test.  |
| PRACH configuration index  |                 |      | 1, 2, 3            | 102            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                                   |
| rangeToBestCell            |                 |      | 1, 2, 3            | Not configured |   |
| T1                         |                 | s    | 1, 2, 3            | 20             | T1 needs to be defined so that Cell re-selection reaction time is taken into account.                 |
| T2                         |                 | s    | 1, 2, 3            | 20             | T2 needs to be defined so that Cell re-selection reaction time is taken into account.                 |

**Table A.6.1.1.4.2-3: Cell specific test parameters for FR1 intra frequency NR cell re-selection test case in AWGN for UE fulfilling not-at-cell edge criterion**

| Parameter  | Unit          | Test configuration | Cell 1                  |          | Cell 2                  |        |
|--|---------------|--------------------|-------------------------|----------|-------------------------|--------|
|  |               |                    | T1                      | T2       | T1                      | T2     |
| TDD configuration  |               | 1                  | N/A                     |          | N/A                     |        |
|  |               | 2                  | TDDConf.1.1             |          | TDDConf.1.1             |        |
|  |               | 3                  | TDDConf.2.1             |          | TDDConf.2.1             |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD              |          | N/A                     |        |
|  |               | 2                  | SR.1.1 TDD              |          |                         |        |
|  |               | 3                  | SR.2.1 TDD              |          |                         |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD              |          | CR.1.1 FDD              |        |
|  |               | 2                  | CR.1.1 TDD              |          | CR.1.1 TDD              |        |
|  |               | 3                  | CR.2.1 TDD              |          | CR.2.1 TDD              |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD             |          | CCR.1.1 FDD             |        |
|  |               | 2                  | CCR.1.1 TDD             |          | CCR.1.1 TDD             |        |
|  |               | 3                  | CCR.2.1 TDD             |          | CCR.2.1 TDD             |        |
| OCNG Pattern   |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |          | OP.1 defined in A.3.2.1 |        |
| Initial DL BWP configuration   |               | 1, 2, 3            | DLBWP.0.1               |          | DLBWP.0.1               |        |
| Initial UL BWP configuration   |               | 1, 2, 3            | ULBWP.0.1               |          | ULBWP.0.1               |        |
| RLM-RS   |               | 1, 2, 3            | SSB                     |          | SSB                     |        |
| Qrxlevmin  | dBm/SCS       | 1, 2               | -140                    |          | -140                    |        |
|  |               | 3                  | -137                    |          | -137                    |        |
| Pcompensation  | dB            | 1, 2, 3            | 0                       |          | 0                       |        |
| Qhyst <sub>s</sub>   | dB            | 1, 2, 3            | 0                       |          | 0                       |        |
| Qoffset <sub>s, n</sub>  | dB            | 1, 2, 3            | 0                       |          | 0                       |        |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2, 3            | SS-RSRP                 |          | SS-RSRP                 |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1                  | -3.11                   | 2.79     | 2.79                    | -3.11  |
|  |               | 2                  |                         |          |                         |        |
|  |               | 3                  |                         |          |                         |        |
| $N_{oc}$ Note2   | dBm/SCS       | 1                  | -98                     |          |                         |        |
|  |               | 2                  | -98                     |          |                         |        |
|  |               | 3                  | -95                     |          |                         |        |
| $N_{oc}$ Note2   | dBm/15 kHz    | 1                  | -98                     |          |                         |        |
|  |               | 2                  |                         |          |                         |        |
|  |               | 3                  |                         |          |                         |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 13                      | 16       | 16                      | 13     |
|  |               | 2                  |                         |          |                         |        |
|  |               | 3                  |                         |          |                         |        |
| SS-RSRP Note3  | dBm/SCS       | 1                  | -85                     | -82      | -82                     | -85    |
|  |               | 2                  | -85                     | -82      | -82                     | -85    |
|  |               | 3                  | -82                     | -79      | -79                     | -82    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -52.21                  | -52.21   | -52.21                  | -52.21 |
|  | dBm/9.36 MHz  | 2                  | -52.21                  | -52.21   | -52.21                  | -52.21 |
|  | dBm/38.16 MHz | 3                  | -46.12                  | -46.12   | -46.12                  | -46.12 |
| Treselection   | s             | 1, 2, 3            | 0                       | 0        | 0                       | 0      |
| SintrasearchP  | dB            | 1, 2, 3            | 60                      |          | 60                      |        |
| S <sub>searchThresholdP</sub>  | dB            | 1, 2, 3            | 50                      | Not sent | Not sent                | 50     |
| Propagation Condition  |               | 1, 2, 3            | AWGN                    |          |                         |        |
| <p>Note 1: OCNG shall be used such that both Cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other Cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                         |          |                         |        |



### A.6.1.1.4.3 Test Requirements

The cell re-selection delay to an already detected cell for UE configured with *cellEdgeEvaluation* criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected cell for UE configured with *cellEdgeEvaluation* criterion shall be less than 17s.

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

NOTE: The cell re-selection delay to an already detected cell for UE configured with relaxed measurement criterion can be expressed as:  $T_{\text{evaluate,NR\_Intra}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{evaluate,NR\_Intra}}$  See Table 4.2.2.9.3-1 for UE fulfilling not-at-cell edge criterion in clause 4.2.2.9.3.

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a Cell; 1280ms is assumed in this test case.

This gives a total of 16.64s, allow 17s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

### A.6.1.1.5 Cell reselection to FR1 inter-frequency NR case for UE fulfilling low mobility relaxed measurement criterion

#### A.6.1.1.5.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.10.2, for UE fulfilling low mobility relaxed measurement criterion.

#### A.6.1.1.5.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.6.1.1.5.2-1, A.6.1.1.5.2-2 and A.6.1.1.5.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

As specified in the Test Purpose, the UE is configured with the relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in [1]. So, Cell 2 and Cell 1 configure the UE as follows:

*lowMobilityEvaluation* [2] criterion is configured according to the parameters listed in Table A.6.1.1.5.2-3;

*cellEdgeEvaluation* [2] criterion is not configured;

*combineRelaxedMeasCondition* [2] is not configured;

**Table A.6.1.1.5.2-1: Supported test configurations**

| Configuration   | Description of serving cell                       | Description of target cell                        |
|---|---|---|
| 1   | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2   | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3   | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |   |

**Table A.6.1.1.5.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case for UE fulfilling low mobility criterion**

| Parameter                  |                 | Unit | Test configuration | Value          | Comment  |
|----------------------------|-----------------|------|--------------------|----------------|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell2          | The UE camps on cell 2 in the initial phase, it fulfills Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 1 |
|                            | Neighbour cells |      | 1, 2, 3            | Cell1          |  |
| T1 end condition           | Active cell     |      | 1, 2, 3            | Cell1          | The UE shall perform reselection to cell 1 during T1   |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2          |  |
| T2 end condition           | Active cell     |      | 1, 2, 3            | Cell2          | The UE shall perform reselection to cell 2 with higher priority during T2  |
|                            | Neighbour cells |      | 1, 2, 3            | Cell1          |  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1, 2           |  |
| Time offset between cells  |                 |      | 1                  | 3 ms           | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s      | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s      | Synchronous cells  |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent       | No additional delays in random access procedure.   |
| SSB Configuration          |                 |      | 1                  | SSB.1 FR1      |  |
|                            |                 |      | 2                  | SSB.1 FR1      |  |
|                            |                 |      | 3                  | SSB.2 FR1      |  |
| SMTC configuration         |                 |      | 1                  | SMTC pattern 2 | Configured in SIB4 of Cell 1   |
|                            |                 |      |                    | SMTC pattern 6 | Configured in SIB4 of Cell 2   |
|                            |                 |      | 2                  | SMTC pattern 1 |  |
|                            |                 |      |                    | 3              | SMTC pattern 1   |
| DRX cycle length           |                 | s    | 1, 2, 3            | 0.64           | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                 |      | 1, 2, 3            | 102            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| rangeToBestCell            |                 |      | 1, 2, 3            | Not configured |  |
| T1                         |                 | s    | 1, 2, 3            | 25 s           | T1 is defined so that cell re-selection reaction time is taken into account.   |
| T2                         |                 | s    | 1, 2, 3            | 25 s           | T2 is defined so that cell re-selection reaction time is taken into account.   |

**Table A.6.1.1.5.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN for UE fulfilling low mobility criterion**

| Parameter  | Unit          | Test configuration | Cell 1                  |        | Cell 2                  |        |
|--|---------------|--------------------|-------------------------|--------|-------------------------|--------|
|  |               |                    | T1                      | T2     | T1                      | T2     |
| TDD configuration                                  |               | 1                  | N/A                     |        | N/A                     |        |
|  |               | 2                  | TDDConf.1.1             |        | TDDConf.1.1             |        |
|  |               | 3                  | TDDConf.2.1             |        | TDDConf.2.1             |        |
| PDSCH RMC configuration                            |               | 1                  | SR.1.1 FDD              |        | SR.1.1 FDD              |        |
|  |               | 2                  | SR.1.1 TDD              |        | SR.1.1 TDD              |        |
|  |               | 3                  | SR.2.1 TDD              |        | SR.2.1 TDD              |        |
| RMSI CORESET RMC configuration                     |               | 1                  | CR.1.1 FDD              |        | CR.1.1 FDD              |        |
|  |               | 2                  | CR.1.1 TDD              |        | CR.1.1 TDD              |        |
|  |               | 3                  | CR.2.1 TDD              |        | CR.2.1 TDD              |        |
| Dedicated CORESET RMC configuration                |               | 1                  | CCR.1.1 FDD             |        | CCR.1.1 FDD             |        |
|  |               | 2                  | CCR.1.1 TDD             |        | CCR.1.1 TDD             |        |
|  |               | 3                  | CCR.2.1 TDD             |        | CCR.2.1 TDD             |        |
| OCNG Pattern                                       |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        | OP.1 defined in A.3.2.1 |        |
| Initial DL BWP configuration                       |               | 1, 2, 3            | DLBWP.0.1               |        | DLBWP.0.1               |        |
| Initial UL BWP configuration                       |               | 1, 2, 3            | ULBWP.0.1               |        | ULBWP.0.1               |        |
| RLM-RS   |               | 1, 2, 3            | SSB                     |        | SSB                     |        |
| Qrxlevmin  | dBm/SCS       | 1, 2               | -140                    |        | -140                    |        |
|  |               | 3                  | -137                    |        | -137                    |        |
| Pcompensation                                      | dB            | 1, 2, 3            | 0                       |        | 0                       |        |
| Qhysts   | dB            | 1, 2, 3            | 0                       |        | 0                       |        |
| Qoffsets, n  | dB            | 1, 2, 3            | 0                       |        | 0                       |        |
| Cell_selection_and_reselection_quality_measurement |               | 1, 2, 3            | SS-RSRP                 |        | SS-RSRP                 |        |
| $\hat{E}_s / I_{ot}$                               | dB            | 1                  | 14                      | 14     | -4                      | 12     |
|  |               | 2                  |                         |        |                         |        |
|  |               | 3                  |                         |        |                         |        |
| $N_{oc}$ Note2                                     | dBm/SCS       | 1                  | -98                     |        |                         |        |
|  |               | 2                  | -98                     |        |                         |        |
|  |               | 3                  | -95                     |        |                         |        |
| $N_{oc}$ Note2                                     | dBm/15 kHz    | 1                  | -98                     |        |                         |        |
|  |               | 2                  |                         |        |                         |        |
|  |               | 3                  |                         |        |                         |        |
| $\hat{E}_s / N_{oc}$                               | dB            | 1                  | 14                      | 14     | -4                      | 12     |
|  |               | 2                  |                         |        |                         |        |
|  |               | 3                  |                         |        |                         |        |
| SS-RSRP Note3                                      | dBm/SCS       | 1                  | -84                     | -84    | -102                    | -86    |
|  |               | 2                  | -84                     | -84    | -102                    | -86    |
|  |               | 3                  | -81                     | -81    | -99                     | -83    |
| Io   | dBm/9.36 MHz  | 1                  | -55.88                  | -55.88 | -68.60                  | -57.78 |
|  | dBm/9.36 MHz  | 2                  | -55.88                  | -55.88 | -68.60                  | -57.78 |
|  | dBm/38.16 MHz | 3                  | -49.79                  | -49.79 | -62.50                  | -51.69 |
| Treselection                                       | s             | 1, 2, 3            | 0                       | 0      | 0                       | 0      |
| SnonintrasearchP                                   | dB            | 1, 2, 3            | Not sent                |        | Not sent                |        |
| Thresh <sub>x, highP</sub>                         | dB            | 1, 2, 3            | 48                      |        | 48                      |        |
| Thresh <sub>serv, lowP</sub>                       | dB            | 1, 2, 3            | 44                      |        | 44                      |        |
| Thresh <sub>x, lowP</sub>                          | dB            | 1, 2, 3            | 50                      |        | 50                      |        |
| S <sub>SearchDeltaP</sub>                          | dB            | 1, 2, 3            | 3                       |        | 3                       |        |

|                       |  |         |      |   |
|-----------------------|--|---------|------|---|
| $T_{SearchDeltaP}$    | s  | 1, 2, 3 | 5    | 5 |
| Propagation Condition |  | 1, 2, 3 | AWGN |   |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |         |      |   |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |         |      |   |
| Note 3:               | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |         |      |   |

### A.6.1.1.5.3 Test Requirements

The cell reselection delay to an already detected lower priority cell for UE fulfilling low mobility relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell for UE fulfilling low mobility relaxed measurements shall be less than 17 s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling low mobility relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to an already detected higher priority cell for UE fulfilling low mobility relaxed measurements shall be less than 17 s.

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

NOTE: The cell re-selection delay to a known lower priority cell can be expressed as:  $T_{evaluate, NR\_inter} + T_{SI-NR}$ ,

Where:

$T_{evaluate, NR\_inter}$  See Table 4.2.2.10.2-1 in clause 4.2.2.10.2

$T_{SI-NR}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17s for the cell re-selection delay to an already detected lower priority cell and 16.64s for the cell re-selection delay to an already detected higher priority cell, which we allow 17s for UE fulfilling low mobility relaxed measurements in the test case.

### A.6.1.1.6 Cell reselection to FR1 inter-frequency NR case for UE fulfilling not-at-cell edge relaxed measurement criterion

#### A.6.1.1.6.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.10.3, for UE fulfilling not-at-cell edge relaxed measurement criterion.

#### A.6.1.1.6.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.6.1.1.6.2-1, A.6.1.1.6.2-2 and A.6.1.1.6.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

As specified in the Test Purpose, the UE is configured with the relaxed measurement criterion for UE not-at-cell edge as defined in clause 5.2.4.9.2 in [1]. So, Cell 2 and Cell 1 configures the UE as follows:

*cellEdgeEvaluation* [2] criterion is configured according to the parameters listed in Table A.6.1.1.5.2-3;

*lowMobilityEvaluation* [2] criterion is not configured;

*combineRelaxedMeasCondition* [2] is not configured;

**Table A.6.1.1.6.2-1: Supported test configurations**

| Configuration   | Description of serving cell                       | Description of target cell                        |
|---|---|---|
| 1   | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2   | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3   | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |   |

**Table A.6.1.1.6.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case for UE fulfilling not-at-cell edge criterion**

| Parameter                  |                 | Unit | Test configuration | Value          | Comment  |
|----------------------------|-----------------|------|--------------------|----------------|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell2          | The UE camps on cell 2 in the initial phase, it fulfills Not-at-cell edge relaxation measurements criterion, and during T1 period the UE reselects to cell 1 |
|                            | Neighbour cells |      | 1, 2, 3            | Cell1          |  |
| T1 end condition           | Active cell     |      | 1, 2, 3            | Cell1          | The UE shall perform reselection to cell 1 during T1   |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2          |  |
| T2 end condition           | Active cell     |      | 1, 2, 3            | Cell2          | The UE shall perform reselection to cell 2 with higher priority during T2  |
|                            | Neighbour cells |      | 1, 2, 3            | Cell1          |  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1, 2           |  |
| Time offset between cells  |                 |      | 1                  | 3 ms           | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s      | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s      | Synchronous cells  |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent       | No additional delays in random access procedure.   |
| SSB Configuration          |                 |      | 1                  | SSB.1 FR1      |  |
|                            |                 |      | 2                  | SSB.1 FR1      |  |
|                            |                 |      | 3                  | SSB.2 FR1      |  |
| SMTC configuration         |                 |      | 1                  | SMTC pattern 2 | Configured in SIB4 of Cell 1   |
|                            |                 |      |                    | SMTC pattern 6 | Configured in SIB4 of Cell 2   |
|                            |                 |      | 2                  | SMTC pattern 1 |  |
|                            |                 |      |                    | SMTC pattern 1 |  |
| DRX cycle length           |                 | s    | 1, 2, 3            | 0.64           | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                 |      | 1, 2, 3            | 102            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| rangeToBestCell            |                 |      | 1, 2, 3            | Not configured |  |
| T1                         |                 | s    | 1, 2, 3            | 20 s           | T1 is defined so that cell re-selection reaction time is taken into account.   |
| T2                         |                 | s    | 1, 2, 3            | 20 s           | T2 is defined so that cell re-selection reaction time is taken into account.   |

**Table A.6.1.1.6.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN for UE fulfilling not-at-cell edge criterion**

| Parameter  | Unit          | Test configuration | Cell 1                  |        | Cell 2                  |        |
|--|---------------|--------------------|-------------------------|--------|-------------------------|--------|
|  |               |                    | T1                      | T2     | T1                      | T2     |
| TDD configuration                                  |               | 1                  | N/A                     |        | N/A                     |        |
|  |               | 2                  | TDDConf.1.1             |        | TDDConf.1.1             |        |
|  |               | 3                  | TDDConf.2.1             |        | TDDConf.2.1             |        |
| PDSCH RMC configuration                            |               | 1                  | SR.1.1 FDD              |        | SR.1.1 FDD              |        |
|  |               | 2                  | SR.1.1 TDD              |        | SR.1.1 TDD              |        |
|  |               | 3                  | SR.2.1 TDD              |        | SR.2.1 TDD              |        |
| RMSI CORESET RMC configuration                     |               | 1                  | CR.1.1 FDD              |        | CR.1.1 FDD              |        |
|  |               | 2                  | CR.1.1 TDD              |        | CR.1.1 TDD              |        |
|  |               | 3                  | CR.2.1 TDD              |        | CR.2.1 TDD              |        |
| Dedicated CORESET RMC configuration                |               | 1                  | CCR.1.1 FDD             |        | CCR.1.1 FDD             |        |
|  |               | 2                  | CCR.1.1 TDD             |        | CCR.1.1 TDD             |        |
|  |               | 3                  | CCR.2.1 TDD             |        | CCR.2.1 TDD             |        |
| OCNG Pattern                                       |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        | OP.1 defined in A.3.2.1 |        |
| Initial DL BWP configuration                       |               | 1, 2, 3            | DLBWP.0.1               |        | DLBWP.0.1               |        |
| Initial UL BWP configuration                       |               | 1, 2, 3            | ULBWP.0.1               |        | ULBWP.0.1               |        |
| RLM-RS   |               | 1, 2, 3            | SSB                     |        | SSB                     |        |
| Qrxlevmin  | dBm/SCS       | 1, 2               | -140                    |        | -140                    |        |
|  |               | 3                  | -137                    |        | -137                    |        |
|  |               |                    |                         |        |                         |        |
| Pcompensation                                      | dB            | 1, 2, 3            | 0                       |        | 0                       |        |
| Qhyst <sub>s</sub>                                 | dB            | 1, 2, 3            | 0                       |        | 0                       |        |
| Qoffset <sub>s, n</sub>                            | dB            | 1, 2, 3            | 0                       |        | 0                       |        |
| Cell_selection_and_reselection_quality_measurement |               | 1, 2, 3            | SS-RSRP                 |        | SS-RSRP                 |        |
| $\hat{E}_s / I_{ot}$                               | dB            | 1                  | 14                      | 14     | -4                      | 12     |
|  |               | 2                  |                         |        |                         |        |
|  |               | 3                  |                         |        |                         |        |
| $N_{oc}$ <small>Note2</small>                      | dBm/SCS       | 1                  | -98                     |        |                         |        |
|  |               | 2                  | -98                     |        |                         |        |
|  |               | 3                  | -95                     |        |                         |        |
| $N_{oc}$ <small>Note2</small>                      | dBm/15 kHz    | 1                  | -98                     |        |                         |        |
|  |               | 2                  |                         |        |                         |        |
|  |               | 3                  |                         |        |                         |        |
| $\hat{E}_s / N_{oc}$                               | dB            | 1                  | 14                      | 14     | -4                      | 12     |
|  |               | 2                  |                         |        |                         |        |
|  |               | 3                  |                         |        |                         |        |
| SS-RSRP <small>Note3</small>                       | dBm/SCS       | 1                  | -84                     | -84    | -102                    | -86    |
|  |               | 2                  | -84                     | -84    | -102                    | -86    |
|  |               | 3                  | -81                     | -81    | -99                     | -83    |
| I <sub>o</sub>                                     | dBm/9.36 MHz  | 1                  | -55.88                  | -55.88 | -68.60                  | -57.78 |
|  | dBm/9.36 MHz  | 2                  | -55.88                  | -55.88 | -68.60                  | -57.78 |
|  | dBm/38.16 MHz | 3                  | -49.79                  | -49.79 | -62.50                  | -51.69 |
| Treselection                                       | s             | 1, 2, 3            | 0                       | 0      | 0                       | 0      |
| SnonintrasearchP                                   | dB            | 1, 2, 3            | Not sent                |        | Not sent                |        |
| Thresh <sub>x, highP</sub>                         | dB            | 1, 2, 3            | 48                      |        | 48                      |        |
| Thresh <sub>serv, lowP</sub>                       | dB            | 1, 2, 3            | 44                      |        | 44                      |        |
| Thresh <sub>x, lowP</sub>                          | dB            | 1, 2, 3            | 50                      |        | 50                      |        |
| S <sub>SearchThresholdP</sub>                      | dB            | 1, 2, 3            | 50                      |        | 50                      |        |



|                               |  |         |                |
|-------------------------------|--|---------|----------------|
| $S_{\text{SearchThresholdQ}}$ | s  | 1, 2, 3 | Not Configured |
| Propagation Condition         |  | 1, 2, 3 | AWGN           |
| Note 1:                       | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |         |                |
| Note 2:                       | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |         |                |
| Note 3:                       | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |         |                |

### A.6.1.1.6.3 Test Requirements

The cell reselection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge relaxed measurements shall be less than 17 s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling not-at-cell-edge relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to an already detected higher priority cell for UE fulfilling not-at-cell-edge relaxed measurements shall be less than 17 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as:  $T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{evaluate, NR\_inter}}$  See Table 4.2.2.10.3-1 in clause 4.2.2.10

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17s for the cell re-selection delay to an already detected lower priority cell and 16.64s for the cell re-selection delay to an already higher priority cell, which we allow 17s for UE fulfilling not-at-cell edge relaxed measurements in the test case.

### A.6.1.1.7 Cell reselection to FR1 intra-frequency NR case for UE configured with *highSpeedMeasFlag-r16*

#### A.6.1.1.7.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements for UE configured with *highSpeedMeasFlag-r16* specified in clause 4.2.2.3.

#### A.6.1.1.7.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.1.1.1.x-1, A.6.1.1.1.x-2 and A.6.1.1.1.x-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2. *highSpeedMeasFlag-r16* is broadcasted to UE.

Table A.6.1.1.7.2-1: Supported test configurations

| Configuration   | Description                                       |
|---|---|
| 1   | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2   | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3   | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

Table A.6.1.1.7.2-2: General test parameters for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16

| Parameter                  | Unit            | Test configuration | Value          | Comment   |
|----------------------------|-----------------|--------------------|----------------|---|
| Initial condition          | Active cell     | 1, 2, 3            | Cell1          |   |
|                            | Neighbour cells | 1, 2, 3            | Cell2          |   |
| T2 end condition           | Active cell     | 1, 2, 3            | Cell2          |   |
|                            | Neighbour cells | 1, 2, 3            | Cell1          |   |
| Final condition            | Active cell     | 1, 2, 3            | Cell1          |   |
|                            | Neighbour cells | 1, 2, 3            | Cell2          |   |
| RF Channel Number          |                 | 1, 2, 3            | 1              |   |
| Time offset between cells  |                 | 1                  | 3 ms           | Asynchronous cells  |
|                            |                 | 2                  | 3 $\mu$ s      | Synchronous cells   |
|                            |                 | 3                  | 3 $\mu$ s      | Synchronous cells   |
| Access Barring Information | -               | 1, 2, 3            | Not Sent       | No additional delays in random access procedure.  |
| SSB configuration          |                 | 1                  | SSB.1 FR1      |   |
|                            |                 | 2                  | SSB.1 FR1      |   |
|                            |                 | 3                  | SSB.2 FR1      |   |
| SMTC configuration         |                 | 1                  | SMTC pattern 2 | Configured in SIB2 of Cell 1  |
|                            |                 |                    | SMTC pattern 6 | Configured in SIB2 of Cell 2  |
|                            |                 | 2                  | SMTC pattern 1 |   |
|                            |                 | 3                  | SMTC pattern 1 |   |
| DRX cycle length           | s               | 1, 2, 3            | 0.32           | The value shall be used for all cells in the test.  |
| PRACH configuration index  |                 | 1, 2, 3            | 102            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2   |
| rangeToBestCell            |                 | 1, 2, 3            | Not configured |   |
| T1                         | s               | 1, 2, 3            | >7             | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2                         | s               | 1, 2, 3            | 4              | T2 needs to be defined so that cell re-selection reaction time is taken into account.   |
| T3                         | s               | 1, 2, 3            | 3              | T3 needs to be defined so that cell re-selection reaction time is taken into account.   |

**Table A.6.1.1.7.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case for UE configured with *highSpeedMeasFlag-r16***

| Parameter  | Unit          | Test configuration | Cell 1                  |        |        | Cell 2   |      |       |
|--|---------------|--------------------|-------------------------|--------|--------|--|------|-------|
|  |               |                    | T1                      | T2     | T3     | T1   | T2   | T3    |
| TDD configuration                                  |               | 1                  | N/A                     |        |        | N/A  |      |       |
|  |               | 2                  | TDDConf.1.1             |        |        | TDDConf.1.1                                    |      |       |
|  |               | 3                  | TDDConf.2.1             |        |        | TDDConf.2.1                                    |      |       |
| PDSCH RMC configuration                            |               | 1                  | SR.1.1 FDD              |        |        | SR.1.1 FDD                                     |      |       |
|  |               | 2                  | SR.1.1 TDD              |        |        | SR.1.1 TDD                                     |      |       |
|  |               | 3                  | SR.2.1 TDD              |        |        | SR.2.1 TDD                                     |      |       |
| RMSI CORESET RMC configuration                     |               | 1                  | CR.1.1 FDD              |        |        | CR.1.1 FDD                                     |      |       |
|  |               | 2                  | CR.1.1 TDD              |        |        | CR.1.1 TDD                                     |      |       |
|  |               | 3                  | CR.2.1 TDD              |        |        | CR.2.1 TDD                                     |      |       |
| Dedicated CORESET RMC configuration                |               | 1                  | CCR.1.1 FDD             |        |        | CCR.1.1 FDD                                    |      |       |
|  |               | 2                  | CCR.1.1 TDD             |        |        | CCR.1.1 TDD                                    |      |       |
|  |               | 3                  | CCR.2.1 TDD             |        |        | CCR.2.1 TDD                                    |      |       |
| OCNG Pattern                                       |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        |        | OP.1 defined in A.3.2.1                        |      |       |
| Initial DL BWP configuration                       |               | 1, 2, 3            | DLBWP.0.1               |        |        | DLBWP.0.1                                      |      |       |
| Initial UL BWP configuration                       |               | 1, 2, 3            | ULBWP.0.1               |        |        | ULBWP.0.1                                      |      |       |
| RLM-RS   |               | 1, 2, 3            | SSB                     |        |        | SSB  |      |       |
| Qrxlevmin  | dBm/SCS       | 1, 2               | -140                    |        |        | -140   |      |       |
|  |               | 3                  | -137                    |        |        | -137   |      |       |
| Pcompensation                                      | dB            | 1, 2, 3            | 0                       |        |        | 0  |      |       |
| Qhyst <sub>s</sub>                                 | dB            | 1, 2, 3            | 0                       |        |        | 0  |      |       |
| Qoffset <sub>s, n</sub>                            | dB            | 1, 2, 3            | 0                       |        |        | 0  |      |       |
| Cell_selection_and_reselection_quality_measurement |               | 1, 2, 3            | SS-RSRP                 |        |        | SS-RSRP  |      |       |
| $\hat{E}_s / I_{ot}$                               | dB            | 1                  | 16                      | -3.11  | 2.79   | -infinity                                      | 2.79 | -3.11 |
|  |               | 2                  |                         |        |        |  |      |       |
|  |               | 3                  |                         |        |        |  |      |       |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/SCS       | 1                  | -98                     |        |        |  |      |       |
|  |               | 2                  | -98                     |        |        |  |      |       |
|  |               | 3                  | -95                     |        |        |  |      |       |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/15 kHz    | 1                  | -98                     |        |        |  |      |       |
|  |               | 2                  |                         |        |        |  |      |       |
|  |               | 3                  |                         |        |        |  |      |       |
| $\hat{E}_s / N_{oc}$                               | dB            | 1                  | 16                      | 13     | 16     | -infinity                                      | 16   | 13    |
|  |               | 2                  |                         |        |        |  |      |       |
|  |               | 3                  |                         |        |        |  |      |       |
| SS-RSRP <sup>Note3</sup>                           | dBm/SCS       | 1                  | -82                     | -85    | -82    | -infinity                                      | -82  | -85   |
|  |               | 2                  | -82                     | -85    | -82    | -infinity                                      | -82  | -85   |
|  |               | 3                  | -79                     | -82    | -79    | -infinity                                      | -79  | -82   |
| I <sub>o</sub>                                     | dBm/9.36 MHz  | 1                  | -53.94                  | -52.21 | -52.21 | Same as parameters specified in Cell 1 columns |      |       |
|  | dBm/9.36 MHz  | 2                  | -53.94                  | -52.21 | -52.21 |  |      |       |
|  | dBm/38.16 MHz | 3                  | -47.85                  | -46.12 | -46.12 |  |      |       |
| Treselection                                       | s             | 1, 2, 3            | 0                       | 0      | 0      | 0  | 0    | 0     |
| SintrasearchP                                      | dB            | 1, 2, 3            | 60                      |        |        | 60   |      |       |
| Propagation Condition                              |               | 1, 2               | AWGN                    |        |        | AWGN 1944Hz <sup>Note4</sup>                   |      |       |
| Propagation Condition                              |               | 3                  | AWGN                    |        |        | AWGN 3334Hz <sup>Note5</sup>                   |      |       |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.  |
| Note 5: | The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.  |

### A.6.1.1.7.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 4 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than 3 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as:  $T_{\text{detect, NR\_Intra}} + T_{\text{SI-NR}}$ , and to an already detected cell can be expressed as:  $T_{\text{evaluate, NR\_intra}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{detect, NR\_Intra}}$  See Table 4.2.2.3-2 in clause 4.2.2.3

$T_{\text{evaluate, NR\_intra}}$  See Table 4.2.2.3-2 in clause 4.2.2.3

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case.

This gives a total of 3.84s, allow 4s for the cell re-selection delay to a newly detectable cell and 2.24 s for the cell re-selection delay to an already detected cell in the test case, which we allow 3 s.

## A.6.1.2 Inter-RAT E-UTRAN cell re-selection

### A.6.1.2.1 Cell reselection to higher priority E-UTRAN

#### A.6.1.2.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 when the E-UTRAN cell is of higher priority.

#### A.6.1.2.1.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.1.2-1, A.6.1.2.1.2-2, A.6.1.2.1.2-3 and A.6.1.2.1.2-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Table A.6.1.2.1.2-1: Supported test configurations

| Configuration | Description of serving cell                          | Description of target cell            |
|---------------|--|---------------------------------------|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 3             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 4             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 5             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations.

Table A.6.1.2.1.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

| Parameter                         |                | Unit | Test configuration | Value    | Comment  |
|-----------------------------------|----------------|------|--------------------|----------|--|
| Initial condition                 | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell1    | The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.   |
| T2 end condition                  | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell2    | The UE shall perform reselection to cell 2 during T2.  |
|                                   | Neighbour cell |      | 1, 2, 3, 4, 5, 6   | Cell1    |  |
| T3 end condition                  | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell1    | The UE shall perform reselection to cell 1 during T3 for iteration of the tests.   |
|                                   | Neighbour cell |      | 1, 2, 3, 4, 5, 6   | Cell2    |  |
| Access Barring Information        |                | -    | 1, 2, 3, 4, 5, 6   | Not Sent | No additional delays in random access procedure.   |
| DRX cycle length                  |                | s    | 1, 2, 3, 4, 5, 6   | 1.28     | The value shall be used for all cells in the test.   |
| NR PRACH configuration index      |                |      | 1, 2, 3, 4, 5, 6   | 102      | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| E-UTRAN PRACH configuration index |                |      | 1, 2, 3            | 53       | As specified in table 5.7.1-2 in TS 36.211 [23]  |
|                                   |                |      | 4, 5, 6            | 4        |  |
| E-UTRAN PRACH configuration index |                |      | 1, 2, 3            | 53       | As specified in table 5.7.1-2 in TS 36.211 [23]  |
|                                   |                |      | 4, 5, 6            | 4        |  |
| T1                                |                | s    | 1, 2, 3, 4, 5, 6   | >7       | During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2. |
| T2                                |                | s    | 1, 2, 3, 4, 5, 6   | 75       | T2 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T3                                |                | s    | 1, 2, 3, 4, 5, 6   | 15       | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

Table A.6.1.2.1.2-3: Cell specific test parameters for NR cell 1

| Parameter   | Unit          | Test configuration | Cell 1                  |        |        |
|---|---------------|--------------------|-------------------------|--------|--------|
|   |               |                    | T1                      | T2     | T3     |
| TDD configuration   |               | 1, 4               | N/A                     |        |        |
|   |               | 2, 5               | TDDConf.1.1             |        |        |
|   |               | 3, 6               | TDDConf.2.1             |        |        |
| PDSCH parameters  |               | 1, 4               | SR.1.1 FDD              |        |        |
|   |               | 2, 5               | SR.1.1 TDD              |        |        |
|   |               | 3, 6               | SR.2.1 TDD              |        |        |
| RMSI CORESET parameters   |               | 1, 4               | CR.1.1 FDD              |        |        |
|   |               | 2, 5               | CR.1.1 TDD              |        |        |
|   |               | 3, 6               | CR.2.1 TDD              |        |        |
| Dedicated CORESET parameters  |               | 1, 4               | CCR.1.1 FDD             |        |        |
|   |               | 2, 5               | CCR.1.1 TDD             |        |        |
|   |               | 3, 6               | CCR.2.1 TDD             |        |        |
| SSB parameters  |               | 1, 4               | SSB.1 FR1               |        |        |
|   |               | 2, 5               | SSB.1 FR1               |        |        |
|   |               | 3, 6               | SSB.2 FR1               |        |        |
| NR SMTC parameters  |               | 1, 4               | SMTC.2                  |        |        |
|   |               | 2, 5               | SMTC.1                  |        |        |
|   |               | 3, 6               | SMTC.1                  |        |        |
| OCNG Pattern  |               | 1, 2, 3, 4, 5, 6   | OP.1 defined in A.3.2.1 |        |        |
| Initial DL BWP configuration  |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1               |        |        |
| Initial UL BWP configuration  |               | 1, 2, 3, 4, 5, 6   | ULBWP.0.1               |        |        |
| RLM-RS  |               | 1, 2, 3, 4, 5, 6   | SSB                     |        |        |
| Qrxlevmin   | dBm/SCS       | 1, 2, 4, 5         | -140                    |        |        |
|   |               | 3, 6               | -137                    |        |        |
| $N_{oc}$  | dBm/SCS       | 1, 4               | -98                     |        |        |
|   |               | 2, 5               | -98                     |        |        |
|   |               | 3, 6               | -95                     |        |        |
| $N_{oc}$  | dBm/15 kHz    | 1, 2, 3, 4, 5, 6   | -98                     |        |        |
| SS-RSRP   | dBm/SCS       | 1, 4               | -84                     | -84    | -84    |
|   |               | 2, 5               | -84                     | -84    | -84    |
|   |               | 3, 6               | -81                     | -81    | -81    |
| $\hat{E}_s / I_{ot}$  | dB            | 1, 4               | 14                      | 14     | 14     |
|   |               | 2, 5               |                         |        |        |
|   |               | 3, 6               |                         |        |        |
| $\hat{E}_s / N_{oc}$  | dB            | 1, 4               | 14                      | 14     | 14     |
|   |               | 2, 5               |                         |        |        |
|   |               | 3, 6               |                         |        |        |
| Io  | dBm/9.36 MHz  | 1, 4               | -55.88                  | -55.88 | -55.88 |
|   | dBm/9.36 MHz  | 2, 5               | -55.88                  | -55.88 | -55.88 |
|   | dBm/38.16 MHz | 3, 6               | -49.79                  | -49.79 | -49.79 |
| Treselection  | S             | 1, 2, 3, 4, 5, 6   | 0                       |        |        |
| SnonintrasearchP  | dB            | 1, 2, 3, 4, 5, 6   | 50                      |        |        |
| Thresh <sub>x, highP</sub> (Note 2)   | dB            | 1, 2, 3, 4, 5, 6   | 48                      |        |        |
| Thresh <sub>serv, lowP</sub>  | dB            | 1, 2, 3, 4, 5, 6   | 44                      |        |        |
| Thresh <sub>x, lowP</sub>   | dB            | 1, 2, 3, 4, 5, 6   | 50                      |        |        |
| Propagation Condition   |               | 1, 2, 3, 4, 5, 6   | AWGN                    |        |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |               |                    |                         |        |        |
| Note 2: This refers to the value of Thresh <sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell       |               |                    |                         |        |        |

Table A.6.1.2.1.2-4: Cell specific test parameters for E-UTRA cell 2

| Parameter                | Unit | Cell 2 |    |    |
|--------------------------|------|--------|----|----|
|                          |      | T1     | T2 | T3 |
| E-UTRA RF Channel number |      | 1      |    |    |

|   |            |   |     |      |
|---|------------|---|-----|------|
| $BW_{channel}$  | MHz        | 10  |     |      |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2  |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |      |
| PBCH_RA   | dB         | 0   |     |      |
| PBCH_RB   | dB         |   |     |      |
| PSS_RA  | dB         |   |     |      |
| SSS_RA  | dB         |   |     |      |
| PCFICH_RB   | dB         |   |     |      |
| PHICH_RA  | dB         |   |     |      |
| PHICH_RB  | dB         |   |     |      |
| PDCCH_RA  | dB         |   |     |      |
| PDCCH_RB  | dB         |   |     |      |
| PDSCH_RA  | dB         |   |     |      |
| PDSCH_RB  | dB         |   |     |      |
| OCNG_RA <sup>Note 1</sup>   | dB         |   |     |      |
| OCNG_RB <sup>Note 1</sup>   | dB         |   |     |      |
| Qrxlevmin   | dBm        | -140  |     |      |
| $N_{oc}$  | dBm/15 kHz | -98   |     |      |
| RSRP  | dBm/15 KHz | -infinity   | -86 | -102 |
| $\hat{E}_s / I_{ot}$  | dB         | -infinity   | 12  | -4   |
| $\hat{E}_s / N_{oc}$  | dB         | -infinity   | 12  | -4   |
| Treselection <sub>EUTRAN</sub>  | S          | 0   |     |      |
| SnonintrasearchP  | dB         | Not sent  |     |      |
| Thresh <sub>x, highP</sub>  | dB         | 48  |     |      |
| Thresh <sub>serv, lowP</sub>  | dB         | 44  |     |      |
| Thresh <sub>x, lowP</sub> (Note 2)  | dB         | 50  |     |      |
| Propagation Condition   |            | AWGN  |     |      |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: This refers to the value of Thresh<sub>x, Low</sub> which is included in E-UTRA system information, and is a threshold for the NR target cell</p> |            |   |     |      |

### A.6.1.2.1.3 Test Requirements

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, E-UTRAN} + T_{SLE-UTRA}$ ,

Where:

$T_{higher\_priority\_search}$  See clause 4.2.2.7

$T_{evaluate, E-UTRAN}$  See Table 4.2.2.5-1 in clause 4.2.2.5

$T_{SLE-UTRA}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.



## A.6.1.2.2 Cell reselection to lower priority E-UTRAN

### A.6.1.2.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

### A.6.1.2.2.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.2.2-1, A.6.1.2.2.2-2, A.6.1.2.2.2-3 and A.6.1.2.2.2-4. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

**Table A.6.1.2.2.2-1: Supported test configurations**

| Configuration | Description of serving cell                          | Description of target cell            |
|---------------|--|---------------------------------------|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 3             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 4             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 5             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations.

**Table A.6.1.2.2.2-2: General test parameters for NR to E-UTRAN cell re-selection test case**

| Parameter                         |                | Unit | Test configuration | Value    | Comment  |
|-----------------------------------|----------------|------|--------------------|----------|--|
| Initial condition                 | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell1    | The UE camps on cell 1 in the initial phase.   |
|                                   | Neighbour cell |      | 1, 2, 3, 4, 5, 6   | Cell2    |  |
| T1 end condition                  | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell2    | The UE shall perform reselection to cell 2 during T1.                                |
|                                   | Neighbour cell |      | 1, 2, 3, 4, 5, 6   | Cell1    |  |
| T2 end condition                  | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell1    | The UE shall perform reselection to cell 1 during T2 for iteration of the tests.     |
|                                   | Neighbour cell |      | 1, 2, 3, 4, 5, 6   | Cell2    |  |
| Access Barring Information        |                | -    | 1, 2, 3, 4, 5, 6   | Not Sent | No additional delays in random access procedure.                                     |
| DRX cycle length                  |                | s    | 1, 2, 3, 4, 5, 6   | 1.28     | The value shall be used for all cells in the test.                                   |
| NR PRACH configuration index      |                |      | 1, 2, 3, 4, 5, 6   | 102      | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                  |
| E-UTRAN PRACH configuration index |                |      | 1, 2, 3            | 53       | As specified in table 5.7.1-2 in TS 36.211 [23]                                      |
|                                   |                |      | 4, 5, 6            | 4        |  |
| T1                                |                | s    | 1, 2, 3, 4, 5, 6   | 15       | T1 needs to be defined so that cell reselection reaction time is taken into account. |
| T2                                |                | s    | 1, 2, 3, 4, 5, 6   | 75       | T2 needs to be defined so that cell reselection reaction time is taken into account. |

Table A.6.1.2.2.2-3: Cell specific test parameters for NR cell 1

| Parameter                           | Unit  | Test configuration | Cell 1                  |        |
|-------------------------------------|---|--------------------|-------------------------|--------|
|                                     |   |                    | T1                      | T2     |
| TDD configuration                   |   | 1, 4               | N/A                     |        |
|                                     |   | 2, 5               | TDDConf.1.1             |        |
|                                     |   | 3, 6               | TDDConf.2.1             |        |
| PDSCH RMC configuration             |   | 1, 4               | SR.1.1 FDD              |        |
|                                     |   | 2, 5               | SR.1.1 TDD              |        |
|                                     |   | 3, 6               | SR.2.1 TDD              |        |
| RMSI CORESET RMC configuration      |   | 1, 4               | CR.1.1 FDD              |        |
|                                     |   | 2, 5               | CR.1.1 TDD              |        |
|                                     |   | 3, 6               | CR.2.1 TDD              |        |
| Dedicated CORESET RMC configuration |   | 1, 4               | CCR.1.1 FDD             |        |
|                                     |   | 2, 5               | CCR.1.1 TDD             |        |
|                                     |   | 3, 6               | CCR.2.1 TDD             |        |
| SSB configuration                   |   | 1, 4               | SSB.1 FR1               |        |
|                                     |   | 2, 5               | SSB.1 FR1               |        |
|                                     |   | 3, 6               | SSB.2 FR1               |        |
| SMTC configuration                  |   | 1, 4               | SMTC.2                  |        |
|                                     |   | 2, 5               | SMTC.1                  |        |
|                                     |   | 3, 6               | SMTC.1                  |        |
| OCNG Pattern                        |   | 1, 2, 3, 4, 5, 6   | OP.1 defined in A.3.2.1 |        |
| Initial DL BWP configuration        |   | 1, 2, 3, 4, 5, 6   | DLBWP.0.1               |        |
| Initial UL BWP configuration        |   | 1, 2, 3, 4, 5, 6   | ULBWP.0.1               |        |
| RLM-RS                              |   | 1, 2, 3, 4, 5, 6   | SSB                     |        |
| Qrxlevmin                           | dBm/SCS   | 1, 2, 4, 5         | -140                    |        |
|                                     |   | 3, 6               | -137                    |        |
| $N_{oc}$                            | dBm/SCS   | 1, 4               | -98                     |        |
|                                     |   | 2, 5               | -98                     |        |
|                                     |   | 3, 6               | -95                     |        |
| $N_{oc}$                            | dBm/15 kHz  | 1, 2, 3, 4, 5, 6   | -98                     |        |
| SS-RSRP                             | dBm/SCS   | 1, 4               | -102                    | -86    |
|                                     |   | 2, 5               | -102                    | -86    |
|                                     |   | 3, 6               | -99                     | -83    |
| $\hat{E}_s / I_{ot}$                | dB  | 1, 4               | -4                      | 12     |
|                                     |   | 2, 5               |                         |        |
|                                     |   | 3, 6               |                         |        |
| $\hat{E}_s / N_{oc}$                | dB  | 1, 4               | -4                      | 12     |
|                                     |   | 2, 5               |                         |        |
|                                     |   | 3, 6               |                         |        |
| Io                                  | dBm/9.36 MHz  | 1, 4               | -68.60                  | -57.78 |
|                                     | dBm/9.36 MHz  | 2, 5               | -68.60                  | -57.78 |
|                                     | dBm/38.16 MHz   | 3, 6               | -62.50                  | -51.69 |
| Treselection                        | S   | 1, 2, 3, 4, 5, 6   | 0                       |        |
| SnonintrasearchP                    | dB  | 1, 2, 3, 4, 5, 6   | Not sent                |        |
| Thresh <sub>x, highP</sub>          | dB  | 1, 2, 3, 4, 5, 6   | 48                      |        |
| Thresh <sub>-serving, lowP</sub>    | dB  | 1, 2, 3, 4, 5, 6   | 44                      |        |
| Thresh <sub>x, lowP</sub> (Note 2)  | dB  | 1, 2, 3, 4, 5, 6   | 50                      |        |
| Propagation Condition               |   | 1, 2, 3, 4, 5, 6   | AWGN                    |        |
| Note 1:                             | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                    |                         |        |
| Note 2:                             | This refers to the value of Thresh <sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell       |                    |                         |        |

Table A.6.1.2.2-4: Cell specific test parameters for E-UTRA cell 2

| Parameter   | Unit       | Cell 2  |     |
|---|------------|---|-----|
|   |            | T1  | T2  |
| E-UTRA RF Channel number  |            | 1   |     |
| $BW_{\text{channel}}$   | MHz        | 10  |     |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2  |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |
| PBCH_RA   | dB         | 0   |     |
| PBCH_RB   | dB         |   |     |
| PSS_RA  | dB         |   |     |
| SSS_RA  | dB         |   |     |
| PCFICH_RB   | dB         |   |     |
| PHICH_RA  | dB         |   |     |
| PHICH_RB  | dB         |   |     |
| PDCCH_RA  | dB         |   |     |
| PDCCH_RB  | dB         |   |     |
| PDSCH_RA  | dB         |   |     |
| PDSCH_RB  | dB         |   |     |
| OCNG_RA <sup>Note 1</sup>   | dB         |   |     |
| OCNG_RB <sup>Note 1</sup>   | dB         |   |     |
| Qrxlevmin   | dBm        |   |     |
| $N_{oc}$  | dBm/15 kHz | -98   |     |
| RSRP  | dBm/15 KHz | -84   | -84 |
| $\hat{E}_s / I_{ot}$  | dB         | 14  | 14  |
| $\hat{E}_s / N_{oc}$  | dB         | 14  | 14  |
| Treselection <sup>EUTRAN</sup>  | S          | 0   |     |
| SnonintraSearchP  | dB         | Not sent  |     |
| Thresh <sub>x, highP</sub> (Note 2)   | dB         | 48  |     |
| Thresh <sub>serv, lowP</sub>  | dB         | 44  |     |
| Thresh <sub>x, lowP</sub>   | dB         | 50  |     |
| Propagation Condition   |            | AWGN  |     |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |            |   |     |
| Note 2: This refers to the value of Thresh <sub>x, high</sub> which is included in E-UTRA system information, and is a threshold for the NR target cell       |            |   |     |

### A.6.1.2.2.3 Test Requirements

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as:  $T_{\text{evaluate, E-UTRAN}} + T_{\text{SI-E-UTRA}}$ ,

Where:

$T_{\text{evaluate, E-UTRAN}}$  See Table 4.2.2.5-1 in clause 4.2.2.5

$T_{\text{SI-E-UTRA}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

### A.6.1.2.3 Cell reselection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion

#### A.6.1.2.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfills the low mobility criterion specified in clause 4.2.2.11.2 and the E-UTRAN cell is of lower priority.

#### A.6.1.2.3.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.3.2-1, A.6.1.2.3.2-2, A.6.1.2.3.2-3 and A.6.1.2.3.2-4. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

As specified in the Test Purpose, the UE is configured with the relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in [1]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] criterion is configured according to the parameters listed in Table A.6.1.2.3.2-3;
- *cellEdgeEvaluation* [2] criterion is not configured;
- *combineRelaxedMeasCondition* [2] is not configured

**Table A.6.1.2.3.2-1: Supported test configurations**

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

**Table A.6.1.2.3.2-2: General test parameters for NR to E-UTRAN cell re-selection test case for UE fulfilling low mobility criterion**

| Parameter                         |                 | Unit | Test configuration | Value    | Comment  |
|-----------------------------------|-----------------|------|--------------------|----------|--|
| Initial condition                 | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell1    | The UE camps on cell 1 in the initial phase, it fulfills Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 2 |
|                                   | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell2    |  |
| T1 end condition                  | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell2    | The UE shall perform reselection to cell 2 during T1   |
|                                   | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell1    |  |
| T2 end condition                  | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell1    | The UE shall perform reselection to cell 1 with higher priority during T2 for iteration of the tests.  |
|                                   | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell2    |  |
| Access Barring Information        |                 | -    | 1, 2, 3, 4, 5, 6   | Not Sent | No additional delays in random access procedure.   |
| DRX cycle length                  |                 | s    | 1, 2, 3, 4, 5, 6   | 0.64     | The value shall be used for all cells in the test.   |
| NR PRACH configuration index      |                 |      | 1, 2, 3, 4, 5, 6   | 102      | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| E-UTRAN PRACH configuration index |                 |      | 1, 2, 3            | 53       | As specified in table 5.7.1-2 in TS 36.211 [23]  |
|                                   |                 |      | 4, 5, 6            | 4        |  |
| T1                                |                 | s    | 1, 2, 3, 4, 5, 6   | 24       | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2                                |                 | s    | 1, 2, 3, 4, 5, 6   | 24       | T2 needs to be defined so that cell re-selection reaction time is taken into account.  |

Table A.6.1.2.3.2-3: Cell specific test parameters for NR cell 1

| Parameter                           | Unit  | Test configuration | Cell 1                  |        |
|-------------------------------------|---|--------------------|-------------------------|--------|
|                                     |   |                    | T1                      | T2     |
| TDD configuration                   |   | 1, 4               | N/A                     |        |
|                                     |   | 2, 5               | TDDConf.1.1             |        |
|                                     |   | 3, 6               | TDDConf.2.1             |        |
| PDSCH RMC configuration             |   | 1, 4               | SR.1.1 FDD              |        |
|                                     |   | 2, 5               | SR.1.1 TDD              |        |
|                                     |   | 3, 6               | SR.2.1 TDD              |        |
| RMSI CORESET RMC configuration      |   | 1, 4               | CR.1.1 FDD              |        |
|                                     |   | 2, 5               | CR.1.1 TDD              |        |
|                                     |   | 3, 6               | CR.2.1 TDD              |        |
| Dedicated CORESET RMC configuration |   | 1, 4               | CCR.1.1 FDD             |        |
|                                     |   | 2, 5               | CCR.1.1 TDD             |        |
|                                     |   | 3, 6               | CCR.2.1 TDD             |        |
| SSB configuration                   |   | 1, 4               | SSB.1 FR1               |        |
|                                     |   | 2, 5               | SSB.1 FR1               |        |
|                                     |   | 3, 6               | SSB.2 FR1               |        |
| SMTC configuration                  |   | 1, 4               | SMTC pattern 2          |        |
|                                     |   | 2, 5               | SMTC pattern 1          |        |
|                                     |   | 3, 6               | SMTC pattern 1          |        |
| OCNG Pattern                        |   | 1, 2, 3, 4, 5, 6   | OP.1 defined in A.3.2.1 |        |
| Initial DL BWP configuration        |   | 1, 2, 3, 4, 5, 6   | DLBWP.0.1               |        |
| Initial UL BWP configuration        |   | 1, 2, 3, 4, 5, 6   | ULBWP.0.1               |        |
| RLM-RS                              |   | 1, 2, 3, 4, 5, 6   | SSB                     |        |
| Qrxlevmin                           | dBm/SCS   | 1, 2, 4, 5         | -140                    |        |
|                                     |   | 3, 6               | -137                    |        |
| $N_{oc}$                            | dBm/SCS   | 1, 4               | -98                     |        |
|                                     |   | 2, 5               | -98                     |        |
|                                     |   | 3, 6               | -95                     |        |
| $N_{oc}$                            | dBm/15 kHz  | 1, 2, 3, 4, 5, 6   | -98                     |        |
| SS-RSRP                             | dBm/SCS   | 1, 4               | -102                    | -86    |
|                                     |   | 2, 5               | -102                    | -86    |
|                                     |   | 3, 6               | -99                     | -83    |
| $\hat{E}_s / I_{ot}$                | dB  | 1, 4               | -4                      | 12     |
|                                     |   | 2, 5               |                         |        |
|                                     |   | 3, 6               |                         |        |
| $\hat{E}_s / N_{oc}$                | dB  | 1, 4               | -4                      | 12     |
|                                     |   | 2, 5               |                         |        |
|                                     |   | 3, 6               |                         |        |
| Io                                  | dBm/9.36 MHz  | 1, 4               | -68.60                  | -57.78 |
|                                     | dBm/9.36 MHz  | 2, 5               | -68.60                  | -57.78 |
|                                     | dBm/38.16 MHz   | 3, 6               | -62.50                  | -51.69 |
| Treselection                        | S   | 1, 2, 3, 4, 5, 6   | 0                       |        |
| SnonintrasearchP                    | dB  | 1, 2, 3, 4, 5, 6   | 50                      |        |
| Thresh <sub>x, highP</sub>          | dB  | 1, 2, 3, 4, 5, 6   | 48                      |        |
| Thresh <sub>serv, lowP</sub>        | dB  | 1, 2, 3, 4, 5, 6   | 44                      |        |
| Thresh <sub>x, lowP</sub> (Note 2)  | dB  | 1, 2, 3, 4, 5, 6   | 50                      |        |
| S <sub>SearchDeltaP</sub>           | dB  | 1, 2, 3, 4, 5, 6   | 3                       |        |
| T <sub>SearchDeltaP</sub>           | s   | 1, 2, 3, 4, 5, 6   | 5                       |        |
| Propagation Condition               |   | 1, 2, 3, 4, 5, 6   | AWGN                    |        |
| Note 1:                             | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                    |                         |        |
| Note 2:                             | This refers to the value of Thresh <sub>x, low</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell        |                    |                         |        |

Table A.6.1.2.3.2-4: Cell specific test parameters for E-UTRA cell 2

| Parameter   | Unit       | Cell 2  |     |
|---|------------|---|-----|
|   |            | T1  | T2  |
| E-UTRA RF Channel number  |            | 1   |     |
| $BW_{\text{channel}}$   | MHz        | 10  |     |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2  |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |
| PBCH_RA   | dB         | 0   |     |
| PBCH_RB   | dB         |   |     |
| PSS_RA  | dB         |   |     |
| SSS_RA  | dB         |   |     |
| PCFICH_RB   | dB         |   |     |
| PHICH_RA  | dB         |   |     |
| PHICH_RB  | dB         |   |     |
| PDCCH_RA  | dB         |   |     |
| PDCCH_RB  | dB         |   |     |
| PDSCH_RA  | dB         |   |     |
| PDSCH_RB  | dB         |   |     |
| OCNG_RA <sup>Note 1</sup>   | dB         |   |     |
| OCNG_RB <sup>Note 1</sup>   | dB         |   |     |
| $Q_{rxlevmin}$  | dBm        |   |     |
| $N_{oc}$  | dBm/15 kHz | -98   |     |
| RSRP  | dBm/15 KHz | -84   | -84 |
| $\hat{E}_s / I_{ot}$  | dB         | 14  | 14  |
| $\hat{E}_s / N_{oc}$  | dB         | 14  | 14  |
| Treselection <sub>EUTRAN</sub>  | S          | 0   |     |
| Snoninrasearch  | dB         | Not sent  |     |
| Thresh <sub>x, high</sub> (Note 2)  | dB         | 48  |     |
| Thresh <sub>servng, low</sub>   | dB         | 44  |     |
| Thresh <sub>x, low</sub>  | dB         | 50  |     |
| Propagation Condition   |            | AWGN  |     |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |            |   |     |
| Note 2: This refers to the value of Thresh <sub>x, high</sub> which is included in E-UTRA system information, and is a threshold for the NR target cell       |            |   |     |

### A.6.1.2.3.3 Test Requirements

time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as:  $T_{\text{evaluate, E-UTRAN}} + T_{\text{SI-E-UTRA}}$ ,

Where:

$T_{\text{evaluate, E-UTRAN}}$  See Table 4.2.2.11.2-1 in clause 4.2.2.11.2

$T_{\text{SI-E-UTRA}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of  $15.36 (T_{\text{evaluate, E-UTRAN}}) + 1.28 (T_{\text{SI-E-UTRA}}) = 16.64$  s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling low mobility criterion.

#### A.6.1.2.4 Cell reselection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion

##### A.6.1.2.4.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements when UE fulfills not-at-cell edge criterion specified in clause 4.2.2.11.3 when the E-UTRAN cell is of lower priority.

##### A.6.1.2.4.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.4.2-1, A.6.1.2.4.2-2, A.6.1.2.4.2-3 and A.6.1.2.4.2-4. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

As specified in the Test Purpose, the UE is configured with the relaxed measurement criterion for UE with not-at-cell edge defined in clause 5.2.4.9.2 in [1]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] criterion is not configured;
- *cellEdgeEvaluation* [2] criterion is configured according to the parameters listed in Table A.6.1.2.4.2-3;
- *combineRelaxedMeasCondition* [2] is not configured

**Table A.6.1.2.4.2-1: Supported test configurations**

| Configuration | Description of serving cell                          | Description of target cell            |
|---------------|--|---------------------------------------|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 3             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 4             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 5             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations.

**Table A.6.1.2.4.2-2: General test parameters for NR to E-UTRAN cell re-selection test case for UE fulfilling not-at-cell edge criterion**

| Parameter         |                 | Unit | Test configuration | Value | Comment  |
|-------------------|-----------------|------|--------------------|-------|--|
| Initial condition | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell1 | The UE camps on cell 1 in the initial phase and fulfill the not at the cell edge criteria. |
|                   | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell2 |  |
| T1 end condition  | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell2 | The UE shall perform reselection to cell 2 during T1.                                      |
|                   | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell1 |  |
| T2 end condition  | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests.           |
|                   | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell2 |  |



|                                   |   |                  |          |   |
|-----------------------------------|---|------------------|----------|---|
| Access Barring Information        | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure.                                      |
| DRX cycle length                  | s | 1, 2, 3, 4, 5, 6 | 0.64     | The value shall be used for all cells in the test.                                    |
| NR PRACH configuration index      |   | 1, 2, 3, 4, 5, 6 | 102      | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                   |
| E-UTRAN PRACH configuration index |   | 1, 2, 3          | 53       | As specified in table 5.7.1-2 in TS 36.211 [23]                                       |
|                                   |   | 4, 5, 6          | 4        |   |
| T1                                | s | 1, 2, 3, 4, 5, 6 | 24       | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2                                | s | 1, 2, 3, 4, 5, 6 | 24       | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.6.1.2.4.2-3: Cell specific test parameters for NR cell 1

| Parameter   | Unit          | Test configuration | Cell 1                  |        |
|---|---------------|--------------------|-------------------------|--------|
|   |               |                    | T1                      | T2     |
| TDD configuration   |               | 1, 4               | N/A                     |        |
|   |               | 2, 5               | TDDConf.1.1             |        |
|   |               | 3, 6               | TDDConf.2.1             |        |
| PDSCH RMC configuration   |               | 1, 4               | SR.1.1 FDD              |        |
|   |               | 2, 5               | SR.1.1 TDD              |        |
|   |               | 3, 6               | SR.2.1 TDD              |        |
| RMSI CORESET RMC configuration  |               | 1, 4               | CR.1.1 FDD              |        |
|   |               | 2, 5               | CR.1.1 TDD              |        |
|   |               | 3, 6               | CR.2.1 TDD              |        |
| Dedicated CORESET RMC configuration   |               | 1, 4               | CCR.1.1 FDD             |        |
|   |               | 2, 5               | CCR.1.1 TDD             |        |
|   |               | 3, 6               | CCR.2.1 TDD             |        |
| SSB configuration   |               | 1, 4               | SSB.1 FR1               |        |
|   |               | 2, 5               | SSB.1 FR1               |        |
|   |               | 3, 6               | SSB.2 FR1               |        |
| SMTC configuration  |               | 1, 4               | SMTC pattern 2          |        |
|   |               | 2, 5               | SMTC pattern 1          |        |
|   |               | 3, 6               | SMTC pattern 1          |        |
| OCNG Pattern  |               | 1, 2, 3, 4, 5, 6   | OP.1 defined in A.3.2.1 |        |
| Initial DL BWP configuration  |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1               |        |
| Initial UL BWP configuration  |               | 1, 2, 3, 4, 5, 6   | ULBWP.0.1               |        |
| RLM-RS  |               | 1, 2, 3, 4, 5, 6   | SSB                     |        |
| Qrxlevmin   | dBm/SCS       | 1, 2, 4, 5         | -140                    |        |
|   |               | 3, 6               | -137                    |        |
| $N_{oc}$  | dBm/SCS       | 1, 4               | -98                     |        |
|   |               | 2, 5               | -98                     |        |
|   |               | 3, 6               | -95                     |        |
| $N_{oc}$  | dBm/15 kHz    | 1, 2, 3, 4, 5, 6   | -98                     |        |
| SS-RSRP   | dBm/SCS       | 1, 4               | -102                    | -86    |
|   |               | 2, 5               | -102                    | -86    |
|   |               | 3, 6               | -99                     | -83    |
| $\hat{E}_s / I_{ot}$  | dB            | 1, 4               | -4                      | 12     |
|   |               | 2, 5               |                         |        |
|   |               | 3, 6               |                         |        |
| $\hat{E}_s / N_{oc}$  | dB            | 1, 4               | -4                      | 12     |
|   |               | 2, 5               |                         |        |
|   |               | 3, 6               |                         |        |
| S <sub>SearchThresholdP</sub>   | dB            | 1, 2, 3, 4, 5, 6   | 32                      | 32     |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1, 4               | -68.60                  | -57.78 |
|   | dBm/9.36 MHz  | 2, 5               | -68.60                  | -57.78 |
|   | dBm/38.16 MHz | 3, 6               | -62.50                  | -51.69 |
| Treselection  | S             | 1, 2, 3, 4, 5, 6   | 0                       |        |
| S <sub>nonintrasearchP</sub>  | dB            | 1, 2, 3, 4, 5, 6   | 60                      |        |
| Thresh <sub>x, highP</sub> (Note 2)   | dB            | 1, 2, 3, 4, 5, 6   | 48                      |        |
| Thresh <sub>serv, lowP</sub>  | dB            | 1, 2, 3, 4, 5, 6   | 44                      |        |
| Thresh <sub>x, lowP</sub>   | dB            | 1, 2, 3, 4, 5, 6   | 50                      |        |
| Propagation Condition   |               | 1, 2, 3, 4, 5, 6   | AWGN                    |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |               |                    |                         |        |
| Note 2: This refers to the value of Thresh <sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell       |               |                    |                         |        |

**Table A.6.1.2.4.2-4: Cell specific test parameters for E-UTRA cell 2**

| Parameter   | Unit       | Cell 2  |     |
|---|------------|---|-----|
|   |            | T1  | T2  |
| E-UTRA RF Channel number  |            | 1   |     |
| $BW_{\text{channel}}$   | MHz        | 10  |     |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2  |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |
| PBCH_RA   | dB         | 0   |     |
| PBCH_RB   | dB         |   |     |
| PSS_RA  | dB         |   |     |
| SSS_RA  | dB         |   |     |
| PCFICH_RB   | dB         |   |     |
| PHICH_RA  | dB         |   |     |
| PHICH_RB  | dB         |   |     |
| PDCCH_RA  | dB         |   |     |
| PDCCH_RB  | dB         |   |     |
| PDSCH_RA  | dB         |   |     |
| PDSCH_RB  | dB         |   |     |
| OCNG_RA <sup>Note 1</sup>   | dB         |   |     |
| OCNG_RB <sup>Note 1</sup>   | dB         |   |     |
| $Q_{\text{rxlevmin}}$   | dBm        |   |     |
| $N_{oc}$  | dBm/15 kHz | -98   |     |
| RSRP  | dBm/15 KHz | -84   | -84 |
| $\hat{E}_s / I_{ot}$  | dB         | 14  | 14  |
| $\hat{E}_s / N_{oc}$  | dB         | 14  | 14  |
| $T_{\text{reselectionEUTRAN}}$  | S          | 0   |     |
| $S_{\text{nonintra}}search$   | dB         | Not sent  |     |
| $\text{Thresh}_{x, \text{high}}$ (Note 2)   | dB         | 48  |     |
| $\text{Thresh}_{\text{serv}, \text{low}}$   | dB         | 44  |     |
| $\text{Thresh}_{x, \text{low}}$   | dB         | 50  |     |
| Propagation Condition   |            | AWGN  |     |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $\text{Thresh}_{x, \text{high}}$ which is included in E-UTRA system information, and is a threshold for the NR target cell |            |   |     |

#### A.6.1.2.4.3 Test Requirements

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as:  $T_{\text{evaluate, E-UTRAN}} + T_{\text{SI-E-UTRA}}$ ,

Where:

$T_{\text{evaluate, E-UTRAN}}$  See Table 4.2.2.11.3-1 in clause 4.2.2.11.3

$T_{\text{SI-E-UTRA}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling not-at-cell edge criterion.

### A.6.1.2.5 Cell reselection to lower priority E-UTRAN cell for UE configured with highSpeedMeasFlag-r16

#### A.6.1.2.5.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements for UE configured with *highSpeedMeasFlag-r16* specified in clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

#### A.6.1.2.5.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.5.2-1, A.6.1.2.5.2-2, A.6.1.2.5.2-3 and A.6.1.2.5.2-4. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1. The E-UTRAN cell 2 is indicated by NR cell 1 as an HST cell.

**Table A.6.1.2.5.2-1: Supported test configurations**

| Configuration | Description of serving cell                          | Description of target cell            |
|---------------|--|---------------------------------------|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 3             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 4             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 5             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations.

**Table A.6.1.2.5.2-2: General test parameters for NR to E-UTRAN cell re-selection test case**

| Parameter                         | Unit            | Test configuration | Value    | Comment  |
|-----------------------------------|-----------------|--------------------|----------|--|
| Initial condition                 | Active cell     | 1, 2, 3, 4, 5, 6   | Cell1    | The UE camps on cell 1 in the initial phase.   |
| T1 end condition                  | Active cell     | 1, 2, 3, 4, 5, 6   | Cell2    | The UE shall perform reselection to cell 2 during T1.                                |
|                                   | Neighbour cells | 1, 2, 3, 4, 5, 6   | Cell1    |  |
| T2 end condition                  | Active cell     | 1, 2, 3, 4, 5, 6   | Cell1    | The UE shall perform reselection to cell 1 during T2 for iteration of the tests.     |
|                                   | Neighbour cells | 1, 2, 3, 4, 5, 6   | Cell2    |  |
| Access Barring Information        | -               | 1, 2, 3, 4, 5, 6   | Not Sent | No additional delays in random access procedure.                                     |
| DRX cycle length                  | s               | 1, 2, 3, 4, 5, 6   | 0.32     | The value shall be used for all cells in the test.                                   |
| NR PRACH configuration index      |                 | 1, 2, 3, 4, 5, 6   | 102      | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                  |
| E-UTRAN PRACH configuration index |                 | 1, 2, 3            | 53       | As specified in table 5.7.1-2 in TS 36.211 [23]                                      |
|                                   |                 | 4, 5, 6            | 4        |  |
| T1                                | s               | 1, 2, 3, 4, 5, 6   | 15       | T1 needs to be defined so that cell reselection reaction time is taken into account. |
| T2                                | s               | 1, 2, 3, 4, 5, 6   | 75       | T2 needs to be defined so that cell reselection reaction time is taken into account. |

**Table A.6.1.2.5.2-3: Cell specific test parameters for NR cell 1**

| Parameter | Unit | Test configuration | Cell 1 |    |
|-----------|------|--------------------|--------|----|
|           |      |                    | T1     | T2 |

|   |               |                  |                              |        |
|---|---------------|------------------|------------------------------|--------|
| TDD configuration   |               | 1, 4             | N/A                          |        |
|   |               | 2, 5             | TDDConf.1.1                  |        |
|   |               | 3, 6             | TDDConf.2.1                  |        |
| PDSCH RMC configuration   |               | 1, 4             | SR.1.1 FDD                   |        |
|   |               | 2, 5             | SR.1.1 TDD                   |        |
|   |               | 3, 6             | SR.2.1 TDD                   |        |
| RMSI CORESET RMC configuration  |               | 1, 4             | CR.1.1 FDD                   |        |
|   |               | 2, 5             | CR.1.1 TDD                   |        |
|   |               | 3, 6             | CR.2.1 TDD                   |        |
| Dedicated CORESET RMC configuration   |               | 1, 4             | CCR.1.1 FDD                  |        |
|   |               | 2, 5             | CCR.1.1 TDD                  |        |
|   |               | 3, 6             | CCR.2.1 TDD                  |        |
| SSB configuration   |               | 1, 4             | SSB.1 FR1                    |        |
|   |               | 2, 5             | SSB.1 FR1                    |        |
|   |               | 3, 6             | SSB.2 FR1                    |        |
| SMTC configuration  |               | 1, 4             | SMTC pattern 2               |        |
|   |               | 2, 5             | SMTC pattern 1               |        |
|   |               | 3, 6             | SMTC pattern 1               |        |
| OCNG Pattern  |               | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.3.2.1      |        |
| Initial DL BWP configuration  |               | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                    |        |
| Initial UL BWP configuration  |               | 1, 2, 3, 4, 5, 6 | ULBWP.0.1                    |        |
| RLM-RS  |               | 1, 2, 3, 4, 5, 6 | SSB                          |        |
| Qrxlevmin   | dBm/SCS       | 1, 2, 4, 5       | -140                         |        |
|   |               | 3, 6             | -137                         |        |
| $N_{oc}$  | dBm/SCS       | 1, 4             | -98                          |        |
|   |               | 2, 5             | -98                          |        |
|   |               | 3, 6             | -95                          |        |
| $N_{oc}$  | dBm/15 kHz    | 1, 2, 3, 4, 5, 6 | -98                          |        |
| SS-RSRP   | dBm/SCS       | 1, 4             | -102                         | -86    |
|   |               | 2, 5             | -102                         | -86    |
|   |               | 3, 6             | -99                          | -83    |
| $\hat{E}_s/I_{ot}$  | dB            | 1, 4             | -4                           | 12     |
|   |               | 2, 5             |                              |        |
|   |               | 3, 6             |                              |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1, 4             | -4                           | 12     |
|   |               | 2, 5             |                              |        |
|   |               | 3, 6             |                              |        |
| Io  | dBm/9.36 MHz  | 1, 4             | -68.60                       | -57.78 |
|   | dBm/9.36 MHz  | 2, 5             | -68.60                       | -57.78 |
|   | dBm/38.16 MHz | 3, 6             | -62.50                       | -51.69 |
| Treselection  | S             | 1, 2, 3, 4, 5, 6 | 0                            |        |
| S <sub>nonintra</sub> searchP   | dB            | 1, 2, 3, 4, 5, 6 | 50                           |        |
| Thresh <sub>x, highP</sub> (Note 2)   | dB            | 1, 2, 3, 4, 5, 6 | 48                           |        |
| Thresh <sub>serv, lowP</sub>  | dB            | 1, 2, 3, 4, 5, 6 | 44                           |        |
| Thresh <sub>x, lowP</sub>   | dB            | 1, 2, 3, 4, 5, 6 | 50                           |        |
| Propagation Condition   |               | 1, 2, 3, 4, 5, 6 | AWGN 1944Hz <sup>Note3</sup> |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |               |                  |                              |        |
| Note 2: This refers to the value of Thresh <sub>x, highP</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell.     |               |                  |                              |        |
| Note 3: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.                                     |               |                  |                              |        |

Table A.6.1.2.5.2-4: Cell specific test parameters for E-UTRA cell 2

| Parameter  | Unit       | Cell 2  |     |
|--|------------|---|-----|
|  |            | T1  | T2  |
| E-UTRA RF Channel number   |            | 1   |     |
| $BW_{\text{channel}}$  | MHz        | 10  |     |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2   |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |
| PBCH_RA  | dB         | 0   |     |
| PBCH_RB  | dB         |   |     |
| PSS_RA   | dB         |   |     |
| SSS_RA   | dB         |   |     |
| PCFICH_RB  | dB         |   |     |
| PHICH_RA   | dB         |   |     |
| PHICH_RB   | dB         |   |     |
| PDCCH_RA   | dB         |   |     |
| PDCCH_RB   | dB         |   |     |
| PDSCH_RA   | dB         |   |     |
| PDSCH_RB   | dB         |   |     |
| OCNG_RA <sup>Note 1</sup>  | dB         |   |     |
| OCNG_RB <sup>Note 1</sup>  | dB         |   |     |
| $Q_{\text{rxlevmin}}$  | dBm        |   |     |
| $N_{oc}$   | dBm/15 kHz | -98   |     |
| RSRP   | dBm/15 KHz | -84   | -84 |
| $\hat{E}_s / I_{ot}$   | dB         | 14  | 14  |
| $\hat{E}_s / N_{oc}$   | dB         | 14  | 14  |
| $T_{\text{reselectionEUTRAN}}$   | S          | 0   |     |
| $S_{\text{nonintrasearchP}}$   | dB         | Not sent  |     |
| $\text{Thresh}_{x, \text{highP}}$ (Note 2)   | dB         | 48  |     |
| $\text{Thresh}_{\text{servng, lowP}}$  | dB         | 44  |     |
| $\text{Thresh}_{x, \text{lowP}}$   | dB         | 50  |     |
| Propagation Condition  |            | AWGN 1944Hz   |     |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $\text{Thresh}_{x, \text{highP}}$ which is included in E-UTRA system information, and is a threshold for the NR target cell |            |   |     |

### A.6.1.2.5.3 Test Requirements

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as:  $T_{\text{evaluate, E-UTRAN\_HST}} + T_{\text{SI-E-UTRA}}$ ,

Where:

$T_{\text{evaluate, E-UTRAN\_HST}}$  See Table 4.2.2.5-2 in clause 4.2.2.5

$T_{\text{SI-E-UTRA}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority E-UTRAN cell.

## A.6.2 SA: RRC\_INACTIVE state mobility

## A.6.3 RRC\_CONNECTED state mobility

### A.6.3.1 Handover

#### A.6.3.1.1 Intra-frequency handover from FR1 to FR1; known target cell

##### A.6.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

##### A.6.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.1.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.1.2-2, and A.6.3.1.1.2-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover.

**Table A.6.3.1.1.2-1: Intra-frequency handover from FR1 to FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.1.1.2-2: General test parameters Intra-frequency handover from FR1 to FR1**

| Parameter                  | Unit              | Value     | Comment  |
|----------------------------|-------------------|-----------|--|
| Initial conditions         | Active cell       | Cell 1    |  |
|                            | Neighbouring cell | Cell 2    |  |
| Final condition            | Active cell       | Cell 2    |  |
| A3-Offset                  | dB                | 0         |  |
| Hysteresis                 | dB                | 0         |  |
| Time To Trigger            | s                 | 0         |  |
| Filter coefficient         |                   | 0         | L3 filtering is not used                         |
| Access Barring Information | -                 | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   | 3 $\mu$ s | Synchronous cells                                |
| T1                         | s                 | 5         |  |
| T2                         | s                 | $\leq 5$  |  |
| T3                         | s                 | 1         |  |

**Table A.6.3.1.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case**



| Parameter                                |                  | Unit      | Cell 1                      |      |      | Cell 2 |      |      |
|--|------------------|-----------|-----------------------------|------|------|--------|------|------|
|  |                  |           | T1                          | T2   | T3   | T1     | T2   | T3   |
| NR RF Channel Number                     |                  |           | 1                           |      |      | 1      |      |      |
| Duplex mode                              | Config 1         |           | FDD                         |      |      |        |      |      |
|  | Config 2,3       |           | TDD                         |      |      |        |      |      |
| TDD configuration                        | Config 1         |           | Not Applicable              |      |      |        |      |      |
|  | Config 2         |           | TDDConf.1.1                 |      |      |        |      |      |
|  | Config 3         |           | TDDConf.2.1                 |      |      |        |      |      |
| BW <sub>channel</sub>                    | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |      |      |        |      |      |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |      |      |        |      |      |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |      |      |        |      |      |
| BWP BW                                   | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |      |      |        |      |      |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |      |      |        |      |      |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |      |      |        |      |      |
| DRx Cycle                                |                  | ms        | Not Applicable              |      |      |        |      |      |
| PDSCH Reference measurement channel      | Config 1         |           | SR.1.1 FDD                  |      |      |        |      |      |
|  | Config 2         |           | SR.1.1 TDD                  |      |      |        |      |      |
|  | Config 3         |           | SR2.1 TDD                   |      |      |        |      |      |
| CORESET Reference Channel                | Config 1         |           | CR.1.1 FDD                  |      |      |        |      |      |
|  | Config 2         |           | CR.1.1 TDD                  |      |      |        |      |      |
|  | Config 3         |           | CR2.1 TDD                   |      |      |        |      |      |
| TRS configuration                        | Config 1         |           | TRS.1.1 FDD                 |      |      |        |      |      |
|  | Config 2         |           | TRS.1.1 TDD                 |      |      |        |      |      |
|  | Config 3         |           | TRS.1.2 TDD                 |      |      |        |      |      |
| OCNG Patterns                            |                  |           | OP.1                        |      |      |        |      |      |
| SMTC Configuration                       |                  |           | SMTC.1                      |      |      |        |      |      |
| SSB Configuration                        | Config 1,2       |           | SSB.1 FR1                   |      |      |        |      |      |
|  | Config 3         |           | SSB.2 FR1                   |      |      |        |      |      |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |      |      |        |      |      |
|  | Config 3         |           | 30 kHz                      |      |      |        |      |      |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |      |      |        |      |      |
|  | Config 3         |           | 30 kHz                      |      |      |        |      |      |
| PRACH configuration                      |                  |           | FR1 PRACH configuration 1   |      |      |        |      |      |
| BWP configuration                        | Initial DL BWP   |           | DLBWP.0.1                   |      |      |        |      |      |
|  | Dedicated DL BWP |           | DLBWP.1.1                   |      |      |        |      |      |
|  | Initial UL BWP   |           | ULBWP.0.1                   |      |      |        |      |      |
|  | Dedicated UL BWP |           | ULBWP.1.1                   |      |      |        |      |      |
| EPRE ratio of PSS to SSS                 |                  | dB        | 0                           |      |      |        |      |      |
| EPRE ratio of PBCH DMRS to SSS           |                  |           |                             |      |      |        |      |      |
| EPRE ratio of PBCH to PBCH DMRS          |                  |           |                             |      |      |        |      |      |
| EPRE ratio of PDCCH DMRS to SSS          |                  |           |                             |      |      |        |      |      |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |           |                             |      |      |        |      |      |
| EPRE ratio of PDSCH DMRS to SSS          |                  |           |                             |      |      |        |      |      |
| EPRE ratio of PDSCH to PDSCH             |                  |           |                             |      |      |        |      |      |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |           |                             |      |      |        |      |      |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |           |                             |      |      |        |      |      |
| N <sub>oc</sub> <sup>Note2</sup>         |                  | dBm/15kHz | -98                         |      |      |        |      |      |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2       | dBm/SCS   | -98                         |      |      |        |      |      |
|  | Config 3         |           | -95                         |      |      |        |      |      |
| Ê <sub>s</sub> / I <sub>ot</sub>         |                  | dB        | 8                           | -3.3 | -3.3 | -      | 2.36 | 2.36 |
| Ê <sub>s</sub> / N <sub>oc</sub>         |                  | dB        | 8                           | 8    | 8    | -      | 11   | 11   |
| SSB <sub>RP</sub>                        | Config 1,2       | dBm/SCS   | -90                         | -90  | -90  | -      | -87  | -87  |
|  | Config 3         | dBm/SCS   | -87                         | -87  | -87  | -      | -84  | -84  |

|                                 |  |                  |        |        |        |        |        |        |
|---------------------------------|--|------------------|--------|--------|--------|--------|--------|--------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2   | dBm/<br>9.36MHz  | -61.41 | -57.06 | -57.06 | -61.41 | -57.06 | -57.06 |
|                                 | Config 3   | dBm/<br>38.16MHz | -55.31 | -50.96 | -50.96 | -55.31 | -50.96 | -50.96 |
| Propagation condition           |  | -                | AWGN   |        |        | AWGN   |        |        |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |        |        |        |        |        |        |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |        |        |        |        |
| Note 3:                         | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |        |        |        |        |        |        |

### A.6.3.1.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.  
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

T<sub>interrupt</sub> = 62 ms in the test. T<sub>interrupt</sub> is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

### A.6.3.1.2 Intra-frequency handover from FR1 to FR1; unknown target cell

#### A.6.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

#### A.6.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.2.2-2, and A.6.3.1.2.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.6.3.1.2.2-1: Intra-frequency handover from FR1 to FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.1.2.2-2: General test parameters Intra-frequency handover from FR1 to FR1**

| Parameter                  |                   | Unit | Value     | Comment  |
|----------------------------|-------------------|------|-----------|--|
| Initial conditions         | Active cell       |      | Cell 1    |  |
|                            | Neighbouring cell |      | Cell 2    |  |
| Final condition            | Active cell       |      | Cell 2    |  |
| Access Barring Information |                   | -    | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   |      | 3 $\mu$ s | Synchronous cells                                |
| T1                         |                   | s    | 5         |  |
| T2                         |                   | s    | $\leq 5$  |  |

**Table A.6.3.1.2.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case**

| Parameter                                |                  | Unit             | Cell 1                      |        | Cell 2    |        |
|--|------------------|------------------|-----------------------------|--------|-----------|--------|
|  |                  |                  | T1                          | T2     | T1        | T2     |
| NR RF Channel Number                     |                  |                  | 1                           |        | 1         |        |
| Duplex mode                              | Config 1         |                  | FDD                         |        |           |        |
|  | Config 2,3       |                  | TDD                         |        |           |        |
| TDD configuration                        | Config 1         |                  | Not Applicable              |        |           |        |
|  | Config 2         |                  | TDDConf.1.1                 |        |           |        |
|  | Config 3         |                  | TDDConf. 2.1                |        |           |        |
| BW <sub>channel</sub>                    | Config 1         | MHz              | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 2         |                  | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 3         |                  | 40: N <sub>RB,c</sub> = 106 |        |           |        |
| BWP BW                                   | Config 1         | MHz              | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 2         |                  | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 3         |                  | 40: N <sub>RB,c</sub> = 106 |        |           |        |
| DRx Cycle                                |                  | ms               | Not Applicable              |        |           |        |
| PDSCH Reference measurement channel      | Config 1         |                  | SR.1.1 FDD                  |        |           |        |
|  | Config 2         |                  | SR.1.1 TDD                  |        |           |        |
|  | Config 3         |                  | SR2.1 TDD                   |        |           |        |
| CORESET Reference Channel                | Config 1         |                  | CR.1.1 FDD                  |        |           |        |
|  | Config 2         |                  | CR.1.1 TDD                  |        |           |        |
|  | Config 3         |                  | CR2.1 TDD                   |        |           |        |
| TRS configuration                        | Config 1         |                  | TRS.1.1 FDD                 |        |           |        |
|  | Config 2         |                  | TRS.1.1 TDD                 |        |           |        |
|  | Config 3         |                  | TRS.1.2 TDD                 |        |           |        |
| OCNG Patterns                            |                  |                  | OP.1                        |        |           |        |
| SMTC Configuration                       |                  |                  | SMTC.1                      |        |           |        |
| SSB Configuration                        | Config 1,2       |                  | SSB.1 FR1                   |        |           |        |
|  | Config 3         |                  | SSB.2 FR1                   |        |           |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz              | 15 kHz                      |        |           |        |
|  | Config 3         |                  | 30 kHz                      |        |           |        |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz              | 15 kHz                      |        |           |        |
|  | Config 3         |                  | 30 kHz                      |        |           |        |
| PRACH configuration                      |                  |                  | FR1 PRACH configuration 1   |        |           |        |
| BWP configuration                        | Initial DL BWP   |                  | DLBWP.0.1                   |        |           |        |
|  | Dedicated DL BWP |                  | DLBWP.1.1                   |        |           |        |
|  | Initial UL BWP   |                  | ULBWP.0.1                   |        |           |        |
|  | Dedicated UL BWP |                  | ULBWP.1.1                   |        |           |        |
| EPRE ratio of PSS to SSS                 |                  | dB               | 0                           |        |           |        |
| EPRE ratio of PBCH DMRS to SSS           |                  |                  |                             |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS          |                  |                  |                             |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS          |                  |                  |                             |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |                  |                             |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS          |                  |                  |                             |        |           |        |
| EPRE ratio of PDSCH to PDSCH             |                  |                  |                             |        |           |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |                  |                             |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |                  |                             |        |           |        |
| $N_{oc}^{Note2}$                         |                  | dBm/15kHz        | -98                         |        |           |        |
| $N_{oc}^{Note2}$                         | Config 1,2       | dBm/SCS          | -98                         |        |           |        |
|  | Config 3         |                  | -95                         |        |           |        |
| $\hat{E}_s / I_{ot}$                     |                  | dB               | 8                           | -0.64  | -Infinity | -0.64  |
| $\hat{E}_s / N_{oc}$                     |                  | dB               | 8                           | 8      | -Infinity | 8      |
| SSB_RP                                   | Config 1,2       | dBm/SCS          | -90                         | -90    | -Infinity | -90    |
|  | Config 3         | dBm/SCS          | -87                         | -87    | -Infinity | -87    |
| I <sub>o</sub> <sup>Note3</sup>          | Config 1,2       | dBm/<br>9.36MHz  | -61.41                      | -58.71 | -61.41    | -58.71 |
|  | Config 3         | dBm/<br>38.16MHz | -55.31                      | -52.60 | -55.31    | -52.60 |

| Propagation condition | -  | AWGN | AWGN |
|-----------------------|--|------|------|
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |      |
| Note 3:               | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |      |

### A.6.3.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$  = 82 ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of 92 ms.

### A.6.3.1.3 Inter-frequency handover from FR1 to FR1; unknown target cell

#### A.6.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 inter frequency handover requirements specified in clause 6.1.1.2.

#### A.6.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.3.2-2, and A.6.3.1.3.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.6.3.1.3.2-1: Inter-frequency handover from FR1 to FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.1.3.2-2: General test parameters Inter-frequency handover from FR1 to FR1**

| Parameter                  | Unit              | Value    | Comment  |
|----------------------------|-------------------|----------|--|
| Initial conditions         | Active cell       |          | Cell 1   |
|                            | Neighbouring cell |          | Cell 2   |
| Final condition            | Active cell       |          | Cell 2   |
| Access Barring Information | -                 | Not Sent | No additional delays in random access procedure. |
| T1                         | s                 | 5        |  |
| T2                         | s                 | ≤5       |  |

**Table A.6.3.1.3.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case**

| Parameter                                |                  | Unit             | Cell 1                      |        | Cell 2    |        |
|--|------------------|------------------|-----------------------------|--------|-----------|--------|
|  |                  |                  | T1                          | T2     | T1        | T2     |
| NR RF Channel Number                     |                  |                  | 1                           |        | 2         |        |
| Duplex mode                              | Config 1         |                  | FDD                         |        |           |        |
|  | Config 2,3       |                  | TDD                         |        |           |        |
| TDD configuration                        | Config 1         |                  | Not Applicable              |        |           |        |
|  | Config 2         |                  | TDDConf.1.1                 |        |           |        |
|  | Config 3         |                  | TDDConf.2.1                 |        |           |        |
| BW <sub>channel</sub>                    | Config 1         | MHz              | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 2         |                  | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 3         |                  | 40: N <sub>RB,c</sub> = 106 |        |           |        |
| BWP BW                                   | Config 1         | MHz              | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 2         |                  | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 3         |                  | 40: N <sub>RB,c</sub> = 106 |        |           |        |
| TRS configuration                        | Config 1         |                  | TRS.1.1 FDD                 |        |           |        |
|  | Config 2         |                  | TRS.1.1 TDD                 |        |           |        |
|  | Config 3         |                  | TRS.1.2 TDD                 |        |           |        |
| DRx Cycle                                |                  | ms               | Not Applicable              |        |           |        |
| PDSCH Reference measurement channel      | Config 1         |                  | SR.1.1 FDD                  |        |           |        |
|  | Config 2         |                  | SR.1.1 TDD                  |        |           |        |
|  | Config 3         |                  | SR2.1 TDD                   |        |           |        |
| CORESET Reference Channel                | Config 1         |                  | CR.1.1 FDD                  |        |           |        |
|  | Config 2         |                  | CR.1.1 TDD                  |        |           |        |
|  | Config 3         |                  | CR2.1 TDD                   |        |           |        |
| OCNG Patterns                            |                  |                  | OP.1                        |        |           |        |
| SMTC Configuration                       |                  |                  | SMTC.1                      |        |           |        |
| SSB Configuration                        | Config 1,2       |                  | SSB.1 FR1                   |        |           |        |
|  | Config 3         |                  | SSB.2 FR1                   |        |           |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz              | 15 kHz                      |        |           |        |
|  | Config 3         |                  | 30 kHz                      |        |           |        |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz              | 15 kHz                      |        |           |        |
|  | Config 3         |                  | 30 kHz                      |        |           |        |
| PRACH configuration                      |                  |                  | FR1 PRACH configuration 1   |        |           |        |
| BWP                                      | Initial DL BWP   |                  | DLBWP.0.1                   |        |           |        |
|  | Dedicated DL BWP |                  | DLBWP.1.1                   |        |           |        |
|  | Initial UL BWP   |                  | ULBWP.0.1                   |        |           |        |
|  | Dedicated UL BWP |                  | ULBWP.1.1                   |        |           |        |
| EPRE ratio of PSS to SSS                 |                  | dB               | 0                           |        |           |        |
| EPRE ratio of PBCH DMRS to SSS           |                  |                  |                             |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS          |                  |                  |                             |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS          |                  |                  |                             |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |                  |                             |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS          |                  |                  |                             |        |           |        |
| EPRE ratio of PDSCH to PDSCH             |                  |                  |                             |        |           |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |                  |                             |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |                  |                             |        |           |        |
| N <sub>oc</sub> <sup>Note2</sup>         |                  | dBm/15kHz        | -98                         |        | -98       |        |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2       | dBm/SCS          | -98                         |        | -98       |        |
|  | Config 3         |                  | -95                         |        | -95       |        |
| Ê <sub>s</sub> /I <sub>ot</sub>          |                  | dB               | 4                           | 4      | -Infinity | 5      |
| Ê <sub>s</sub> /N <sub>oc</sub>          |                  | dB               | 4                           | 4      | -Infinity | 5      |
| SSB_RP                                   | Config 1,2       | dBm/SCS          | -94                         | -94    | -Infinity | -93    |
|  | Config 3         | dBm/SCS          | -91                         | -91    | -Infinity | -90    |
| I <sub>o</sub> <sup>Note3</sup>          | Config 1,2       | dBm/<br>9.36MHz  | -64.59                      | -64.59 | -70.05    | -63.85 |
|  | Config 3         | dBm/<br>38.16MHz | -58.49                      | -58.49 | -63.94    | -57.75 |



| Propagation condition | -  | AWGN | AWGN |
|-----------------------|--|------|------|
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |      |
| Note 3:               | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |      |

### A.6.3.1.3.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{\text{interrupt}}$  = 122 ms in the test.  $T_{\text{interrupt}}$  is defined in clause 6.1.1.2.2.

This gives a total of 132 ms.

### A.6.3.1.4 SA NR - E-UTRAN handover

#### A.6.3.1.4.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.4-1. General test parameters are provided in Table A.6.3.1.4-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.4-3 and A.6.3.1.4-4 respectively.

**Table A.6.3.1.4-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests**

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

**Table A.6.3.1.4-2: General test parameters for SA inter-RAT E-UTRAN handover**

| Parameter                    |                   | Unit | Value                             | Comment  |
|------------------------------|-------------------|------|-----------------------------------|--|
| NR RF Channel Number         |                   |      | 1                                 | 1 NR carrier frequency is used in the test             |
| LTE RF Channel Number        |                   |      | 2                                 | 1 E-UTRAN carrier frequency is used in the test        |
| Initial conditions           | Active cell       |      | Cell 1                            | NR cell  |
|                              | Neighbouring cell |      | Cell 2                            | E-UTRAN cell   |
| Final condition              | Active cell       |      | Cell 2                            |  |
| NR measurement quantity      |                   |      | SS-RSRP                           |  |
| E-UTRAN measurement quantity |                   |      | RSRP                              |  |
| b2-Threshold1                |                   | dBm  | As specified in Table A.6.3.1.4-3 | Absolute NR SS-RSRP threshold for event B2             |
| b2-Threshold2EUTRAN          |                   | dBm  | -98                               | Absolute E-UTRAN RSRP threshold for event B2           |
| Hysteresis                   |                   | dB   | 0                                 |  |
| TimeToTrigger                |                   | s    | 0                                 |  |
| Filter coefficient           |                   |      | 0                                 | L3 filtering is not used                               |
| DRX                          |                   |      | OFF                               | Non-DRX test   |
| Access Barring Information   |                   | -    | Not sent                          | No additional delays in random access procedure        |
| Time offset between cells    |                   |      | 3 ms                              | Asynchronous cells                                     |
| Gap pattern configuration Id |                   |      | 0                                 | As specified in Table 9.1.2-1 started before T2 starts |
| T1                           |                   | s    | 5                                 |  |
| T2                           |                   | s    | ≤5                                |  |
| T3                           |                   | s    | 1                                 |  |

**Table A.6.3.1.4-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)**

| Parameter  | Unit             | Configuration    | Cell 1                            |          |        |
|--|------------------|------------------|-----------------------------------|----------|--------|
|  |                  |                  | T1                                | T2       | T3     |
| RF channel number                                |                  | 1, 2, 3, 4, 5, 6 | 1                                 |          |        |
| Duplex mode                                      |                  | 1, 4             | FDD                               |          |        |
|  |                  | 2, 3, 5, 6       | TDD                               |          |        |
| TDD Configuration                                |                  | 2, 5             | TDDConf.1.1                       |          |        |
|  |                  | 3, 6             | TDDConf.2.1                       |          |        |
| BW <sub>channel</sub>                            | MHz              | 1, 4             | 10: N <sub>RB,c</sub> = 52 (FDD)  |          |        |
|  |                  | 2, 5             | 10: N <sub>RB,c</sub> = 52 (TDD)  |          |        |
|  |                  | 3, 6             | 40: N <sub>RB,c</sub> = 106 (TDD) |          |        |
| PDSCH reference measurement channel              |                  | 1, 4             | SR.1.1 FDD                        |          |        |
|  |                  | 2, 5             | SR.1.1 TDD                        |          |        |
|  |                  | 3, 6             | SR.2.1 TDD                        |          |        |
| CORSET reference channel                         |                  | 1, 4             | CR.1.1 FDD                        |          |        |
|  |                  | 2, 5             | CR.1.1 TDD                        |          |        |
|  |                  | 3, 6             | CR.2.1 TDD                        |          |        |
| TRS configuration                                |                  | 1, 4             | TRS.1.1 FDD                       |          |        |
|  |                  | 2, 5             | TRS.1.1 TDD                       |          |        |
|  |                  | 3, 6             | TRS.1.2 TDD                       |          |        |
| OCNG pattern <sup>Note1</sup>                    |                  | 1, 2, 3, 4, 5, 6 | OP.1                              |          |        |
| BWP  | Initial DL BWP   | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                         |          |        |
|  | Dedicated DL BWP |                  | DLBWP.1.1                         |          |        |
|  | Initial UL BWP   |                  | ULBWP.0.1                         |          |        |
|  | Dedicated UL BWP |                  | ULBWP.1.1                         |          |        |
| SMTTC configuration                              |                  | 1, 2, 3, 4, 5, 6 | SMTTC.1                           |          |        |
| SSB configuration                                |                  | 1, 2, 4, 5       | SSB.1 FR1                         |          |        |
|  |                  | 3, 6             | SSB.2 FR1                         |          |        |
| b2-Threshold1                                    | dBm              | 1, 2, 4, 5       | -96                               |          |        |
|  |                  | 3, 6             | -93                               |          |        |
| EPRE ratio of PSS to SSS                         | dB               | 1, 2, 3, 4, 5, 6 | 0                                 |          |        |
| EPRE ratio of PBCH_DMRS to SSS                   |                  |                  |                                   |          |        |
| EPRE ratio of PBCH to PBCH_DMRS                  |                  |                  |                                   |          |        |
| EPRE ratio of PDCCH_DMRS to SSS                  |                  |                  |                                   |          |        |
| EPRE ratio of PDCCH to PDCCH_DMRS                |                  |                  |                                   |          |        |
| EPRE ratio of PDSCH_DMRS to SSS                  |                  |                  |                                   |          |        |
| EPRE ratio of PDSCH to PDSCH_DMRS                |                  |                  |                                   |          |        |
| EPRE ratio of OCNG DMRS to SSS                   |                  |                  |                                   |          |        |
| EPRE ratio of OCNG to OCNG DMRS                  |                  |                  |                                   |          |        |
| N <sub>oc</sub> <sup>Note2</sup>                 |                  |                  |                                   |          |        |
| N <sub>oc</sub> <sup>Note2</sup>                 | dBm/SCS          | 1, 2, 4, 5       | -100                              | -104     | -100   |
|  |                  | 3, 6             | -97                               | -101     | -97    |
| E <sub>s</sub> /N <sub>oc</sub>                  | dB               | 1, 2, 3, 4, 5, 6 | 12                                | 0        | -4     |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup> | dB               | 1, 2, 3, 4, 5, 6 | 12                                | 0        | -4     |
| SS-RSRP <sup>Note3</sup>                         | dBm/SCS          | 1, 2, 4, 5       | -88                               | -104     | -104   |
|  |                  | 3, 6             | -85                               | -101     | -101   |
| I <sub>o</sub> <sup>Note3</sup>                  | dBm/9.36 MHz     | 1, 2, 4, 5       | -59.78                            | -73.04   | -70.59 |
|  | dBm/38.16 MHz    | 3, 6             | -53.68                            | -66.9448 | -64.49 |
| Propagation condition                            |                  | 1, 2, 3, 4, 5, 6 | AWGN                              |          |        |
| Antenna Configuration and Correlation Matrix     |                  | 1, 2, 3, 4, 5, 6 | 1x2 Low                           |          |        |

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3:  $\hat{E}_s/l_{ot}$ , SS-RSRP, and  $l_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table A.6.3.1.4-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 |    |    |
|-----------|------|---------------|--------|----|----|
|           |      |               | T1     | T2 | T3 |
|           |      |               |        |    |    |

|  |           |                  |  |  |  |
|--|-----------|------------------|--|--|--|
| RF channel number  |           | 1, 2, 3, 4, 5, 6 | 2  |  |  |
| Duplex mode  |           | 1, 2, 3          | FDD  |  |  |
|  |           | 4, 5, 6          | TDD  |  |  |
| TDD special subframe configuration <sup>Note1</sup>                              |           | 4, 5, 6          | 6  |  |  |
| TDD uplink-downlink configuration <sup>Note1</sup>                               |           | 4, 5, 6          | 1  |  |  |
| BW <sub>channel</sub>  | MHz       | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |  |  |
| PRACH Configuration <sup>Note2</sup>   |           | 1, 2, 3          | 4  |  |  |
|  |           | 4, 5, 6          | 53   |  |  |
| PDSCH parameters: DL Reference Measurement Channel <sup>Note3</sup>              |           | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |  |  |
|  |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |  |  |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel <sup>Note3</sup> |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |  |  |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |  |  |
| OCNG Patterns <sup>Note3</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |  |  |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |  |  |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |  |  |
| PBCH_RB  |           |                  |  |  |  |
| PSS_RA   |           |                  |  |  |  |
| SSS_RA   |           |                  |  |  |  |
| PCFICH_RB  |           |                  |  |  |  |
| PHICH_RA   |           |                  |  |  |  |
| PHICH_RB   |           |                  |  |  |  |
| PDCCH_RA   |           |                  |  |  |  |
| PDCCH_RB   |           |                  |  |  |  |
| PDSCH_RA   |           |                  |  |  |  |
| PDSCH_RB   |           |                  |  |  |  |
| OCNG_RA <sup>Note4</sup>   |           |                  |  |  |  |
| OCNG_RB <sup>Note4</sup>   |           |                  |  |  |  |
| N <sub>oc</sub> <sup>Note5</sup>   | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98  |  |  |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | 8  | 78                                       |
| $\bar{E}_s/I_{ot}$ <sup>Note6</sup>  | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | 78                                       | 78                                       |
| RSRP <sup>Note6</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -90                                      | -90                                      |
| SCH_RP <sup>Note6</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -90                                      | -90                                      |
| I <sub>o</sub> <sup>Note6</sup>  | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -67.21<br>+10log(N <sub>RB,c</sub> /100)   | -58.57<br>+10log(N <sub>RB,c</sub> /100) | -58.57<br>+10log(N <sub>RB,c</sub> /100) |
| Propagation Condition  |           | 1, 2, 3, 4, 5, 6 | AWGN   |  |  |
| Antenna Configuration and Correlation Matrix <sup>Note7</sup>                    |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |  |  |

|         |  |
|---------|--|
| Note 1: | Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  |
| Note 2: | PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].   |
| Note 3: | DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.   |
| Note 4: | OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |
| Note 5: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 6: | $\hat{E}_s/I_{ot}$ , RSRP, SCH_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 7: | Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].  |

#### A.6.3.1.4.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

$T_{interrupt}$  = 35 ms in the test;  $T_{interrupt}$  is defined in clause 6.1.2.1.

This gives a total of 85 ms.

#### A.6.3.1.5 SA NR - E-UTRAN handover with unknown target cell

##### A.6.3.1.5.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

A RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.5-1. General test parameters are provided in Table A.6.3.1.5-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.5-3 and A.6.3.1.5-4 respectively.

**Table A.6.3.1.5-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests**

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

**Table A.6.3.1.5-2: General test parameters for SA inter-RAT E-UTRAN handover**

| Parameter                  |                   | Unit | Value    | Comment   |
|----------------------------|-------------------|------|----------|---|
| NR RF Channel Number       |                   |      | 1        | 1 NR carrier frequency is used in the test      |
| LTE RF Channel Number      |                   |      | 2        | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions         | Active cell       |      | Cell 1   | NR cell   |
|                            | Neighbouring cell |      | Cell 2   | E-UTRAN cell                                    |
| Final condition            | Active cell       |      | Cell 2   |   |
| NR measurement quantity    |                   |      | SS-RSRP  |   |
| DRX                        |                   |      | OFF      | Non-DRX test                                    |
| Access Barring Information |                   | -    | Not sent | No additional delays in random access procedure |
| Time offset between cells  |                   |      | 3 ms     | Asynchronous cells                              |
| T1                         |                   | s    | ≤5       |   |
| T2                         |                   | s    | 1        |   |

**Table A.6.3.1.5-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 |    |
|-----------|------|---------------|--------|----|
|           |      |               | T1     | T2 |
|           |      |               |        |    |



|   |                  |              |                  |                                   |        |
|---|------------------|--------------|------------------|-----------------------------------|--------|
| RF channel number   |                  |              | 1, 2, 3, 4, 5, 6 | 1                                 |        |
| Duplex mode   |                  |              | 1, 4             | FDD                               |        |
|   |                  |              | 2, 3, 5, 6       | TDD                               |        |
| TDD Configuration   |                  |              | 2, 5             | TDDConf.1.1                       |        |
|   |                  |              | 3, 6             | TDDConf.2.1                       |        |
| BW <sub>channel</sub>   |                  | MHz          | 1, 4             | 10: N <sub>RB,c</sub> = 52 (FDD)  |        |
|   |                  |              | 2, 5             | 10: N <sub>RB,c</sub> = 52 (TDD)  |        |
|   |                  |              | 3, 6             | 40: N <sub>RB,c</sub> = 106 (TDD) |        |
| PDSCH reference measurement channel   |                  |              | 1, 4             | SR.1.1 FDD                        |        |
|   |                  |              | 2, 5             | SR.1.1 TDD                        |        |
|   |                  |              | 3, 6             | SR.2.1 TDD                        |        |
| CORSET reference channel  |                  |              | 1, 4             | CR.1.1 FDD                        |        |
|   |                  |              | 2, 5             | CR.1.1 TDD                        |        |
|   |                  |              | 3, 6             | CR.2.1 TDD                        |        |
| TRS configuration   |                  |              | 1, 4             | TRS.1.1 FDD                       |        |
|   |                  |              | 2, 5             | TRS.1.1 TDD                       |        |
|   |                  |              | 3, 6             | TRS.1.2 TDD                       |        |
| OCNG pattern <sup>Note1</sup>   |                  |              | 1, 2, 3, 4, 5, 6 | OP.1                              |        |
| BWP   | Initial DL BWP   |              | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                         |        |
|   | Dedicated DL BWP |              |                  | DLBWP.1.1                         |        |
|   | Initial UL BWP   |              |                  | ULBWP.0.1                         |        |
|   | Dedicated UL BWP |              |                  | ULBWP.1.1                         |        |
| SMTC configuration  |                  |              | 1, 2, 3, 4, 5, 6 | SMTC.1                            |        |
| SSB configuration   |                  |              | 1, 2, 4, 5       | SSB.1 FR1                         |        |
|   |                  |              | 3, 6             | SSB.2 FR1                         |        |
| EPRE ratio of PSS to SSS  |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 |        |
| EPRE ratio of PBCH_DMRS to SSS  |                  |              |                  |                                   |        |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |              |                  |                                   |        |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |              |                  |                                   |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |              |                  |                                   |        |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |              |                  |                                   |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |              |                  |                                   |        |
| EPRE ratio of OCNG DMRS to SSS  |                  |              |                  |                                   |        |
| EPRE ratio of OCNG to OCNG DMRS   |                  |              |                  |                                   |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  |              |                  |                                   |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  | dBm/SCS      | 1, 2, 4, 5       | -98                               |        |
|   |                  |              | 3, 6             | -95                               |        |
| Ē <sub>s</sub> /N <sub>oc</sub>   |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 | 0      |
| Ē <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup>  |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 | 0      |
| SS-RSRP <sup>Note3</sup>  |                  | dBm/SCS      | 1, 2, 4, 5       | -98                               | -98    |
|   |                  |              | 3, 6             | -95                               | -95    |
| I <sub>o</sub> <sup>Note3</sup>   |                  | dBm/9.36 MHz | 1, 2, 4, 5       | -67.04                            | -67.04 |
|   |                  |              | dBm/38.16 MHz    | 3, 6                              | -60.94 |
| Propagation condition   |                  |              | 1, 2, 3, 4, 5, 6 | AWGN                              |        |
| Antenna Configuration and Correlation Matrix  |                  |              | 1, 2, 3, 4, 5, 6 | 1x2 Low                           |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                  |              |                  |                                   |        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                  |              |                  |                                   |        |
| Note 3: Ē <sub>s</sub> /I <sub>ot</sub> , SS-RSRP, and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.                                   |                  |              |                  |                                   |        |



**Table A.6.3.1.5-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)**

| Parameter  | Unit      | Configuration    | Cell 2   |        |
|--|-----------|------------------|--|--------|
|  |           |                  | T1   | T2     |
| RF channel number  |           | 1, 2, 3, 4, 5, 6 | 2  |        |
| Duplex mode  |           | 1, 2, 3          | FDD  |        |
|  |           | 4, 5, 6          | TDD  |        |
| TDD special subframe configuration <sup>Note1</sup>  |           | 4, 5, 6          | 6  |        |
| TDD uplink-downlink configuration <sup>Note1</sup>   |           | 4, 5, 6          | 1  |        |
| BW <sub>channel</sub>  | MHz       | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |        |
| PRACH Configuration <sup>Note2</sup>   |           | 1, 2, 3          | 4  |        |
|  |           | 4, 5, 6          | 53   |        |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup>   |           | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |        |
|  |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |        |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |        |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |        |
| OCNG Patterns <sup>Note3</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |        |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |        |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |        |
| PBCH_RB  |           |                  |  |        |
| PSS_RA   |           |                  |  |        |
| SSS_RA   |           |                  |  |        |
| PCFICH_RB  |           |                  |  |        |
| PHICH_RA   |           |                  |  |        |
| PHICH_RB   |           |                  |  |        |
| PDCCH_RA   |           |                  |  |        |
| PDCCH_RB   |           |                  |  |        |
| PDSCH_RA   |           |                  |  |        |
| PDSCH_RB   |           |                  |  |        |
| OCNG_RA <sup>Note4</sup>   |           |                  |  |        |
| OCNG_RB <sup>Note4</sup>   |           |                  |  |        |
| N <sub>oc</sub> <sup>Note5</sup>   |           |                  |  |        |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | 7      |
| $\hat{E}_s/I_{ot}$ <sup>Note6</sup>  | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | 7      |
| RSRP <sup>Note6</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -91    |
| SCH_RP <sup>Note6</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -91    |
| I <sub>o</sub> <sup>Note6</sup>  | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -70.22   | -62.43 |
| Propagation Condition  |           | 1, 2, 3, 4, 5, 6 | AWGN   |        |
| Antenna Configuration and Correlation Matrix <sup>Note7</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |        |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].</p> <p>Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 6: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |        |

### A.6.3.1.5.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

$T_{\text{interrupt}}$  = 115 ms in the test;  $T_{\text{interrupt}}$  is defined in clause 6.1.2.1.

This gives a total of 165 ms.

### A.6.3.1.6 SA NR - UTRAN FDD handover

#### A.6.3.1.6.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT UTRAN FDD handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to UTRAN FDD handover requirements as specified in clause 6.1.2.2.1.

The test comprises of one NR carrier and one UTRA FDD carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN FDD neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.6-1. General test parameters are provided in Table A.6.3.1.6-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.6-3 and A.6.3.1.6-4 respectively.

**Table A.6.3.1.6-1: Supported test configurations for SA inter-RAT UTRAN FDD handover tests**

| Configuration | Description  |
|---------------|--|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, UTRAN FDD                  |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, UTRAN FDD                  |
| 3             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, UTRAN FDD                  |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.3.1.6-2: General test parameters for SA inter-RAT UTRAN FDD handover**

| Parameter                                  |                   | Unit | Value                             | Comment  |
|--|-------------------|------|-----------------------------------|--|
| NR RF Channel Number                       |                   |      | 1                                 | 1 NR carrier frequency is used in the test             |
| UTRA RF Channel Number                     |                   |      | 2                                 | 1 UTRAN carrier frequency is used in the test          |
| Initial conditions                         | Active cell       |      | Cell 1                            | NR cell  |
|  | Neighbouring cell |      | Cell 2                            | UTRAN cell   |
| Final condition                            | Active cell       |      | Cell 2                            |  |
| NR measurement quantity                    |                   |      | SS-RSRP                           |  |
| Inter-RAT (UTRAN FDD) measurement quantity |                   |      | CPICH Ec/N0                       |  |
| b2-Threshold1                              |                   | dBm  | As specified in Table A.6.3.1.6-3 | Absolute NR SS-RSRP threshold for event B2             |
| b2-Threshold2UTRA-FDD                      |                   | dB   | -18                               | Absolute UTRAN CPICH Ec/lo threshold for event B2      |
| Hysteresis                                 |                   | dB   | 0                                 |  |
| TimeToTrigger                              |                   | s    | 0                                 |  |
| Filter coefficient                         |                   |      | 0                                 | L3 filtering is not used                               |
| DRX  |                   |      | OFF                               | Non-DRX test   |
| Access Barring Information                 |                   | -    | Not sent                          | No additional delays in random access procedure        |
| Time offset between cells                  |                   |      | 3 ms                              | Asynchronous cells                                     |
| Gap pattern configuration Id               |                   |      | 0                                 | As specified in Table 9.1.2-1 started before T2 starts |
| T1   |                   | s    | 5                                 |  |
| T2   |                   | s    | ≤5                                |  |
| T3   |                   | s    | 1                                 |  |

Table A.6.3.1.6-3: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 1)

| Parameter   |                  | Unit         | Configuration | Cell 1                            |        |        |
|---|------------------|--------------|---------------|-----------------------------------|--------|--------|
|   |                  |              |               | T1                                | T2     | T3     |
| RF channel number   |                  |              | 1, 2, 3       | 1                                 |        |        |
| Duplex mode   |                  |              | 1             | FDD                               |        |        |
|   |                  |              | 2, 3          | TDD                               |        |        |
| TDD Configuration   |                  |              | 2             | TDDConf.1.1                       |        |        |
|   |                  |              | 3             | TDDConf.2.1                       |        |        |
| BW <sub>channel</sub>   |                  | MHz          | 1             | 10: N <sub>RB,c</sub> = 52 (FDD)  |        |        |
|   |                  |              | 2             | 10: N <sub>RB,c</sub> = 52 (TDD)  |        |        |
|   |                  |              | 3             | 40: N <sub>RB,c</sub> = 106 (TDD) |        |        |
| PDSCH reference measurement channel   |                  |              | 1             | SR.1.1 FDD                        |        |        |
|   |                  |              | 2             | SR.1.1 TDD                        |        |        |
|   |                  |              | 3             | SR.2.1 TDD                        |        |        |
| CORSET reference channel  |                  |              | 1             | CR.1.1 FDD                        |        |        |
|   |                  |              | 2             | CR.1.1 TDD                        |        |        |
|   |                  |              | 3             | CR.2.1 TDD                        |        |        |
| TRS configuration   |                  |              | 1             | TRS.1.1 FDD                       |        |        |
|   |                  |              | 2             | TRS.1.1 TDD                       |        |        |
|   |                  |              | 3             | TRS.1.2 TDD                       |        |        |
| OCNG pattern <sup>Note1</sup>   |                  |              | 1, 2, 3       | OP.1                              |        |        |
| BWP   | Initial DL BWP   |              | 1, 2, 3       | DLBWP.0.1                         |        |        |
|   | Dedicated DL BWP |              |               | DLBWP.1.1                         |        |        |
|   | Initial UL BWP   |              |               | ULBWP.0.1                         |        |        |
|   | Dedicated UL BWP |              |               | ULBWP.1.1                         |        |        |
| SMTC configuration  |                  |              | 1, 2, 3       | SMTC.1                            |        |        |
| SSB configuration   |                  |              | 1, 2          | SSB.1 FR1                         |        |        |
|   |                  |              | 3             | SSB.2 FR1                         |        |        |
| b2-Threshold1   |                  | dBm          | 1, 2          | -96                               |        |        |
|   |                  |              | 3             | -93                               |        |        |
| EPRE ratio of PSS to SSS  |                  | dB           | 1, 2, 3       | 0                                 |        |        |
| EPRE ratio of PBCH_DMRS to SSS  |                  |              |               |                                   |        |        |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |              |               |                                   |        |        |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |              |               |                                   |        |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |              |               |                                   |        |        |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |              |               |                                   |        |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |              |               |                                   |        |        |
| EPRE ratio of OCNG DMRS to SSS  |                  |              |               |                                   |        |        |
| EPRE ratio of OCNG to OCNG DMRS   |                  |              |               |                                   |        |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  |              |               |                                   |        |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  | dBm/SCS      | 1, 2,         | -100                              |        |        |
|   |                  |              | 3             | -97                               |        |        |
| E <sub>s</sub> /N <sub>oc</sub>   |                  | dB           | 1, 2, 3       | 12                                | -4     | -4     |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup>  |                  | dB           | 1, 2, 3       | 12                                | -4     | -4     |
| SS-RSRP <sup>Note3</sup>  |                  | dBm/SCS      | 1, 2          | -88                               | -104   | -104   |
|   |                  |              | 3             | -85                               | -101   | -101   |
| I <sub>o</sub> <sup>Note3</sup>   |                  | dBm/9.36 MHz | 1, 2          | -59.78                            | -70.59 | -70.59 |
|   |                  |              | dBm/38.16 MHz | 3                                 | -53.68 | -64.49 |
| Propagation condition   |                  |              | 1, 2, 3       | AWGN                              |        |        |
| Antenna Configuration and Correlation Matrix  |                  |              | 1, 2, 3       | 1x2 Low                           |        |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                  |              |               |                                   |        |        |

|         |  |
|---------|--|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | $\hat{E}_s/I_{or}$ , SS-RSRP, and $I_{oc}$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |

**Table A.6.3.1.6-4: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 2)**

| Parameter  | Unit         | Cell 2 (UTRA) |       |        |
|--|--------------|---------------|-------|--------|
|  |              | T1            | T2    | T3     |
| UTRA RF Channel Number   |              | 2             |       |        |
| CPICH_Ec/lor   | dB           | -10           |       |        |
| PCCPCH_Ec/lor  | dB           | -12           |       |        |
| SCH_Ec/lor   | dB           | -12           |       |        |
| PICH_Ec/lor  | dB           | -15           |       |        |
| DCH_Ec/lor   | dB           | N/A           | N/A   | Note 1 |
| OCNS_Ec/lor  | dB           | -0.941        | 0.941 | Note 2 |
| $\hat{I}_{or}/I_{oc}$  | dB           | -infinity     | -1.8  | -1.8   |
| $I_{oc}$   | dBm/3,84 MHz | -70           | -70   | -70    |
| CPICH_Ec/lo  | dB           | -infinity     | -14   | -14    |
| Propagation Condition  |              | AWGN          |       |        |
| Note 1: The DPCH level is controlled by the power control loop   |              |               |       |        |
| Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to $I_{or}$ . |              |               |       |        |

#### A.6.3.1.6.2 Test Requirements

The UE shall start to transmit the UL DPCH to Cell 2 less than 190 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = 50 ms, which is specified in clause 5.3.1.1.1.

$T_{interrupt}$  = 140 ms in the test;  $T_{interrupt}$  is defined in clause 5.3.1.1.2. This gives a total of 190 ms.

#### A.6.3.1.7 Intra-frequency synchronous DAPS handover in FR1

##### A.6.3.1.7.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency DAPS handover requirements in synchronous scenario specified in clause 6.1.3.2.

##### A.6.3.1.7.2 Test Parameters

Supported test configurations are shown in Table A.6.3.1.7.2-1. Both handover delay and interruption length are tested by using the parameters in Table A.6.3.1.7.2-2, and A.6.3.1.7.2-3. The test consists of five successive time periods, with time durations of T1, T2, T3, T4, and T5 respectively.

Before the start of T1, the UE is connected to the cell1 and not aware of the cell2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE does not have any timing information of the cell2.

Starting T2, the cell2 becomes detectable. During T2, the UE performs cell detection and measurements on the cell2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the last TTI containing DAPS handover command is sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the cell2 while the DL scheduling and UL feedback in the cell1 shall be avoided. After successful RACH procedure of the cell2, UE is scheduled with PDSCH from cell1 and cell2 in alternative TTIs where both cell1 and cell2 belong to the same TAG. In the end the network sends a RRC message implying cell1 release to the UE. During T3, the handover delay  $D_{handover1}$  for target cell addition need to be verified.

The start of T4 is the instant when the last TTI containing cell1 release command is sent to the UE. During T4, the UE shall accomplish the release actions within  $D_{\text{handover}2}$ .

Starting T5, the UE stops sending the periodical CSI report to the cell1.

**Table A.6.3.1.7.2-1: Intra-frequency DAPS handover in FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.1.7.2-2: General test parameters synchronous Intra-frequency DAPS handover in FR1**

| Parameter                  | Unit              | Value                  | Comment   |
|----------------------------|-------------------|------------------------|---|
| Initial conditions         | Active cell       | Cell 1                 |   |
|                            | Neighbouring cell | Cell 2                 |   |
| Final condition            | Active cell       | Cell 2                 |   |
| A3-Offset                  | dB                | 0                      |   |
| Hysteresis                 | dB                | 0                      |   |
| Time To Trigger            | s                 | 0                      |   |
| Filter coefficient         |                   | 0                      | L3 filtering is not used                              |
| Access Barring Information | -                 | Not Sent               | No additional delays in random access procedure.      |
| Time offset between cells  |                   | 3 $\mu$ s              | Synchronous cells                                     |
| T1                         | s                 | 5                      |   |
| T2                         | s                 | $\leq 5$               |   |
| T3                         | s                 | 1                      |   |
| T4                         | ms                | $D_{\text{handover}2}$ | $D_{\text{Handover}2}$ is defined in clause 6.1.3.2.1 |
| T5                         | ms                | 100                    |   |



**Table A.6.3.1.7.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency DAPS handover test case**

| Parameter                                |                  | Unit | Cell 1                      |    |    |    |    | Cell 2 |    |    |    |    |
|--|------------------|------|-----------------------------|----|----|----|----|--------|----|----|----|----|
|  |                  |      | T1                          | T2 | T3 | T4 | T5 | T1     | T2 | T3 | T4 | T5 |
| NR RF Channel Number                     |                  |      | 1                           |    |    |    |    | 1      |    |    |    |    |
| Duplex mode                              | Config 1         |      | FDD                         |    |    |    |    |        |    |    |    |    |
|  | Config 2,3       |      | TDD                         |    |    |    |    |        |    |    |    |    |
| TDD configuration                        | Config 1         |      | Not Applicable              |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | TDDConf.1.1                 |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | TDDConf.2.1                 |    |    |    |    |        |    |    |    |    |
| BW <sub>channel</sub>                    | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    |    |    |    |        |    |    |    |    |
| BWP BW                                   | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    |    |    |    |        |    |    |    |    |
| DRX Cycle                                |                  | ms   | Not Applicable              |    |    |    |    |        |    |    |    |    |
| PDSCH Reference measurement channel      | Config 1         |      | SR.1.1 FDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | SR.1.1 TDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | SR2.1 TDD                   |    |    |    |    |        |    |    |    |    |
| CORESET Reference Channel                | Config 1         |      | CR.1.1 FDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | CR.1.1 TDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | CR2.1 TDD                   |    |    |    |    |        |    |    |    |    |
| TRS configuration                        | Config 1         |      | TRS.1.1 FDD                 |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | TRS.1.1 TDD                 |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | TRS.1.2 TDD                 |    |    |    |    |        |    |    |    |    |
| OCNG Patterns                            |                  |      | OP.1                        |    |    |    |    |        |    |    |    |    |
| CSI-RS configuration for CSI reporting   | Config 1         |      | CSI-RS.1.1 FDD              |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | CSI-RS.1.1 TDD              |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | CSI-RS.2.1 TDD              |    |    |    |    |        |    |    |    |    |
| SMTC Configuration                       |                  |      | SMTC.1                      |    |    |    |    |        |    |    |    |    |
| SSB Configuration                        | Config 1,2       |      | SSB.1 FR1                   |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | SSB.2 FR1                   |    |    |    |    |        |    |    |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz  | 15 kHz                      |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 30 kHz                      |    |    |    |    |        |    |    |    |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz  | 15 kHz                      |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 30 kHz                      |    |    |    |    |        |    |    |    |    |
| PRACH configuration                      |                  |      | FR1 PRACH configuration 1   |    |    |    |    |        |    |    |    |    |
| BWP configuration                        | Initial DL BWP   |      | DLBWP.0.1                   |    |    |    |    |        |    |    |    |    |
|  | Dedicated DL BWP |      | DLBWP.1.1                   |    |    |    |    |        |    |    |    |    |
|  | Initial UL BWP   |      | ULBWP.0.1                   |    |    |    |    |        |    |    |    |    |
|  | Dedicated UL BWP |      | ULBWP.1.1                   |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PSS to SSS                 |                  | dB   | 0                           |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH DMRS        |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |      |                             |    |    |    |    |        |    |    |    |    |

|   |            |                  |       |       |       |       |       |       |       |       |       |       |
|---|------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| $N_{oc}^{Note2}$  |            | dBm/15kHz        | -98   |       |       |       |       |       |       |       |       |       |
| $N_{oc}^{Note2}$  | Config 1,2 | dBm/SCS          | -98   |       |       |       |       |       |       |       |       |       |
|   | Config 3   |                  | -95   |       |       |       |       |       |       |       |       |       |
| $\hat{E}_s / I_{ot}$  |            | dB               | 8     | -1.5  | -1.5  | -1.5  | -1.5  | -     | 0.36  | 0.36  | 0.36  | 0.36  |
| $\hat{E}_s / N_{oc}$  |            | dB               | 8     | 8     | 8     | 8     | 8     | -     | 9     | 9     | 9     | 9     |
| SSB_RP  | Config 1,2 | dBm/SCS          | -90   | -90   | -90   | -90   | -90   | -     | -89   | -89   | -89   | -89   |
|   | Config 3   | dBm/SCS          | -87   | -87   | -87   | -87   | -87   | -     | -86   | -86   | -86   | -86   |
| $I_o^{Note3}$   | Config 1,2 | dBm/<br>9.36MHz  | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     |
|   | Config 3   | dBm/<br>38.16MHz | 61.41 | 58.21 | 58.21 | 58.21 | 58.21 | 61.41 | 58.21 | 58.21 | 58.21 | 58.21 |
| Propagation condition   |            |                  | AWGN  |       |       |       |       |       |       |       |       |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |            |                  |       |       |       |       |       |       |       |       |       |       |

### A.6.3.1.7.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

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

NOTE: The target cell add delay  $D_{handover1}$  can be expressed as:  $T_{RRC\_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$ , where:

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{search}$ ,  $T_{IU}$ ,  $T_{processing}$ ,  $T_{\Delta}$  and  $T_{margin}$  are defined in clause 6.1.1.2.2.

If the target cell is known, then  $T_{search} = 0$  ms

$T_{IU} = 20$  ms in the test.  $T_{IU}$  is defined in clause 6.1.1.2.2.

$T_{\Delta} = 20$  ms in the test.  $T_{\Delta}$  is defined in clause 6.1.1.2.2.

$T_{processing} = 20$  ms in the test.  $T_{processing}$  is defined in clause 6.1.1.2.2.

$T_{margin} = 2$  ms in the test.  $T_{margin}$  is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

After successful RACH to cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from cell 1 and cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release cell 1 less than  $D_{handover2} = (T_{RRC\_procedure} + T_{interrupt2})$  from the beginning of time period T4.

NOTE:  $D_{handover2}$  is defined in clause 6.1.3.2.1.

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt2}$  is defined in clause 6.1.3.2.2.

UE shall not report CSI to cell 1 during T5.

### A.6.3.1.8 Intra-frequency asynchronous DAPS handover in FR1

#### A.6.3.1.8.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency DAPS handover requirements in asynchronous scenario specified in clause 6.1.3.2.

#### A.6.3.1.8.2 Test Parameters

Supported test configurations are shown in Table A.6.3.1.8.2-1. Both handover delay and interruption length are tested by using the parameters in Table A.6.3.1.8.2-2, and A.6.3.1.8.2-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4, and T5 respectively.

Before the start of T1, the UE is connected to the cell1 and not aware of the cell2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE does not have any timing information of the cell2.

Starting T2, the cell2 becomes detectable. During T2, the UE performs cell detection and measurements on the cell2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the last TTI containing DAPS handover command is sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the cell2 while the DL scheduling and UL feedback in the cell1 shall be avoided. After successful RACH procedure of the cell2, UE is scheduled with PDSCH from cell1 and cell2 in alternative TTIs where both cell1 and cell2 belong to the same TAG. In the end the network sends a RRC message implying cell1 release to the UE. During T3, the handover delay  $D_{handover1}$  for target cell addition needs to be verified.

The start of T4 is the instant when the last TTI containing cell1 release command is sent to the UE by cell2. During T4, the UE shall accomplish the release actions within  $D_{handover2}$ .

#### Starting T5, the UE stops sending the periodical CSI report to the cell1. Table A.6.3.1.8.2-1: Intra-frequency DAPS handover in FR1 test configurations

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.1.8.2-2: General test parameters Intra-frequency asynchronous DAPS handover in FR1**

| Parameter                  | Unit              | Value           | Comment  |
|----------------------------|-------------------|-----------------|--|
| Initial conditions         | Active cell       | Cell 1          |  |
|                            | Neighbouring cell | Cell 2          |  |
| Final condition            | Active cell       | Cell 2          |  |
| A3-Offset                  | dB                | 0               |  |
| Hysteresis                 | dB                | 0               |  |
| Time To Trigger            | s                 | 0               |  |
| Filter coefficient         |                   | 0               | L3 filtering is not used                         |
| Access Barring Information | -                 | Not Sent        | No additional delays in random access procedure. |
| Time offset between cells  |                   | 7 $\mu$ s       | Asynchronous cells                               |
| T1                         | s                 | 5               |  |
| T2                         | s                 | $\leq 5$        |  |
| T3                         | s                 | 1               |  |
| T4                         | ms                | $D_{handover2}$ | $D_{Handover2}$ is defined in clause 6.1.3.2.1   |
| T5                         | ms                | 100             |  |

**Table A.6.3.1.8.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency DAPS handover test case**

| Parameter                              |                  | Unit | Cell 1                      |    |    |    |    | Cell 2 |    |    |    |    |
|--|------------------|------|-----------------------------|----|----|----|----|--------|----|----|----|----|
|  |                  |      | T1                          | T2 | T3 | T4 | T5 | T1     | T2 | T3 | T4 | T5 |
| NR RF Channel Number                   |                  |      | 1                           |    |    |    |    | 1      |    |    |    |    |
| Duplex mode                            | Config 1         |      | FDD                         |    |    |    |    |        |    |    |    |    |
|  | Config 2,3       |      | TDD                         |    |    |    |    |        |    |    |    |    |
| TDD configuration                      | Config 1         |      | Not Applicable              |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | TDDConf.1.1                 |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | TDDConf.2.1                 |    |    |    |    |        |    |    |    |    |
| BW <sub>channel</sub>                  | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    |    |    |    |        |    |    |    |    |
| BWP BW                                 | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    |    |    |    |        |    |    |    |    |
| DRX Cycle                              |                  | ms   | Not Applicable              |    |    |    |    |        |    |    |    |    |
| PDSCH Reference measurement channel    | Config 1         |      | SR.1.1 FDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | SR.1.1 TDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | SR2.1 TDD                   |    |    |    |    |        |    |    |    |    |
| CORESET Reference Channel              | Config 1         |      | CR.1.1 FDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | CR.1.1 TDD                  |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | CR2.1 TDD                   |    |    |    |    |        |    |    |    |    |
| TRS configuration                      | Config 1         |      | TRS.1.1 FDD                 |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | TRS.1.1 TDD                 |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | TRS.1.2 TDD                 |    |    |    |    |        |    |    |    |    |
| OCNG Patterns                          |                  |      | OP.1                        |    |    |    |    |        |    |    |    |    |
| CSI-RS configuration for CSI reporting | Config 1         |      | CSI-RS.1.1 FDD              |    |    |    |    |        |    |    |    |    |
|  | Config 2         |      | CSI-RS.1.1 TDD              |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | CSI-RS.2.1 TDD              |    |    |    |    |        |    |    |    |    |
| SMTc Configuration                     |                  |      | SMTc.1                      |    |    |    |    |        |    |    |    |    |
| SSB Configuration                      | Config 1,2       |      | SSB.1 FR1                   |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | SSB.2 FR1                   |    |    |    |    |        |    |    |    |    |
| PDSCH/PDCCH subcarrier spacing         | Config 1,2       | kHz  | 15 kHz                      |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 30 kHz                      |    |    |    |    |        |    |    |    |    |
| PUCCH/PUSCH subcarrier spacing         | Config 1,2       | kHz  | 15 kHz                      |    |    |    |    |        |    |    |    |    |
|  | Config 3         |      | 30 kHz                      |    |    |    |    |        |    |    |    |    |
| PRACH configuration                    |                  |      | FR1 PRACH configuration 1   |    |    |    |    |        |    |    |    |    |
| BWP configuration                      | Initial DL BWP   |      | DLBWP.0.1                   |    |    |    |    |        |    |    |    |    |
|  | Dedicated DL BWP |      | DLBWP.1.1                   |    |    |    |    |        |    |    |    |    |
|  | Initial UL BWP   |      | ULBWP.0.1                   |    |    |    |    |        |    |    |    |    |
|  | Dedicated UL BWP |      | ULBWP.1.1                   |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PSS to SSS               |                  | dB   | 0                           |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS         |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS        |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS        |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS      |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS        |                  |      |                             |    |    |    |    |        |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH           |                  |      |                             |    |    |    |    |        |    |    |    |    |

|   |            |           |       |       |       |       |       |       |           |       |       |       |       |
|---|------------|-----------|-------|-------|-------|-------|-------|-------|-----------|-------|-------|-------|-------|
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |            |           |       |       |       |       |       |       |           |       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |            |           |       |       |       |       |       |       |           |       |       |       |       |
| $N_{oc}$ <sup>Note2</sup>   |            | dBm/15kHz | -98   |       |       |       |       |       |           |       |       |       |       |
| $N_{oc}$ <sup>Note2</sup>   | Config 1,2 | dBm/SCS   | -98   |       |       |       |       |       |           |       |       |       |       |
|   | Config 3   |           | -95   |       |       |       |       |       |           |       |       |       |       |
| $\hat{E}_s / I_{\alpha}$  |            | dB        | 8     | -1.5  | -1.5  | -1.5  | -1.5  | -1.5  | -Infinity | 0.36  | 0.36  | 0.36  | 0.36  |
| $\hat{E}_s / N_{oc}$  |            | dB        | 8     | 8     | 8     | 8     | 8     | 8     | -Infinity | 9     | 9     | 9     | 9     |
| SSB_RP  | Config 1,2 | dBm/SCS   | -90   | -90   | -90   | -90   | -90   | -90   | -Infinity | -89   | -89   | -89   | -89   |
|   | Config 3   | dBm/SCS   | -87   | -87   | -87   | -87   | -87   | -87   | -Infinity | -86   | -86   | -86   | -86   |
| $I_o$ <sup>Note3</sup>  | Config 1,2 | dBm/      | -     | -     | -     | -     | -     | -     | -61.41    | -     | -     | -     | -     |
|   |            | 9.36MHz   | 61.41 | 58.21 | 58.21 | 58.21 | 58.21 | 58.21 |           | 58.21 | 58.21 | 58.21 | 58.21 |
| $I_o$ <sup>Note3</sup>  | Config 3   | dBm/      | -     | -     | -     | -     | -     | -     | -55.31    | -     | -     | -     | -     |
|   |            | 38.16MHz  | 55.31 | 52.11 | 52.11 | 52.11 | 52.11 | 52.11 |           | 52.11 | 52.11 | 52.11 | 52.11 |
| Propagation condition   |            |           | AWGN  |       |       |       |       |       |           |       |       |       |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |            |           |       |       |       |       |       |       |           |       |       |       |       |

### A.6.3.1.8.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

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

NOTE: The target cell add delay  $D_{handover1}$  can be expressed as:  $T_{RRC\_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$ , where:

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{search}$ ,  $T_{IU}$ ,  $T_{processing}$ ,  $T_{\Delta}$  and  $T_{margin}$  are defined in clause 6.1.1.2.2.

If the target cell is known, then  $T_{search} = 0$  ms

$T_{IU} = 20$  ms in the test.  $T_{IU}$  is defined in clause 6.1.1.2.2.

$T_{\Delta} = 20$  ms in the test.  $T_{\Delta}$  is defined in clause 6.1.1.2.2.

$T_{processing} = 20$  ms in the test.  $T_{processing}$  is defined in clause 6.1.1.2.2.

$T_{margin} = 2$  ms in the test.  $T_{margin}$  is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

After successful RACH to cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from cell 1 and cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release cell 1 less than  $D_{handover2} = (T_{RRC\_procedure} + T_{interrupt2})$  from the beginning of time period T4.

NOTE:  $D_{handover2}$  is defined in clause 6.1.3.2.1.

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt2}$  is defined in clause 6.1.3.2.2.

UE shall not report CSI to cell 1 during T5.

### A.6.3.1.9 Intra-band inter-frequency synchronous DAPS handover test in SA for FR1

#### A.6.3.1.9.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency synchronous DAPS handover requirements specified in clause 6.1.3.2.

#### A.6.3.1.9.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.9.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.9.2-2, and A.6.3.1.9.2-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. The UE shall be configured with periodic CSI reporting for cell1. The test scenario comprises of two carriers and one cell on each carrier. Gap pattern ID gp0 as specified in Table 9.1.2-1 is configured before T2 in the test case.

Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC message implying DAPS handover to the UE.

T3 is defined as the end of the last TTI containing the RRC message implying DAPS handover. During T3 UE shall be able to perform random access to cell 2. Cell 1 is continuously scheduled in DL during T3. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. At the end of T3 cell 2 shall send an RRC message implying cell 1 release command.

T4 is defined as the end of the last TTI containing the RRC message implying DAPS handover. Cell 2 is continuously scheduled in DL during T4. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

**Table A.6.3.1.9.2-1: Intra-band inter-frequency synchronous DAPS handover in SA for FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |



**Table A.6.3.1.9.2-2: General test parameters for intra-band inter-frequency synchronous DAPS handover test in SA for FR1**

| Parameter                  |                   | Unit | Value                        | Comment  |
|----------------------------|-------------------|------|------------------------------|--|
| Initial conditions         | Active cell       |      | Cell 1                       |  |
|                            | Neighbouring cell |      | Cell 2                       |  |
| Final condition            | Active cell       |      | Cell 2                       |  |
| A3-Offset                  |                   | dB   | 0                            |  |
| Hysteresis                 |                   | dB   | 0                            |  |
| Time To Trigger            |                   | s    | 0                            |  |
| Filter coefficient         |                   |      | 0                            | L3 filtering is not used   |
| Access Barring Information |                   | -    | Not Sent                     | No additional delays in random access procedure.                         |
| Time offset between cells  |                   |      | 0 $\mu$ s                    | Synchronous cells  |
| T1                         |                   | s    | 5                            |  |
| T2                         |                   | s    | $\leq 5$                     |  |
| T3                         |                   | s    | 1                            |  |
| T4                         |                   | ms   | $10 + T_{\text{interrupt2}}$ | $T_{\text{interrupt2}}$ is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5 |
| T5                         |                   | ms   | 100                          |  |

**Table A.6.3.1.9.2-3: Cell specific test parameters for intra-band inter-frequency synchronous DAPS handover test in SA for FR1**

| Parameter                                |                  | Unit      | Cell 1                      |    |    |    |      | Cell 2 |    |    |    |    |
|--|------------------|-----------|-----------------------------|----|----|----|------|--------|----|----|----|----|
|  |                  |           | T1                          | T2 | T3 | T4 | T5   | T1     | T2 | T3 | T4 | T5 |
| NR RF Channel Number                     |                  |           | 1                           |    |    |    |      | 2      |    |    |    |    |
| Duplex mode                              | Config 1         |           | FDD                         |    |    |    |      |        |    |    |    |    |
|  | Config 2,3       |           | TDD                         |    |    |    |      |        |    |    |    |    |
| TDD configuration                        | Config 1         |           | Not Applicable              |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | TDDConf.1.1                 |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | TDDConf.2.1                 |    |    |    |      |        |    |    |    |    |
| BW <sub>channel</sub>                    | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |    |    |    |      |        |    |    |    |    |
| BWP BW                                   | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |    |    |    |      |        |    |    |    |    |
| DRx Cycle                                |                  | ms        | Not Applicable              |    |    |    |      |        |    |    |    |    |
| PDSCH Reference measurement channel      | Config 1         |           | SR.1.1 FDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | SR.1.1 TDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | SR2.1 TDD                   |    |    |    |      |        |    |    |    |    |
| CORESET Reference Channel                | Config 1         |           | CR.1.1 FDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | CR.1.1 TDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | CR2.1 TDD                   |    |    |    |      |        |    |    |    |    |
| TRS configuration                        | Config 1         |           | TRS.1.1 FDD                 |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | TRS.1.1 TDD                 |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | TRS.1.2 TDD                 |    |    |    |      |        |    |    |    |    |
| OCNG Patterns                            |                  |           | OP.1                        |    |    |    |      |        |    |    |    |    |
| CSI-RS configuration for CSI reporting   | Config 1         |           | CSI-RS.1.1 FDD              |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | CSI-RS.1.1 TDD              |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | CSI-RS.2.1 TDD              |    |    |    |      |        |    |    |    |    |
| SMTC Configuration                       |                  |           | SMTC.1                      |    |    |    |      |        |    |    |    |    |
| SSB Configuration                        | Config 1,2       |           | SSB.1 FR1                   |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | SSB.2 FR1                   |    |    |    |      |        |    |    |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 30 kHz                      |    |    |    |      |        |    |    |    |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 30 kHz                      |    |    |    |      |        |    |    |    |    |
| PRACH configuration                      |                  |           | FR1 PRACH configuration 1   |    |    |    |      |        |    |    |    |    |
| BWP configuration                        | Initial DL BWP   |           | DLBWP.0.1                   |    |    |    |      |        |    |    |    |    |
|  | Dedicated DL BWP |           | DLBWP.1.1                   |    |    |    |      |        |    |    |    |    |
|  | Initial UL BWP   |           | ULBWP.0.1                   |    |    |    |      |        |    |    |    |    |
|  | Dedicated UL BWP |           | ULBWP.1.1                   |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PSS to SSS                 |                  | dB        | 0                           |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH             |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |           |                             |    |    |    |      |        |    |    |    |    |
| N <sub>oc</sub> <sup>Note2</sup>         |                  | dBm/15kHz | -98                         |    |    |    |      |        |    |    |    |    |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2       | dBm/SCS   | -98                         |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | -95                         |    |    |    |      |        |    |    |    |    |
| Ê <sub>s</sub> / I <sub>ot</sub>         |                  | dB        | 8                           | 8  | 8  | 8  | 8    | -      | 8  | 8  | 8  | 8  |
|  |                  |           |                             |    |    |    | Infi |        |    |    |    |    |
|  |                  |           |                             |    |    |    | nity |        |    |    |    |    |

|                                 |            |  |                |                |                |                |                |                       |                |                |                |                |
|---------------------------------|------------|--|----------------|----------------|----------------|----------------|----------------|-----------------------|----------------|----------------|----------------|----------------|
| $\hat{E}_s / N_{oc}$            |            | dB   | 8              | 8              | 8              | 8              | 8              | -<br>Infi<br>nit<br>y | 8              | 8              | 8              | 8              |
| SSB_RP                          | Config 1,2 | dBm/SCS  | -<br>90        | -<br>90        | -<br>90        | -<br>90        | -<br>90        | -<br>Infi<br>nit<br>y | -<br>90        | -<br>90        | -<br>90        | -<br>90        |
|                                 | Config 3   | dBm/SCS  | -<br>87        | -<br>87        | -<br>87        | -<br>87        | -<br>87        | -<br>Infi<br>nit<br>y | -<br>87        | -<br>87        | -<br>87        | -<br>87        |
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2 | dBm/<br>9.36MHz  | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>70.<br>05        | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 |
|                                 | Config 3   | dBm/<br>38.16MHz   | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>63.<br>94        | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 |
| Propagation condition           |            | -  | AWGN           |                |                |                |                | AWGN                  |                |                |                |                |
| Note 1:                         |            | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                |                |                |                |                |                       |                |                |                |                |
| Note 2:                         |            | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                |                |                |                |                |                       |                |                |                |                |
| Note 3:                         |            | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                |                |                |                |                |                       |                |                |                |                |

### A.6.3.1.9.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

During T3 UE is allowed to cause T<sub>interrupt1</sub> interruption to cell 1. T<sub>interrupt1</sub> is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause T<sub>interrupt2</sub> interruption to cell 1. T<sub>interrupt2</sub> is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

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

### A.6.3.1.10 Intra-band inter-frequency asynchronous DAPS handover test in SA for FR1

#### A.6.3.1.10.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency asynchronous DAPS handover requirements specified in clause 6.1.3.2.

#### A.6.3.1.10.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.10.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.10.2-2, and A.6.3.1.10.2-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. The UE shall be configured with periodic CSI reporting for cell1. The test scenario comprises of two carriers and one cell on each carrier. Gap pattern ID gp0 as specified in Table 9.1.2-1 is configured before T2 in the test case.

Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC message implying DAPS handover to the UE.

T3 is defined as the end of the last TTI containing the RRC message implying DAPS handover. During T3 UE shall be able to perform random access to cell 2. Cell 1 is continuously scheduled in DL during T3. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH

procedure in cell 2, except preamble transmission. At the end of T3 cell 2 shall send an RRC message implying cell 1 release command.

T4 is defined as the end of the last TTI containing the RRC message implying DAPS handover. Cell 2 is continuously scheduled in DL during T4. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

**Table A.6.3.1.10.2-1: Intra-band inter-frequency asynchronous DAPS handover in SA for FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.1.10.2-2: General test parameters for intra-band inter-frequency asynchronous DAPS handover test in SA for FR1**

| Parameter                  | Unit              | Value                        | Comment  |
|----------------------------|-------------------|------------------------------|--|
| Initial conditions         | Active cell       | Cell 1                       |  |
|                            | Neighbouring cell | Cell 2                       |  |
| Final condition            | Active cell       | Cell 2                       |  |
| A3-Offset                  | dB                | 0                            |  |
| Hysteresis                 | dB                | 0                            |  |
| Time To Trigger            | s                 | 0                            |  |
| Filter coefficient         |                   | 0                            | L3 filtering is not used   |
| Access Barring Information | -                 | Not Sent                     | No additional delays in random access procedure.                         |
| Time offset between cells  |                   | 10 $\mu$ s                   | Asynchronous cells   |
| T1                         | s                 | 5                            |  |
| T2                         | s                 | $\leq 5$                     |  |
| T3                         | s                 | 1                            |  |
| T4                         | ms                | $10 + T_{\text{interrupt}2}$ | $T_{\text{interrupt}2}$ is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5 |
| T5                         | ms                | 100                          |  |

**Table A.6.3.1.10.2-3: Cell specific test parameters for intra-band inter-frequency asynchronous DAPS handover test in SA for FR1**

| Parameter                                |                  | Unit      | Cell 1                      |    |    |    |      | Cell 2 |    |    |    |    |
|--|------------------|-----------|-----------------------------|----|----|----|------|--------|----|----|----|----|
|  |                  |           | T1                          | T2 | T3 | T4 | T5   | T1     | T2 | T3 | T4 | T5 |
| NR RF Channel Number                     |                  |           | 1                           |    |    |    |      | 2      |    |    |    |    |
| Duplex mode                              | Config 1         |           | FDD                         |    |    |    |      |        |    |    |    |    |
|  | Config 2,3       |           | TDD                         |    |    |    |      |        |    |    |    |    |
| TDD configuration                        | Config 1         |           | Not Applicable              |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | TDDConf.1.1                 |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | TDDConf.2.1                 |    |    |    |      |        |    |    |    |    |
| BW <sub>channel</sub>                    | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |    |    |    |      |        |    |    |    |    |
| BWP BW                                   | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |    |    |    |      |        |    |    |    |    |
| DRx Cycle                                |                  | ms        | Not Applicable              |    |    |    |      |        |    |    |    |    |
| PDSCH Reference measurement channel      | Config 1         |           | SR.1.1 FDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | SR.1.1 TDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | SR2.1 TDD                   |    |    |    |      |        |    |    |    |    |
| CORESET Reference Channel                | Config 1         |           | CR.1.1 FDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | CR.1.1 TDD                  |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | CR2.1 TDD                   |    |    |    |      |        |    |    |    |    |
| TRS configuration                        | Config 1         |           | TRS.1.1 FDD                 |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | TRS.1.1 TDD                 |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | TRS.1.2 TDD                 |    |    |    |      |        |    |    |    |    |
| OCNG Patterns                            |                  |           | OP.1                        |    |    |    |      |        |    |    |    |    |
| CSI-RS configuration for CSI reporting   | Config 1         |           | CSI-RS.1.1 FDD              |    |    |    |      |        |    |    |    |    |
|  | Config 2         |           | CSI-RS.1.1 TDD              |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | CSI-RS.2.1 TDD              |    |    |    |      |        |    |    |    |    |
| SMTC Configuration                       |                  |           | SMTC.1                      |    |    |    |      |        |    |    |    |    |
| SSB Configuration                        | Config 1,2       |           | SSB.1 FR1                   |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | SSB.2 FR1                   |    |    |    |      |        |    |    |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 30 kHz                      |    |    |    |      |        |    |    |    |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | 30 kHz                      |    |    |    |      |        |    |    |    |    |
| PRACH configuration                      |                  |           | FR1 PRACH configuration 1   |    |    |    |      |        |    |    |    |    |
| BWP configuration                        | Initial DL BWP   |           | DLBWP.0.1                   |    |    |    |      |        |    |    |    |    |
|  | Dedicated DL BWP |           | DLBWP.1.1                   |    |    |    |      |        |    |    |    |    |
|  | Initial UL BWP   |           | ULBWP.0.1                   |    |    |    |      |        |    |    |    |    |
|  | Dedicated UL BWP |           | ULBWP.1.1                   |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PSS to SSS                 |                  | dB        | 0                           |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH             |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |           |                             |    |    |    |      |        |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |           |                             |    |    |    |      |        |    |    |    |    |
| $N_{oc}^{Note2}$                         |                  | dBm/15kHz | -98                         |    |    |    |      |        |    |    |    |    |
| $N_{oc}^{Note2}$                         | Config 1,2       | dBm/SCS   | -98                         |    |    |    |      |        |    |    |    |    |
|  | Config 3         |           | -95                         |    |    |    |      |        |    |    |    |    |
| $\hat{E}_s / I_{ot}$                     |                  | dB        | 8                           | 8  | 8  | 8  | 8    | -      | 8  | 8  | 8  | 8  |
|  |                  |           |                             |    |    |    | Infi |        |    |    |    |    |
|  |                  |           |                             |    |    |    | nity |        |    |    |    |    |

|                                 |            |  |                |                |                |                |                |                       |                |                |                |                |
|---------------------------------|------------|--|----------------|----------------|----------------|----------------|----------------|-----------------------|----------------|----------------|----------------|----------------|
| $\hat{E}_s / N_{oc}$            |            | dB   | 8              | 8              | 8              | 8              | 8              | -<br>Infi<br>nit<br>y | 8              | 8              | 8              | 8              |
| SSB_RP                          | Config 1,2 | dBm/SCS  | -<br>90        | -<br>90        | -<br>90        | -<br>90        | -<br>90        | -<br>Infi<br>nit<br>y | -<br>90        | -<br>90        | -<br>90        | -<br>90        |
|                                 | Config 3   | dBm/SCS  | -<br>87        | -<br>87        | -<br>87        | -<br>87        | -<br>87        | -<br>Infi<br>nit<br>y | -<br>87        | -<br>87        | -<br>87        | -<br>87        |
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2 | dBm/<br>9.36MHz  | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>70.<br>05        | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 | -<br>61.<br>41 |
|                                 | Config 3   | dBm/<br>38.16MHz   | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>63.<br>94        | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 | -<br>55.<br>31 |
| Propagation condition           |            | -  | AWGN           |                |                |                |                | AWGN                  |                |                |                |                |
| Note 1:                         |            | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                |                |                |                |                |                       |                |                |                |                |
| Note 2:                         |            | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                |                |                |                |                |                       |                |                |                |                |
| Note 3:                         |            | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                |                |                |                |                |                       |                |                |                |                |

### A.6.3.1.10.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

During T3 UE is allowed to cause T<sub>interrupt1</sub> interruption to cell 1. T<sub>interrupt1</sub> is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause T<sub>interrupt2</sub> interruption to cell 1. T<sub>interrupt2</sub> is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

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

### A.6.3.1.11 Inter-band inter-frequency synchronous DAPS handover from FR1 to FR1

#### A.6.3.1.11.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR1 inter-band inter-frequency synchronous DAPS handover requirements specified in clause 6.1.3.2.

#### A.6.3.1.11.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.11.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.11.2-2, A.6.3.1.11.2-3 and A.6.3.1.11.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A3 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0). Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC message implying DAPS handover to the UE.



The start of T3 is the instant when the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) is sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the last TTI containing the RRC message implying source cell release is sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.6.3.1.11.2-1: Inter-band inter-frequency synchronous DAPS handover from FR1 to FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 5      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 7      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 9      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.1.11.2-2: General test parameters for inter-band inter-frequency synchronous DAPS handover from FR1 to FR1**

| Parameter                  | Unit              | Value                      | Comment   |
|----------------------------|-------------------|----------------------------|---|
| Initial conditions         | Active cell       | Cell 1                     | PCell on RF channel number 1  |
|                            | Neighbouring cell | Cell 2                     | Neighbour cell on RF channel number 2   |
| Final condition            | Active cell       | Cell 2                     | PCell on RF channel number 2  |
|                            | Neighbouring cell | Cell 1                     | Neighbour cell on RF channel number 1   |
| A3-Offset                  | dB                | -6                         |   |
| Hysteresis                 | dB                | 0                          |   |
| Time To Trigger            | s                 | 0                          |   |
| Filter coefficient         |                   | 0                          | L3 filtering is not used  |
| Access Barring Information | -                 | Not Sent                   | No additional delays in random access procedure.                                |
| Time offset between cells  | µs                | 33                         | Synchronous cells   |
| DRX                        |                   | OFF                        |   |
| Measurement gap pattern Id |                   | #0                         | Gaps are configured before T2.  |
| T1                         | s                 | 5                          |   |
| T2                         | s                 | <5                         |   |
| T3                         | s                 | <0.5                       |   |
| T4                         | ms                | 10+T <sub>interrupt2</sub> | T <sub>interrupt2</sub> as defined in Table 6.1.3.2.2-6 for synchronous DAPS HO |
| T5                         | ms                | 100                        |   |

**Table A.6.3.1.11.2-3: Cell specific test parameters for inter-band inter-frequency synchronous DAPS handover from FR1 to FR1 (Cell 1)**

| Parameter                                |                    | Unit      | Cell 1                      |     |     |     |     |
|--|--------------------|-----------|-----------------------------|-----|-----|-----|-----|
|  |                    |           | T1                          | T2  | T3  | T4  | T5  |
| NR RF Channel Number                     |                    |           | 1                           |     |     |     |     |
| Duplex mode                              | Config 1,4,7       |           | FDD                         |     |     |     |     |
|  | Config 2,3,5,6,8,9 |           | TDD                         |     |     |     |     |
| TDD configuration                        | Config 1,4,7       |           | Not Applicable              |     |     |     |     |
|  | Config 2,5,8       |           | TDDConf.1.1                 |     |     |     |     |
|  | Config 3,6,9       |           | TDDConf.2.1                 |     |     |     |     |
| BW <sub>channel</sub>                    | Config 1,4,7       | MHz       | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 2,5,8       |           | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 3,6,9       |           | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| BWP BW                                   | Config 1,4,7       | MHz       | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 2,5,8       |           | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 3,6,9       |           | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| TRS configuration                        | Config 1,4,7       |           | TRS.1.1 FDD                 |     |     |     |     |
|  | Config 2,5,8       |           | TRS.1.1 TDD                 |     |     |     |     |
|  | Config 3,6,9       |           | TRS.1.2 TDD                 |     |     |     |     |
| DRX Cycle                                |                    | ms        | Not Applicable              |     |     |     |     |
| PDSCH Reference measurement channel      | Config 1,4,7       |           | SR.1.1 FDD                  |     |     |     |     |
|  | Config 2,5,8       |           | SR.1.1 TDD                  |     |     |     |     |
|  | Config 3,6,9       |           | SR2.1 TDD                   |     |     |     |     |
| CORESET Reference Channel                | Config 1,4,7       |           | CR.1.1 FDD                  |     |     |     |     |
|  | Config 2,5,8       |           | CR.1.1 TDD                  |     |     |     |     |
|  | Config 3,6,9       |           | CR2.1 TDD                   |     |     |     |     |
| OCNG Patterns                            |                    |           | OCNG pattern 1              |     |     |     |     |
| CSI-RS configuration for CSI reporting   | Config 1,4,7       |           | CSI-RS.1.1 FDD              |     |     |     |     |
|  | Config 2,5,8       |           | CSI-RS.1.1 TDD              |     |     |     |     |
|  | Config 3,6,9       |           | CSI-RS.2.1 TDD              |     |     |     |     |
| SMTTC Configuration                      |                    |           | SMTTC pattern 1             |     |     |     |     |
| SSB Configuration                        | Config 1,2,4,5,7,8 |           | SSB.1 FR1                   |     |     |     |     |
|  | Config 3,6,9       |           | SSB.2 FR1                   |     |     |     |     |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5,7,8 | kHz       | 15 kHz                      |     |     |     |     |
|  | Config 3,6,9       |           | 30 kHz                      |     |     |     |     |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2,4,5,7,8 | kHz       | 15 kHz                      |     |     |     |     |
|  | Config 3,6,9       |           | 30 kHz                      |     |     |     |     |
| PRACH configuration                      |                    |           | FR1 PRACH configuration 2   |     |     |     |     |
| BWP                                      | Initial DL BWP     |           | DLBWP.0.1                   |     |     |     |     |
|  | Dedicated DL BWP   |           | DLBWP.1.3                   |     |     |     |     |
|  | Initial UL BWP     |           | ULBWP.0.1                   |     |     |     |     |
|  | Dedicated UL BWP   |           | ULBWP.1.3                   |     |     |     |     |
| EPRE ratio of PSS to SSS                 |                    | dB        | 0                           |     |     |     |     |
| EPRE ratio of PBCH DMRS to SSS           |                    |           |                             |     |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS          |                    |           |                             |     |     |     |     |
| EPRE ratio of PDCCH DMRS to SSS          |                    |           |                             |     |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS        |                    |           |                             |     |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS          |                    |           |                             |     |     |     |     |
| EPRE ratio of PDSCH to PDSCH             |                    |           |                             |     |     |     |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |           |                             |     |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                    |           |                             |     |     |     |     |
| $N_{oc}^{Note2}$                         |                    | dBm/15kHz | -98                         | -98 | -98 | -98 | -98 |
| $N_{oc}^{Note2}$                         | Config 1,2,4,5,7,8 | dBm/SCS   | -98                         | -98 | -98 | -98 | -98 |
|  | Config 3,6,9       |           | -95                         | -95 | -95 | -95 | -95 |
| $\hat{E}_s / I_{ot}$                     |                    | dB        | 4                           | 4   | 4   | 4   | 4   |
| $\hat{E}_s / N_{oc}$                     |                    | dB        | 4                           | 4   | 4   | 4   | 4   |

|   |                    |                  |        |        |        |        |        |
|---|--------------------|------------------|--------|--------|--------|--------|--------|
| SSB_RP  | Config 1,2,4,5,7,8 | dBm/SCS          | -94    | -94    | -94    | -94    | -94    |
|   | Config 3,6,9       | dBm/SCS          | -91    | -91    | -91    | -91    | -91    |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1,2,4,5,7,8 | dBm/<br>9.36MHz  | -64.59 | -64.59 | -64.59 | -64.59 | -64.59 |
|   | Config 3,6,9       | dBm/<br>38.16MHz | -58.49 | -58.49 | -58.49 | -58.49 | -58.49 |
| Propagation condition   |                    | -                | AWGN   |        |        |        |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                    |                  |        |        |        |        |        |

**Table A.6.3.1.11.2-4: Cell specific test parameters for inter-band inter-frequency synchronous DAPS handover from FR1 to FR1 (Cell 2)**

| Parameter                                |                    | Unit           | Cell 2                      |     |     |     |     |
|--|--------------------|----------------|-----------------------------|-----|-----|-----|-----|
|  |                    |                | T1                          | T2  | T3  | T4  | T5  |
| NR RF Channel Number                     |                    |                | 2                           |     |     |     |     |
| Duplex mode                              | Config 1,2,3       |                | FDD                         |     |     |     |     |
|  | Config 4,5,6,7,8,9 |                | TDD                         |     |     |     |     |
| TDD configuration                        | Config 1,2,3       |                | Not Applicable              |     |     |     |     |
|  | Config 4,5,6       |                | TDDConf.1.1                 |     |     |     |     |
|  | Config 7,8,9       |                | TDDConf.2.1                 |     |     |     |     |
| BW <sub>channel</sub>                    | Config 1,2,3       | MHz            | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 4,5,6       |                | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 7,8,9       |                | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| BWP BW                                   | Config 1,2,3       | MHz            | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 4,5,6       |                | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 7,8,9       |                | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| TRS configuration                        | Config 1,2,3       |                | TRS.1.1 FDD                 |     |     |     |     |
|  | Config 4,5,6       |                | TRS.1.1 TDD                 |     |     |     |     |
|  | Config 7,8,9       |                | TRS.1.2 TDD                 |     |     |     |     |
| DRx Cycle                                |                    | ms             | Not Applicable              |     |     |     |     |
| PDSCH Reference measurement channel      | Config 1,2,3       |                | SR.1.1 FDD                  |     |     |     |     |
|  | Config 4,5,6       |                | SR.1.1 TDD                  |     |     |     |     |
|  | Config 7,8,9       |                | SR2.1 TDD                   |     |     |     |     |
| CORESET Reference Channel                | Config 1,2,3       |                | CR.1.1 FDD                  |     |     |     |     |
|  | Config 4,5,6       |                | CR.1.1 TDD                  |     |     |     |     |
|  | Config 7,8,9       |                | CR2.1 TDD                   |     |     |     |     |
| OCNG Patterns                            |                    |                | OCNG pattern 1              |     |     |     |     |
| CSI-RS configuration for CSI reporting   | Config 1,2,3       |                | CSI-RS.1.1 FDD              |     |     |     |     |
|  | Config 4,5,6       |                | CSI-RS.1.1 TDD              |     |     |     |     |
|  | Config 7,8,9       |                | CSI-RS.2.1 TDD              |     |     |     |     |
| SMTC Configuration                       |                    |                | SMTC pattern 1              |     |     |     |     |
| SSB Configuration                        | Config 1,2,3,4,5,6 |                | SSB.1 FR1                   |     |     |     |     |
|  | Config 7,8,9       |                | SSB.2 FR1                   |     |     |     |     |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,3,4,5,6 | kHz            | 15 kHz                      |     |     |     |     |
|  | Config 7,8,9       |                | 30 kHz                      |     |     |     |     |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2,3,4,5,6 | kHz            | 15 kHz                      |     |     |     |     |
|  | Config 7,8,9       |                | 30 kHz                      |     |     |     |     |
| PRACH configuration                      |                    |                | FR1 PRACH configuration 2   |     |     |     |     |
| BWP                                      | Initial DL BWP     |                | DLBWP.0.1                   |     |     |     |     |
|  | Dedicated DL BWP   |                | DLBWP.1.3                   |     |     |     |     |
|  | Initial UL BWP     |                | ULBWP.0.1                   |     |     |     |     |
|  | Dedicated UL BWP   |                | ULBWP.1.3                   |     |     |     |     |
| EPRE ratio of PSS to SSS                 |                    | dB             | 0                           |     |     |     |     |
| EPRE ratio of PBCH DMRS to SSS           |                    |                |                             |     |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS          |                    |                |                             |     |     |     |     |
| EPRE ratio of PDCCH DMRS to SSS          |                    |                |                             |     |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS        |                    |                |                             |     |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS          |                    |                |                             |     |     |     |     |
| EPRE ratio of PDSCH to PDSCH             |                    |                |                             |     |     |     |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |                |                             |     |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                    |                |                             |     |     |     |     |
| $N_{oc}$ <sup>Note2</sup>                |                    | dBm/15kHz<br>z | -98                         | -98 | -98 | -98 | -98 |
| $N_{oc}$ <sup>Note2</sup>                | Config 1,2,3,4,5,6 | dBm/SCS        | -98                         | -98 | -98 | -98 | -98 |
|  | Config 7,8,9       |                | -95                         | -95 | -95 | -95 | -95 |
| $\hat{E}_s / I_{ot}$                     |                    | dB             | -Infinity                   | 4   | 4   | 4   | 4   |
| $\hat{E}_s / N_{oc}$                     |                    | dB             | -Infinity                   | 4   | 4   | 4   | 4   |
| SSB <sub>RP</sub>                        | Config 1,2,3,4,5,6 | dBm/SCS        | -Infinity                   | -94 | -94 | -94 | -94 |
|  | Config 7,8,9       | dBm/SCS        | -Infinity                   | -91 | -91 | -91 | -91 |

|                                 |  |                  |        |        |        |        |        |
|---------------------------------|--|------------------|--------|--------|--------|--------|--------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2,3,4,5,6   | dBm/<br>9.36MHz  | -70.05 | -64.59 | -64.59 | -64.59 | -64.59 |
|                                 | Config 7,8,9   | dBm/<br>38.16MHz | -63.94 | -58.49 | -58.49 | -58.49 | -58.49 |
| Propagation condition           |  | -                | AWGN   |        |        |        |        |
| Note 1:                         | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                  |        |        |        |        |        |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |        |        |        |
| Note 3:                         | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |        |        |        |        |        |

### A.6.3.1.11.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3. During  $D_{handover1}$ , the interruption on Cell 1 shall not exceed  $T_{interrupt1}$  as defined in Table 6.1.3.2.2-3 for synchronous DAPS HO.

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

NOTE: The handover delay  $D_{handover1}$  can be expressed as:  $T_{RRC\_procedure} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$ , where:

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{IU} = 20$  ms in the test.  $T_{IU}$  is defined in clause 6.1.1.2.2.

$T_{\Delta} = 20$  ms in the test.  $T_{\Delta}$  is defined in clause 6.1.1.2.2.

$T_{processing} = 20$  ms in the test.  $T_{processing}$  is defined in clause 6.1.1.2.2.

$T_{margin} = 2$  ms in the test.  $T_{margin}$  is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than  $(10 \text{ ms} + T_{interrupt2})$  from the beginning of time period T4. During  $D_{handover2}$ , the interruption on Cell 2 shall not exceed  $T_{interrupt2}$  as defined in Table 6.1.3.2.2-6 for synchronous DAPS HO.

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

NOTE: The handover delay  $D_{handover2}$  can be expressed as:  $T_{RRC\_procedure} + T_{interrupt2}$ , where:

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

## A.6.3.1.12 Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1

### A.6.3.1.12.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR1 inter-band inter-frequency asynchronous DAPS handover requirements specified in clause 6.1.3.2.

### A.6.3.1.12.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.12.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.12.2-2, A.6.3.1.12.2-3 and A.6.3.1.12.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A3 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0).

Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) is sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the last TTI containing the RRC message implying source cell release is sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.6.3.1.12.2-1: Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 5      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 7      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 9      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.6.3.1.12.2-2: General test parameters for inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1**

| Parameter                  | Unit              | Value                      | Comment   |
|----------------------------|-------------------|----------------------------|---|
| Initial conditions         | Active cell       |                            | Cell 1  |
|                            | Neighbouring cell |                            | Cell 2  |
| Final condition            | Active cell       |                            | Cell 2  |
| A3-Offset                  | dB                | -4                         |   |
| Hysteresis                 | dB                | 0                          |   |
| Time To Trigger            | s                 | 0                          |   |
| Filter coefficient         |                   | 0                          | L3 filtering is not used  |
| Access Barring Information | -                 | Not Sent                   | No additional delays in random access procedure.                                  |
| Time offset between cells  | Config 1,2,4,5    | ms                         | 0.5   |
|                            | Config3,6,7,8,9   | ms                         | 0.25  |
| DRX                        |                   | OFF                        |   |
| Measurement gap pattern Id |                   | #0                         | Gaps are configured before T2.  |
| T1                         | s                 | 5                          |   |
| T2                         | s                 | <5                         |   |
| T3                         | s                 | <0.5                       |   |
| T4                         | ms                | 10+T <sub>interrupt2</sub> | T <sub>interrupt2</sub> as defined in Table 6.1.3.2.2-6 for asynchronous DAPS HO. |
| T5                         | ms                | 100                        |   |

**Table A.6.3.1.12.2-3: Cell specific test parameters for inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1 (Cell 1)**



| Parameter                                |                    | Unit      | Cell 1                      |     |     |     |     |
|--|--------------------|-----------|-----------------------------|-----|-----|-----|-----|
|  |                    |           | T1                          | T2  | T3  | T4  | T5  |
| NR RF Channel Number                     |                    |           | 1                           |     |     |     |     |
| Duplex mode                              | Config 1,4,7       |           | FDD                         |     |     |     |     |
|  | Config 2,3,5,6,8,9 |           | TDD                         |     |     |     |     |
| TDD configuration                        | Config 1,4,7       |           | Not Applicable              |     |     |     |     |
|  | Config 2,5,8       |           | TDDConf.1.1                 |     |     |     |     |
|  | Config 3,6,9       |           | TDDConf.2.1                 |     |     |     |     |
| BW <sub>channel</sub>                    | Config 1,4,7       | MHz       | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 2,5,8       |           | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 3,6,9       |           | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| BWP BW                                   | Config 1,4,7       | MHz       | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 2,5,8       |           | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 3,6,9       |           | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| TRS configuration                        | Config 1,4,7       |           | TRS.1.1 FDD                 |     |     |     |     |
|  | Config 2,5,8       |           | TRS.1.1 TDD                 |     |     |     |     |
|  | Config 3,6,9       |           | TRS.1.2 TDD                 |     |     |     |     |
| DRX Cycle                                |                    | ms        | Not Applicable              |     |     |     |     |
| PDSCH Reference measurement channel      | Config 1,4,7       |           | SR.1.1 FDD                  |     |     |     |     |
|  | Config 2,5,8       |           | SR.1.1 TDD                  |     |     |     |     |
|  | Config 3,6,9       |           | SR2.1 TDD                   |     |     |     |     |
| CORESET Reference Channel                | Config 1,4,7       |           | CR.1.1 FDD                  |     |     |     |     |
|  | Config 2,5,8       |           | CR.1.1 TDD                  |     |     |     |     |
|  | Config 3,6,9       |           | CR2.1 TDD                   |     |     |     |     |
| OCNG Patterns                            |                    |           | OCNG pattern 1              |     |     |     |     |
| CSI-RS configuration for CSI reporting   | Config 1,4,7       |           | CSI-RS.1.1 FDD              |     |     |     |     |
|  | Config 2,5,8       |           | CSI-RS.1.1 TDD              |     |     |     |     |
|  | Config 3,6,9       |           | CSI-RS.2.1 TDD              |     |     |     |     |
| SMTC Configuration                       |                    |           | SMTC pattern 1              |     |     |     |     |
| SSB Configuration                        | Config 1,2,4,5,7,8 |           | SSB.1 FR1                   |     |     |     |     |
|  | Config 3,6,9       |           | SSB.2 FR1                   |     |     |     |     |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5,7,8 | kHz       | 15 kHz                      |     |     |     |     |
|  | Config 3,6,9       |           | 30 kHz                      |     |     |     |     |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2,4,5,7,8 | kHz       | 15 kHz                      |     |     |     |     |
|  | Config 3,6,9       |           | 30 kHz                      |     |     |     |     |
| PRACH configuration                      |                    |           | FR1 PRACH configuration 2   |     |     |     |     |
| BWP                                      | Initial DL BWP     |           | DLBWP.0.1                   |     |     |     |     |
|  | Dedicated DL BWP   |           | DLBWP.1.3                   |     |     |     |     |
|  | Initial UL BWP     |           | ULBWP.0.1                   |     |     |     |     |
|  | Dedicated UL BWP   |           | ULBWP.1.3                   |     |     |     |     |
| EPRE ratio of PSS to SSS                 |                    | dB        | 0                           |     |     |     |     |
| EPRE ratio of PBCH DMRS to SSS           |                    |           |                             |     |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS          |                    |           |                             |     |     |     |     |
| EPRE ratio of PDCCH DMRS to SSS          |                    |           |                             |     |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS        |                    |           |                             |     |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS          |                    |           |                             |     |     |     |     |
| EPRE ratio of PDSCH to PDSCH             |                    |           |                             |     |     |     |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |           |                             |     |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                    |           |                             |     |     |     |     |
| N <sub>oc</sub> Note2                    |                    | dBm/15kHz | -98                         | -98 | -98 | -98 | -98 |
| N <sub>oc</sub> Note2                    | Config 1,2,4,5,7,8 | dBm/SCS   | -98                         | -98 | -98 | -98 | -98 |
|  | Config 3,6,9       |           | -95                         | -95 | -95 | -95 | -95 |
| $\hat{E}_s / I_{ot}$                     |                    | dB        | 4                           | 4   | 4   | 4   | 4   |
| $\hat{E}_s / N_{oc}$                     |                    | dB        | 4                           | 4   | 4   | 4   | 4   |
| SSB_RP                                   | Config 1,2,4,5,7,8 | dBm/SCS   | -94                         | -94 | -94 | -94 | -94 |

|   |                    |                  |        |        |        |        |        |
|---|--------------------|------------------|--------|--------|--------|--------|--------|
|   | Config 3,6,9       | dBm/SCS          | -91    | -91    | -91    | -91    | -91    |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1,2,4,5,7,8 | dBm/<br>9.36MHz  | -64.59 | -64.59 | -64.59 | -64.59 | -64.59 |
|   | Config 3,6,9       | dBm/<br>38.16MHz | -58.49 | -58.49 | -58.49 | -58.49 | -58.49 |
| Propagation condition   |                    | -                | AWGN   |        |        |        |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                    |                  |        |        |        |        |        |

**Table A.6.3.1.12.2-4: Cell specific test parameters for inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1 (Cell 2)**

| Parameter | Unit | Cell 2 |    |    |    |    |
|-----------|------|--------|----|----|----|----|
|           |      | T1     | T2 | T3 | T4 | T5 |
|           |      |        |    |    |    |    |

|  |                    |                        |                             |     |     |     |     |
|--|--------------------|------------------------|-----------------------------|-----|-----|-----|-----|
| NR RF Channel Number                     |                    |                        | 2                           |     |     |     |     |
| Duplex mode                              | Config 1,2,3       |                        | FDD                         |     |     |     |     |
|  | Config 4,5,6,7,8,9 |                        | TDD                         |     |     |     |     |
| TDD configuration                        | Config 1,2,3       |                        | Not Applicable              |     |     |     |     |
|  | Config 4,5,6       |                        | TDDConf.1.1                 |     |     |     |     |
|  | Config 7,8,9       |                        | TDDConf.2.1                 |     |     |     |     |
| BW <sub>channel</sub>                    | Config 1,2,3       | MHz                    | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 4,5,6       |                        | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 7,8,9       |                        | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| BWP BW                                   | Config 1,2,3       | MHz                    | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 4,5,6       |                        | 10: N <sub>RB,c</sub> = 52  |     |     |     |     |
|  | Config 7,8,9       |                        | 40: N <sub>RB,c</sub> = 106 |     |     |     |     |
| TRS configuration                        | Config 1,2,3       |                        | TRS.1.1 FDD                 |     |     |     |     |
|  | Config 4,5,6       |                        | TRS.1.1 TDD                 |     |     |     |     |
|  | Config 7,8,9       |                        | TRS.1.2 TDD                 |     |     |     |     |
| DRx Cycle                                |                    | ms                     | Not Applicable              |     |     |     |     |
| PDSCH Reference measurement channel      | Config 1,2,3       |                        | SR.1.1 FDD                  |     |     |     |     |
|  | Config 4,5,6       |                        | SR.1.1 TDD                  |     |     |     |     |
|  | Config 7,8,9       |                        | SR2.1 TDD                   |     |     |     |     |
| CORESET Reference Channel                | Config 1,2,3       |                        | CR.1.1 FDD                  |     |     |     |     |
|  | Config 4,5,6       |                        | CR.1.1 TDD                  |     |     |     |     |
|  | Config 7,8,9       |                        | CR2.1 TDD                   |     |     |     |     |
| OCNG Patterns                            |                    |                        | OCNG pattern 1              |     |     |     |     |
| CSI-RS configuration for CSI reporting   | Config 1,2,3       |                        | CSI-RS.1.1 FDD              |     |     |     |     |
|  | Config 4,5,6       |                        | CSI-RS.1.1 TDD              |     |     |     |     |
|  | Config 7,8,9       |                        | CSI-RS.2.1 TDD              |     |     |     |     |
| SMTc Configuration                       |                    |                        | SMTc pattern 1              |     |     |     |     |
| SSB Configuration                        | Config 1,2,3,4,5,6 |                        | SSB.1 FR1                   |     |     |     |     |
|  | Config 7,8,9       |                        | SSB.2 FR1                   |     |     |     |     |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,3,4,5,6 | kHz                    | 15 kHz                      |     |     |     |     |
|  | Config 7,8,9       |                        | 30 kHz                      |     |     |     |     |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2,3,4,5,6 | kHz                    | 15 kHz                      |     |     |     |     |
|  | Config 7,8,9       |                        | 30 kHz                      |     |     |     |     |
| PRACH configuration                      |                    |                        | FR1 PRACH configuration 2   |     |     |     |     |
| BWP                                      | Initial DL BWP     |                        | DLBWP.0.1                   |     |     |     |     |
|  | Dedicated DL BWP   |                        | DLBWP.1.3                   |     |     |     |     |
|  | Initial UL BWP     |                        | ULBWP.0.1                   |     |     |     |     |
|  | Dedicated UL BWP   |                        | ULBWP.1.3                   |     |     |     |     |
| EPRE ratio of PSS to SSS                 |                    | dB                     | 0                           |     |     |     |     |
| EPRE ratio of PBCH DMRS to SSS           |                    |                        |                             |     |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS          |                    |                        |                             |     |     |     |     |
| EPRE ratio of PDCCH DMRS to SSS          |                    |                        |                             |     |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS        |                    |                        |                             |     |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS          |                    |                        |                             |     |     |     |     |
| EPRE ratio of PDSCH to PDSCH             |                    |                        |                             |     |     |     |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |                        |                             |     |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                    |                        |                             |     |     |     |     |
| $N_{oc}$ Note2                           |                    | dBm/15kHz <sub>z</sub> | -98                         | -98 | -98 | -98 | -98 |
| $N_{oc}$ Note2                           | Config 1,2,3,4,5,6 | dBm/SCS                | -98                         | -98 | -98 | -98 | -98 |
|  | Config 7,8,9       |                        | -95                         | -95 | -95 | -95 | -95 |
| $\hat{E}_s / I_{ot}$                     |                    | dB                     | -Infinity                   | 4   | 4   | 4   | 4   |
| $\hat{E}_s / N_{oc}$                     |                    | dB                     | -Infinity                   | 4   | 4   | 4   | 4   |
| SSB <sub>RP</sub>                        | Config 1,2,3,4,5,6 | dBm/SCS                | -Infinity                   | -94 | -94 | -94 | -94 |
|  | Config 7,8,9       | dBm/SCS                | -Infinity                   | -91 | -91 | -91 | -91 |

|                                 |  |                  |        |        |        |        |        |
|---------------------------------|--|------------------|--------|--------|--------|--------|--------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2,3,4,5,6   | dBm/<br>9.36MHz  | -70.05 | -64.59 | -64.59 | -64.59 | -64.59 |
|                                 | Config 7,8,9   | dBm/<br>38.16MHz | -63.94 | -58.49 | -58.49 | -58.49 | -58.49 |
| Propagation condition           |  | -                | AWGN   |        |        |        |        |
| Note 1:                         | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                  |        |        |        |        |        |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |        |        |        |
| Note 3:                         | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |        |        |        |        |        |

### A.6.3.1.12.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3. During  $D_{handover1}$ , the interruption on Cell 1 shall not exceed  $T_{interrupt1}$  as defined in Table 6.1.3.2.2-3 for asynchronous DAPS HO.

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

NOTE: The handover delay  $D_{handover1}$  can be expressed as:  $T_{RRC\_procedure} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$ , where:

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{IU} = 20$  ms in the test.  $T_{IU}$  is defined in clause 6.1.1.2.2.

$T_{\Delta} = 20$  ms in the test.  $T_{\Delta}$  is defined in clause 6.1.1.2.2.

$T_{processing} = 20$  ms in the test.  $T_{processing}$  is defined in clause 6.1.1.2.2.

$T_{margin} = 2$  ms in the test.  $T_{margin}$  is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than  $(10 \text{ ms} + T_{interrupt2})$  from the beginning of time period T4. During  $D_{handover2}$ , the interruption on Cell 2 shall not exceed  $T_{interrupt2}$  as defined in Table 6.1.3.2.2-6 for asynchronous DAPS HO.

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

NOTE: The handover delay  $D_{handover2}$  can be expressed as:  $T_{RRC\_procedure} + T_{interrupt2}$ , where:

$T_{RRC\_procedure} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

## A.6.3.2 RRC Connection Mobility Control

### A.6.3.2.1 SA: RRC Re-establishment

#### A.6.3.2.1.1 Intra-frequency RRC Re-establishment in FR1

##### A.6.3.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.1.1-1, table A.6.3.2.1.1.1-2 and table A.6.3.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

**Table A.6.3.2.1.1.1-1: Supported test configurations**

| Configuration   | Description                                       |
|---|---|
| 1   | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2   | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3   | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.6.3.2.1.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter                  |                 | Unit | Test configuration | Value                     | Comment  |
|----------------------------|-----------------|------|--------------------|---------------------------|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell1                     |  |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2                     |  |
| Final condition            | Active cell     |      | 1, 2, 3            | Cell2                     |  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1                         |  |
| Time offset between cells  |                 |      | 1                  | 3 ms                      | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s                 | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s                 | Synchronous cells  |
| N310                       |                 | -    | 1, 2, 3            | 1                         | Maximum consecutive out-of-sync indications from lower layers  |
| N311                       |                 | -    | 1, 2, 3            | 1                         | Minimum consecutive in-sync indications from lower layers  |
| T310                       |                 | ms   | 1, 2, 3            | 0                         | Radio link failure timer;  |
| T311                       |                 | ms   | 1, 2, 3            | 3000                      | RRC re-establishment timer   |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent                  | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | SSB.1 FR1                 |  |
|                            |                 |      | 2                  | SSB.1 FR1                 |  |
|                            |                 |      | 3                  | SSB.2 FR1                 |  |
| SMTC configuration         |                 |      | 1                  | SMTC.2                    |  |
|                            |                 |      | 2                  | SMTC.1                    |  |
|                            |                 |      | 3                  | SMTC.1                    |  |
| DRX cycle length           |                 | s    | 1, 2, 3            | OFF                       |  |
| PRACH configuration        |                 |      | 1, 2, 3            | FR1 PRACH configuration 1 | Table A.3.8.2.1-1  |
| T1                         |                 | s    | 1, 2, 3            | 5                         |  |
| T2                         |                 | ms   | 1, 2, 3            | 240                       | Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 ) |
| T3                         |                 | s    | 1, 2, 3            | 2                         |  |

**Table A.6.3.2.1.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter                           | Unit          | Test configuration | Cell 1                  |           |           | Cell 2                  |        |            |
|-------------------------------------|---------------|--------------------|-------------------------|-----------|-----------|-------------------------|--------|------------|
|                                     |               |                    | T1                      | T2        | T3        | T1                      | T2     | T3         |
| TDD configuration                   |               | 1                  | N/A                     |           |           | N/A                     |        |            |
|                                     |               | 2                  | TDDConf.1.1             |           |           | TDDConf.1.1             |        |            |
|                                     |               | 3                  | TDDConf.2.1             |           |           | TDDConf.2.1             |        |            |
| PDSCH RMC configuration             |               | 1                  | SR.1.1 FDD              |           |           | SR.1.1 FDD              |        |            |
|                                     |               | 2                  | SR.1.1 TDD              |           |           | SR.1.1 TDD              |        |            |
|                                     |               | 3                  | SR.2.1 TDD              |           |           | SR.2.1 TDD              |        |            |
| RMSI CORESET RMC configuration      |               | 1                  | CR.1.1 FDD              |           |           | CR.1.1 FDD              |        |            |
|                                     |               | 2                  | CR.1.1 TDD              |           |           | CR.1.1 TDD              |        |            |
|                                     |               | 3                  | CR.2.1 TDD              |           |           | CR.2.1 TDD              |        |            |
| Dedicated CORESET RMC configuration |               | 1                  | CCR.1.1 FDD             |           |           | CCR.1.1 FDD             |        |            |
|                                     |               | 2                  | CCR.1.1 TDD             |           |           | CCR.1.1 TDD             |        |            |
|                                     |               | 3                  | CCR.2.1 TDD             |           |           | CCR.2.1 TDD             |        |            |
| OCNG Pattern                        |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |           |           | OP.1 defined in A.3.2.1 |        |            |
| TRS configuration                   |               | 1                  | TRS.1.1 FDD             |           |           | TRS.1.1 FDD             |        |            |
|                                     |               | 2                  | TRS.1.1 TDD             |           |           | TRS.1.1 TDD             |        |            |
|                                     |               | 3                  | TRS.1.2 TDD             |           |           | TRS.1.2 TDD             |        |            |
| Initial DL BWP configuration        |               | 1, 2, 3            | DLBWP.0.1               |           |           | DLBWP.0.1               |        |            |
| Initial UL BWP configuration        |               | 1, 2, 3            | ULBWP.0.1               |           |           | ULBWP.0.1               |        |            |
| Active DL BWP configuration         |               | 1, 2, 3            | DLBWP.1.1               | N/A       | N/A       | N/A                     | N/A    | DLBW P.1.1 |
| Active UL BWP configuration         |               | 1, 2, 3            | ULBWP.1.1               | N/A       | N/A       | N/A                     | N/A    | ULBW P.1.1 |
| RLM-RS                              |               | 1, 2, 3            | SSB                     |           |           | SSB                     |        |            |
| $\hat{E}_s / I_{ot}$                | dB            | 1                  | 1.54                    | -infinity | -infinity | -3.79                   | 4      | 4          |
|                                     |               | 2                  |                         |           |           |                         |        |            |
|                                     |               | 3                  |                         |           |           |                         |        |            |
| $N_{oc}$ Note2                      | dBm/SCS       | 1                  | -98                     |           |           |                         |        |            |
|                                     |               | 2                  | -98                     |           |           |                         |        |            |
|                                     |               | 3                  | -95                     |           |           |                         |        |            |
| $N_{oc}$ Note2                      | dBm/15 kHz    | 1                  | -98                     |           |           |                         |        |            |
|                                     |               | 2                  |                         |           |           |                         |        |            |
|                                     |               | 3                  |                         |           |           |                         |        |            |
| $\hat{E}_s / N_{oc}$                | dB            | 1                  | 7                       | -infinity | -infinity | 4                       | 4      | 4          |
|                                     |               | 2                  |                         |           |           |                         |        |            |
|                                     |               | 3                  |                         |           |           |                         |        |            |
| SS-RSRP Note3                       | dBm/SCS       | 1                  | -91                     | -infinity | -infinity | -94                     | -94    | -94        |
|                                     |               | 2                  | -91                     | -infinity | -infinity | -94                     | -94    | -94        |
|                                     |               | 3                  | -88                     | -infinity | -infinity | -91                     | -91    | -91        |
| I <sub>o</sub>                      | dBm/9.36 MHz  | 1                  | -60.74                  | -64.59    | -64.59    | -60.74                  | -64.59 | -64.59     |
|                                     | dBm/9.36 MHz  | 2                  | -60.74                  | -64.59    | -64.59    | -60.74                  | -64.59 | -64.59     |
|                                     | dBm/38.16 MHz | 3                  | -54.65                  | -58.50    | -58.50    | -54.65                  | -58.50 | -58.50     |
| Propagation Condition               |               | 1, 2, 3            | AWGN                    |           |           |                         |        |            |

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{\text{re-establish\_delay}} = T_{\text{UL\_grant}} + T_{\text{UE\_re-establish\_delay}}$$

Where:

$T_{\text{UL\_grant}}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{\text{UL\_grant}}$  is not used.

$$T_{\text{UE\_re-establish\_delay}} = 50 \text{ ms} + T_{\text{identify\_intra\_NR}} + \sum_{i=1}^{N_{\text{freq}}-1} T_{\text{identify\_inter\_NR},i} + T_{\text{SI-NR}} + T_{\text{PRACH}}$$

$$N_{\text{freq}} = 1$$

$$T_{\text{identify\_intra\_NR}} = 200 \text{ ms}$$

$T_{\text{SI}} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

$T_{\text{PRACH}} = 15 \text{ ms}$ ; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms, allow 1.6 s in the test case.

### A.6.3.2.1.2 Inter-frequency RRC Re-establishment in FR1

#### A.6.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.2.1-1, table A.6.3.2.1.2.1-2 and table A.6.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

**Table A.6.3.2.1.2.1-1: Supported test configurations**

| Configuration | Description of serving cell   | Description of target cell                        |
|---------------|---|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |   |



**Table A.6.3.2.1.2.1-2: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter                  |                 | Unit | Test configuration | Value                     | Comment  |
|----------------------------|-----------------|------|--------------------|---------------------------|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell1                     |  |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2                     |  |
| Final condition            | Active cell     |      | 1, 2, 3            | Cell2                     |  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1, 2                      |  |
| Time offset between cells  |                 |      | 1                  | 3 ms                      | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s                 | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s                 | Synchronous cells  |
| N310                       | -               |      | 1, 2, 3            | 1                         | Maximum consecutive out-of-sync indications from lower layers  |
| N311                       | -               |      | 1, 2, 3            | 1                         | Minimum consecutive in-sync indications from lower layers  |
| T310                       | ms              |      | 1, 2, 3            | 0                         | Radio link failure timer;  |
| T311                       | ms              |      | 1, 2, 3            | 5000                      | RRC re-establishment timer   |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent                  | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | SSB.1 FR1                 |  |
|                            |                 |      | 2                  | SSB.1 FR1                 |  |
|                            |                 |      | 3                  | SSB.2 FR1                 |  |
| SMTC configuration         |                 |      | 1                  | SMTC.2                    |  |
|                            |                 |      | 2                  | SMTC.1                    |  |
|                            |                 |      | 3                  | SMTC.1                    |  |
| DRX cycle length           |                 | s    | 1, 2, 3            | OFF                       |  |
| PRACH configuration        |                 |      | 1, 2, 3            | FR1 PRACH configuration 1 | Table A.3.8.2.1-1  |
| T1                         | s               |      | 1, 2, 3            | 5                         |  |
| T2                         | ms              |      | 1, 2, 3            | 240                       | Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 ) |
| T3                         | s               |      | 1, 2, 3            | 5                         |  |

**Table A.6.3.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter  | Unit          | Test configuration | Cell 1                  |           |           | Cell 2                  |           |            |
|--|---------------|--------------------|-------------------------|-----------|-----------|-------------------------|-----------|------------|
|  |               |                    | T1                      | T2        | T3        | T1                      | T2        | T3         |
| RF Channel Number  |               | 1, 2, 3            | 1                       |           |           | 2                       |           |            |
| TDD configuration  |               | 1                  | N/A                     |           |           | N/A                     |           |            |
|  |               | 2                  | TDDConf.1.1             |           |           | TDDConf.1.1             |           |            |
|  |               | 3                  | TDDConf.2.1             |           |           | TDDConf.2.1             |           |            |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD              |           |           | SR.1.1 FDD              |           |            |
|  |               | 2                  | SR.1.1 TDD              |           |           | SR.1.1 TDD              |           |            |
|  |               | 3                  | SR.2.1 TDD              |           |           | SR.2.1 TDD              |           |            |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD              |           |           | CR.1.1 FDD              |           |            |
|  |               | 2                  | CR.1.1 TDD              |           |           | CR.1.1 TDD              |           |            |
|  |               | 3                  | CR.2.1 TDD              |           |           | CR.2.1 TDD              |           |            |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD             |           |           | CCR.1.1 FDD             |           |            |
|  |               | 2                  | CCR.1.1 TDD             |           |           | CCR.1.1 TDD             |           |            |
|  |               | 3                  | CCR.2.1 TDD             |           |           | CCR.2.1 TDD             |           |            |
| OCNG Pattern   |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |           |           | OP.1 defined in A.3.2.1 |           |            |
| TRS configuration  |               | 1                  | TRS.1.1 FDD             |           |           | TRS.1.1 FDD             |           |            |
|  |               | 2                  | TRS.1.1 TDD             |           |           | TRS.1.1 TDD             |           |            |
|  |               | 3                  | TRS.1.2 TDD             |           |           | TRS.1.2 TDD             |           |            |
| Initial DL BWP configuration   |               | 1, 2, 3            | DLBWP.0.1               |           |           | DLBWP.0.1               |           |            |
| Initial UL BWP configuration   |               | 1, 2, 3            | ULBWP.0.1               |           |           | ULBWP.0.1               |           |            |
| Active DL BWP configuration  |               | 1, 2, 3            | DLBWP.1.1               | N/A       | N/A       | N/A                     | N/A       | DLBW P.1.1 |
| Active UL BWP configuration  |               | 1, 2, 3            | ULBWP.1.1               | N/A       | N/A       | N/A                     | N/A       | ULBW P.1.1 |
| RLM-RS   |               | 1, 2, 3            | SSB                     |           |           | SSB                     |           |            |
| $\hat{E}_s / I_{ot}$   | dB            | 1                  | 4                       | -infinity | -infinity | -infinity               | -infinity | 7          |
|  |               | 2                  |                         |           |           |                         |           |            |
|  |               | 3                  |                         |           |           |                         |           |            |
| $N_{oc}$ Note2   | dBm/SCS       | 1                  | -98                     |           |           |                         |           |            |
|  |               | 2                  | -98                     |           |           |                         |           |            |
|  |               | 3                  | -95                     |           |           |                         |           |            |
| $N_{oc}$ Note2   | dBm/15 kHz    | 1                  | -98                     |           |           |                         |           |            |
|  |               | 2                  |                         |           |           |                         |           |            |
|  |               | 3                  |                         |           |           |                         |           |            |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 4                       | -infinity | -infinity | -infinity               | -infinity | 7          |
|  |               | 2                  |                         |           |           |                         |           |            |
|  |               | 3                  |                         |           |           |                         |           |            |
| SS-RSRP Note3  | dBm/SCS       | 1                  | -94                     | -infinity | -infinity | -infinity               | -infinity | -91        |
|  |               | 2                  | -94                     | -infinity | -infinity | -infinity               | -infinity | -91        |
|  |               | 3                  | -91                     | -infinity | -infinity | -infinity               | -infinity | -88        |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -64.59                  | -70.05    | -70.05    | -70.05                  | -70.05    | -62.26     |
|  | dBm/9.36 MHz  | 2                  | -64.59                  | -70.05    | -70.05    | -70.05                  | -70.05    | -62.26     |
|  | dBm/38.16 MHz | 3                  | -58.50                  | -63.94    | -63.94    | -63.94                  | -63.94    | -56.15     |
| Propagation Condition  |               | 1, 2, 3            | AWGN                    |           |           |                         |           |            |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                         |           |           |                         |           |            |

### A.6.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{\text{re-establish\_delay}} = T_{\text{UL\_grant}} + T_{\text{UE\_re-establish\_delay}}$$

Where:

$T_{\text{UL\_grant}}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{\text{UL\_grant}}$  is not used.

$$T_{\text{UE\_re-establish\_delay}} = 50 \text{ ms} + T_{\text{identify\_intra\_NR}} + \sum_{i=1}^{N_{\text{freq}}-1} T_{\text{identify\_inter\_NR},i} + T_{\text{SI-NR}} + T_{\text{PRACH}}$$

$$N_{\text{freq}} = 2$$

$$T_{\text{identify\_intra\_NR}} = 800 \text{ ms}$$

$$T_{\text{identify\_inter\_NR}} = 800 \text{ ms}$$

$T_{\text{SI}} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

$T_{\text{PRACH}} = 15 \text{ ms}$ ; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

### A.6.3.2.1.3 Intra-frequency RRC Re-establishment in FR1 without serving cell timing

#### A.6.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.3.1-1, table A.6.3.2.1.3.1-2 and table A.6.3.2.1.3.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

**Table A.6.3.2.1.3.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter                  |                 | Unit | Test configuration | Value                     | Comment  |
|----------------------------|-----------------|------|--------------------|---------------------------|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell1                     |  |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2                     |  |
| Final condition            | Active cell     |      | 1, 2, 3            | Cell2                     |  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1                         |  |
| Time offset between cells  |                 |      | 1                  | 3 ms                      | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s                 | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s                 | Synchronous cells  |
| N310                       | -               |      | 1, 2, 3            | 1                         | Maximum consecutive out-of-sync indications from lower layers  |
| N311                       | -               |      | 1, 2, 3            | 1                         | Minimum consecutive in-sync indications from lower layers  |
| T310                       | ms              |      | 1, 2, 3            | 6000                      | Radio link failure timer configured by <i>RLF-TimersAndConstants</i>   |
| T311                       | ms              |      | 1, 2, 3            | 3000                      | RRC re-establishment timer   |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent                  | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | SSB.1 FR1                 |  |
|                            |                 |      | 2                  | SSB.1 FR1                 |  |
|                            |                 |      | 3                  | SSB.2 FR1                 |  |
| SMTC configuration         |                 |      | 1                  | SMTC.2                    |  |
|                            |                 |      | 2                  | SMTC.1                    |  |
|                            |                 |      | 3                  | SMTC.1                    |  |
| DRX cycle length           | s               |      | 1, 2, 3            | OFF                       |  |
| PRACH configuration        |                 |      | 1, 2, 3            | FR1 PRACH configuration 1 | Table A.3.8.2.1-1  |
| T1                         | s               |      | 1, 2, 3            | 5                         |  |
| T2                         | s               |      | 1, 2, 3            | 6.24                      | Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 ) |
| T3                         | s               |      | 1, 2, 3            | 3                         |  |

**Table A.6.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter  | Unit          | Test configuration | Cell 1                  |           |           | Cell 2                  |           |        |
|--|---------------|--------------------|-------------------------|-----------|-----------|-------------------------|-----------|--------|
|  |               |                    | T1                      | T2        | T3        | T1                      | T2        | T3     |
| TDD configuration  |               | 1                  | N/A                     |           |           | N/A                     |           |        |
|  |               | 2                  | TDDConf.1.1             |           |           | TDDConf.1.1             |           |        |
|  |               | 3                  | TDDConf.2.1             |           |           | TDDConf.2.1             |           |        |
|  |               |                    |                         |           |           |                         |           |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD              |           |           | SR.1.1 FDD              |           |        |
|  |               | 2                  | SR.1.1 TDD              |           |           | SR.1.1 TDD              |           |        |
|  |               | 3                  | SR.2.1 TDD              |           |           | SR.2.1 TDD              |           |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD              |           |           | CR.1.1 FDD              |           |        |
|  |               | 2                  | CR.1.1 TDD              |           |           | CR.1.1 TDD              |           |        |
|  |               | 3                  | CR.2.1 TDD              |           |           | CR.2.1 TDD              |           |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD             |           |           | CCR.1.1 FDD             |           |        |
|  |               | 2                  | CCR.1.1 TDD             |           |           | CCR.1.1 TDD             |           |        |
|  |               | 3                  | CCR.2.1 TDD             |           |           | CCR.2.1 TDD             |           |        |
| OCNG Pattern   |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |           |           | OP.1 defined in A.3.2.1 |           |        |
| Initial DL BWP configuration   |               | 1, 2, 3            | DLBWP.0.1               |           |           | DLBWP.0.1               |           |        |
| TRS Configuration  |               | 1                  | TRS.1.1.FDD             |           |           | TRS.1.1.FDD             |           |        |
|  |               | 2                  | TRS.1.1.TDD             |           |           | TRS.1.1.TDD             |           |        |
|  |               | 3                  | TRS.1.2.TDD             |           |           | TRS.1.2.TDD             |           |        |
| Initial UL BWP configuration   |               | 1, 2, 3            | ULBWP.0.1               |           |           | ULBWP.0.1               |           |        |
| RLM-RS   |               | 1, 2, 3            | SSB                     |           |           | SSB                     |           |        |
| $\hat{E}_s / I_{\alpha}$   | dB            | 1                  | 4                       | -infinity | -infinity | -infinity               | -infinity | 4      |
|  |               | 2                  |                         |           |           |                         |           |        |
|  |               | 3                  |                         |           |           |                         |           |        |
| $N_{oc}$ Note2   | dBm/SCS       | 1                  | -98                     |           |           |                         |           |        |
|  |               | 2                  | -98                     |           |           |                         |           |        |
|  |               | 3                  | -95                     |           |           |                         |           |        |
| $N_{oc}$ Note2   | dBm/15 kHz    | 1                  | -98                     |           |           |                         |           |        |
|  |               | 2                  |                         |           |           |                         |           |        |
|  |               | 3                  |                         |           |           |                         |           |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 4                       | -infinity | -infinity | -infinity               | -infinity | 4      |
|  |               | 2                  |                         |           |           |                         |           |        |
|  |               | 3                  |                         |           |           |                         |           |        |
| SS-RSRP Note3  | dBm/SCS       | 1                  | -94                     | -infinity | -infinity | -infinity               | -infinity | -94    |
|  |               | 2                  | -94                     | -infinity | -infinity | -infinity               | -infinity | -94    |
|  |               | 3                  | -91                     | -infinity | -infinity | -infinity               | -infinity | -91    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -64.59                  | -infinity | -infinity | -infinity               | -infinity | -64.59 |
|  | dBm/9.36 MHz  | 2                  | -64.59                  | -infinity | -infinity | -infinity               | -infinity | -64.59 |
|  | dBm/38.16 MHz | 3                  | -58.50                  | -infinity | -infinity | -infinity               | -infinity | -58.50 |
| Propagation Condition  |               | 1, 2, 3            | AWGN                    |           |           |                         |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                         |           |           |                         |           |        |

### A.6.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 2.2 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{\text{re-establish\_delay}} = T_{\text{UL\_grant}} + T_{\text{UE\_re-establish\_delay}}$$

Where:

$T_{\text{UL\_grant}}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{\text{UL\_grant}}$  is not used.

$$T_{\text{UE\_re-establish\_delay}} = 50 \text{ ms} + T_{\text{identify\_intra\_NR}} + \sum_{i=1}^{N_{\text{freq}}-1} T_{\text{identify\_inter\_NR},i} + T_{\text{SI-NR}} + T_{\text{PRACH}}$$

$$N_{\text{freq}} = 1$$

$$T_{\text{identify\_intra\_NR}} = 800 \text{ ms}$$

$T_{\text{SI}} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

$T_{\text{PRACH}} = 15 \text{ ms}$ ; it is the additional delay caused by the random access procedure.

This gives a total of 2145 ms, allow 2.2 s in the test case.

### A.6.3.2.2 Random Access

#### A.6.3.2.2.1 4-step RA type contention based random access test in FR1 for NR standalone

##### A.6.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.1.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.1.1-2.

**Table A.6.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR1 for NR standalone**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability

**Table A.6.3.2.1.1-2: General test parameters for contention based random access test in FR1 for NR Standalone**

| Parameter   |                      | Unit     | Test-1                    | Comments  |   |
|---|----------------------|----------|---------------------------|---|---|
| SSB Configuration                                       | Config 1             |          | SSB pattern 1 in FR1      | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |   |
|   | Config 2             |          | SSB pattern 2 in FR1      |   |   |
| Number of SSBs per SS-burst                             |                      |          | 2                         | Different from the definition in A.3.10   |   |
| SS/PBCH block index                                     |                      |          | 0,1                       | Different from the definition in A.3.10   |   |
| Duplex Mode for Cell 1                                  | Config 1             |          | FDD                       |   |   |
|   | Config 2             |          | TDD                       |   |   |
| TDD Configuration                                       | Config 2             |          | TDDConf.2.1               |   |   |
| CSI-RS for tracking                                     | Config 1             |          | TRS.1.1 FDD               |   |   |
|   | Config 2             |          | TRS.1.2 TDD               |   |   |
| OCNG Pattern <sup>Note 1</sup>                          |                      |          | OP.1                      | As defined in A.3.2.1.  |   |
| PDSCH parameters <sup>Note 4</sup>                      | Config 1             |          | SR.1.1 FDD                | As defined in A.3.1.1.  |   |
|   | Config 2             |          | SR.2.1 TDD                |   |   |
| RMSI CORESET Reference Channe                           | Config 1             |          | CR.1.1 FDD                |   |   |
|   | Config 2             |          | CR.2.1 TDD                |   |   |
| Dedicated CORESET Reference Channel                     | Config 1             |          | CCR.1.1 FDD               |   |   |
|   | Config 2             |          | CCR.2.1 TDD               |   |   |
| NR RF Channel Number                                    |                      |          | 1                         |   |   |
| EPRE ratio of PSS to SSS                                |                      | dB       | 0                         |   |   |
| EPRE ratio of PBCH_DMRS to SSS                          |                      | dB       |                           |   |   |
| EPRE ratio of PBCH to PBCH_DMRS                         |                      | dB       |                           |   |   |
| EPRE ratio of PDCCH_DMRS to SSS                         |                      | dB       |                           |   |   |
| EPRE ratio of PDCCH to PDCCH_DMRS                       |                      | dB       |                           |   |   |
| EPRE ratio of PDSCH_DMRS to SSS                         |                      | dB       |                           |   |   |
| EPRE ratio of PDSCH to PDSCH_DMRS                       |                      | dB       |                           |   |   |
| SSB with index 0  | $\hat{E}_s / I_{ot}$ |          |                           | dB  | 3   |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                 | -98   |   |
|   |                      | Config 2 |                           | -101  |   |
|   | $\hat{E}_s / N_{oc}$ |          | dB                        | 3   |   |
| SS-RSRP <sup>Note 3</sup>                               |                      | dBm/ SCS | -95                       |   |   |
| SSB with index 1  | $\hat{E}_s / I_{ot}$ |          | dB                        | -17   | Power of SSB with index 1 is set to be below configured $rsrp$ -<br><i>ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                 | -98   |   |
|   |                      | Config 2 |                           | -101  |   |
|   | $\hat{E}_s / N_{oc}$ |          | dB                        | -17   |   |
| SS-RSRP <sup>Note 3</sup>                               |                      | dBm/ SCS | -115                      |   |   |
| $I_o$ <sup>Note 2</sup>                                 | Config 1             | dBm      | -65.3/9.36MHz             | For symbols without SSB index 1   |   |
|   | Config 2             |          | -62.2/38.16MHz            |   |   |
| ss-PBCH-BlockPower                                      |                      | dBm/ SCS | -5                        | As defined in clause 6.3.2 in TS 38.331 [2].  |   |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ ) |                      | dBm      | 23                        | As defined in clause 6.2.4 in TS 38.101-1.  |   |
| PRACH Configuration                                     |                      |          | FR1 PRACH configuration 1 | As defined in A.3.8.  |   |
| Propagation Condition                                   |                      | -        | AWGN                      |   |   |



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

#### A.6.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.6.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.6.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

#### A.6.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### A.6.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

#### A.6.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

### A.6.3.2.2.2 4-step RA type non-contention based random access test in FR1 for NR standalone

#### A.6.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.2.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2). Test 2 is only applicable to UE which supports *csi-RSRP-AndRSRQ-MeasWithSSB* or *csi-RSRP-AndRSRQ-MeasWithoutSSB*.

**Table A.6.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for NR standalone**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.6.3.2.2.1-2: General test parameters for non-contention based random access test in FR1 for NR Standalone**

| Parameter                           |                      | Unit     | Test-1               | Test-2               | Comments  |  |
|-------------------------------------|----------------------|----------|----------------------|----------------------|---|--|
| SSB Configuration                   | Config 1             |          | SSB pattern 1 in FR1 | SSB pattern 1 in FR1 | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |  |
|                                     | Config 2             |          | SSB pattern 2 in FR1 | SSB pattern 2 in FR1 |   |  |
| Number of SSBs per SS-burst         |                      |          | 2                    | 2                    | Different from the definition in A.3.10   |  |
| SS/PBCH block index                 |                      |          | 0,1                  | 0,1                  | Different from the definition in A.3.10   |  |
| CSI-RS Configuration                | Config 1             |          | N/A                  | CSI-RS.1.1 FDD       | As defined in A.3.1.4   |  |
|                                     | Config 2             |          |                      | CSI-RS.2.1 TDD       |   |  |
| Duplex Mode for Cell 1              | Config 1             |          | FDD                  | FDD                  |   |  |
|                                     | Config 2             |          | TDD                  | TDD                  |   |  |
| TDD Configuration                   | Config 2             |          | TDDConf.2.1          | TDDConf.2.1          |   |  |
| CSI-RS for tracking                 | Config 1             |          | TRS.1.1 FDD          | TRS.1.1 FDD          |   |  |
|                                     | Config 2             |          | TRS.1.2 TDD          | TRS.1.2 TDD          |   |  |
| OCNG Pattern <sup>Note 1</sup>      |                      |          | OP.1                 | OP.1                 | As defined in A.3.2.1.  |  |
| PDSCH parameters <sup>Note 4</sup>  | Config 1             |          | SR.1.1 FDD           | SR.1.1 FDD           | As defined in A.3.1.1.  |  |
|                                     | Config 2             |          | SR.2.1 TDD           | SR.2.1 TDD           |   |  |
| RMSI CORESET Reference Channel      | Config 1             |          | CR.1.1 TDD           | CR.1.1 TDD           |   |  |
|                                     | Config 2             |          | CR.2.1 TDD           | CR.2.1 TDD           |   |  |
| Dedicated CORESET Reference Channel | Config 1             |          | CCR.1.1 TDD          | CCR.1.1 TDD          |   |  |
|                                     | Config 2             |          | CCR.2.1 TDD          | CCR.2.1 TDD          |   |  |
| NR RF Channel Number                |                      |          | 1                    | 1                    |   |  |
| EPRE ratio of PSS to SSS            |                      | dB       | 0                    | 0                    |   |  |
| EPRE ratio of PBCH_DMRS to SSS      |                      | dB       |                      |                      |   |  |
| EPRE ratio of PBCH to PBCH_DMRS     |                      | dB       |                      |                      |   |  |
| EPRE ratio of PDCCH_DMRS to SSS     |                      | dB       |                      |                      |   |  |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                      | dB       |                      |                      |   |  |
| EPRE ratio of PDSCH_DMRS to SSS     |                      | dB       |                      |                      |   |  |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                      | dB       |                      |                      |   |  |
| SSB with index 0                    | $\hat{E}_s / I_{ot}$ |          | dB                   | 3                    | 3   | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|                                     | $N_{oc}$             | Config 1 | dBm/15kHz            | -98                  | -98   |  |
|                                     |                      | Config 2 |                      | -101                 | -101  |  |
|                                     | $\hat{E}_s / N_{oc}$ |          | dB                   | 3                    | 3   |  |
| SS-RSRP <sup>Note 3</sup>           |                      | dBm/ SCS | -95                  | -95                  |   |  |
| SSB with index 1                    | $\hat{E}_s / I_{ot}$ |          | dB                   | -17                  | -17   | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|                                     | $N_{oc}$             | Config 1 | dBm/15kHz            | -98                  | -98   |  |
|                                     |                      | Config 2 |                      | -101                 | -101  |  |
|                                     | $\hat{E}_s / N_{oc}$ |          | dB                   | -17                  | -17   |  |
| SS-RSRP <sup>Note 3</sup>           |                      | dBm/ SCS | -115                 | -115                 |   |  |
| $I_o$ <sup>Note 2</sup>             | Config 1             | dBm      | -65.3/9.36MHz        | -65.3/9.36MHz        | For symbols without SSB index 1   |  |
|                                     | Config 2             |          | -62.2/38.16MHz       | -62.2/38.16MHz       |   |  |
| ss-PBCH-BlockPower                  |                      | dBm/ SCS | -5                   | -5                   | As defined in clause 6.3.2 in TS 38.331 [2].  |  |

|   |  |                           |                           |  |
|---|--|---------------------------|---------------------------|--|
| Configured UE transmitted power ( $P_{\text{C}_{\text{MAX}}, f, c}$ ) | dBm  | 23                        | 23                        | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration   |  | FR1 PRACH configuration 2 | FR1 PRACH configuration 3 | As defined in A.3.8.2.                     |
| Propagation Condition   | -  | AWGN                      | AWGN                      |  |
| Note 1:   | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |                           |                           |  |
| Note 2:   | SS-RSRP, Es/lot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.   |                           |                           |  |
| Note 3:   | Void   |                           |                           |  |
| Note 4:   | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |                           |                           |  |

#### A.6.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.6.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.6.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.6.3.2.2.3 2-step RA type contention based random access test in FR1 for NR standalone

##### A.6.3.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.3.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.3.1-2.

**Table A.6.3.2.2.3.1-1: Supported test configurations for 2-step RA type contention based random access with successRAR test in FR1 for NR standalone**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.6.3.2.3.1-2: General test parameters for 2-step RA type contention based random access with successRAR test in FR1 for NR standalone**

| Parameter  |                      | Unit     | Test-1                   | Comments  |   |
|--|----------------------|----------|--------------------------|---|---|
| SSB Configuration  | Config 1             |          | SSB pattern 1 in FR1     | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |   |
|  | Config 2             |          | SSB pattern 2 in FR1     |   |   |
| Number of SSBs per SS-burst  |                      |          | 2                        | Different from the definition in A.3.10   |   |
| SS/PBCH block index  |                      |          | 0,1                      | Different from the definition in A.3.10   |   |
| Duplex Mode for Cell 2   | Config 1             |          | FDD                      |   |   |
|  | Config 2             |          | TDD                      |   |   |
| TDD Configuration  | Config 2             |          | TDDConf.2.1              |   |   |
| OCNG Pattern <sup>Note 1</sup>   |                      |          | OP.1                     | As defined in A.3.2.1.  |   |
| PDSCH parameters <sup>Note 3</sup>   | Config 1             |          | SR.1.1 FDD               | As defined in A.3.1.1.  |   |
|  | Config 2             |          | SR.2.1 TDD               |   |   |
| NR RF Channel Number   |                      |          | 1                        |   |   |
| EPRE ratio of PSS to SSS   |                      | dB       | 0                        |   |   |
| EPRE ratio of PBCH_DMRS to SSS   |                      | dB       |                          |   |   |
| EPRE ratio of PBCH to PBCH_DMRS  |                      | dB       |                          |   |   |
| EPRE ratio of PDCCH_DMRS to SSS  |                      | dB       |                          |   |   |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                      | dB       |                          |   |   |
| EPRE ratio of PDSCH_DMRS to SSS  |                      | dB       |                          |   |   |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                      | dB       |                          |   |   |
| SSB with index 0   | $\hat{E}_s / I_{ot}$ |          | dB                       | 3   | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1 | dBm/15kHz                | -98   |   |
|  |                      | Config 2 |                          | -101  |   |
|  | $\hat{E}_s / N_{oc}$ |          | dB                       | 3   |   |
| SS-RSRP  |                      | dBm/ SCS | -95                      |   |   |
| SSB with index 1   | $\hat{E}_s / I_{ot}$ |          | dB                       | -17   | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | $N_{oc}$             | Config 1 | dBm/15kHz                | -98   |   |
|  |                      | Config 2 |                          | -101  |   |
|  | $\hat{E}_s / N_{oc}$ |          | dB                       | -17   |   |
| SS-RSRP  |                      | dBm/ SCS | -115                     |   |   |
| $I_o$ <sup>Note 2</sup>  | Config 1             | dBm      | -65.3/9.36MHz            | For symbols without SSB index 1   |   |
|  | Config 2             |          | -62.2/38.16MHz           |   |   |
| ss-PBCH-BlockPower   |                      | dBm/ SCS | -5                       | As defined in clause 6.3.2 in TS 38.331 [2].  |   |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ )  |                      | dBm      | 23                       | As defined in clause 6.2.4 in TS 38.101-1.  |   |
| MsgA Configuration   |                      |          | FR1 MsgA configuration 1 | As defined in A.3.20.2.1.   |   |
| <i>msgA-RSRP-ThresholdSSB</i>  |                      | dBm      | RSRP_51                  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].                    |   |
| Propagation Condition  |                      | -        | AWGN                     |   |   |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: SS-RSRP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purpose. They are not settable parameters.</p> <p>Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> |                      |          |                          |   |   |

#### A.6.3.2.2.3.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.6.3.2.2.3.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble transmission shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.3.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.1.2 the System Simulator shall transmit a MsgB containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB(s) and shall transmit an ACK if the MsgB with a successRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble and if the Contention Resolution is successful.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB(s) contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.1.3 the System Simulator shall transmit a MsgB containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.



#### A.6.3.2.2.4 2-step RA type non-contention based test in FR1 for NR standalone

##### A.6.3.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.4.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.4.1-2.

**Table A.6.3.2.2.4.1-1: Supported test configurations for non-contention based random access test in FR1 for NR standalone**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:         | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.6.3.2.4.1-2: General test parameters for non-contention based random access test in FR1 for NR Standalone**

| Parameter  |                           | Unit     | Test-1                   | Comments  |      |
|--|---------------------------|----------|--------------------------|---|------|
| SSB Configuration  | Config 1                  |          | SSB pattern 2 in FR1     | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |      |
| Number of SSBs per SS-burst  |                           |          | 2                        | Different from the definition in A.3.10   |      |
| SS/PBCH block index  |                           |          | 0,1                      | Different from the definition in A.3.10   |      |
| Duplex Mode for Cell 1   | Config 1                  |          | TDD                      |   |      |
| TDD Configuration  | Config 1                  |          | TDDConf.2.1              |   |      |
| OCNG Pattern <sup>Note 1</sup>   |                           |          | OP.1                     | As defined in A.3.2.1.  |      |
| PDSCH parameters <sup>Note 4</sup>   | Config 1                  |          | SR.2.1 TDD               | As defined in A.3.1.1.  |      |
| NR RF Channel Number   |                           |          | 1                        |   |      |
| EPRE ratio of PSS to SSS   |                           | dB       | 0                        |   |      |
| EPRE ratio of PBCH_DMRS to SSS   |                           | dB       |                          |   |      |
| EPRE ratio of PBCH to PBCH_DMRS  |                           | dB       |                          |   |      |
| EPRE ratio of PDCCH_DMRS to SSS  |                           | dB       |                          |   |      |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                           | dB       |                          |   |      |
| EPRE ratio of PDSCH_DMRS to SSS  |                           | dB       |                          |   |      |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                           | dB       |                          |   |      |
| msgA-RSRP-ThresholdSSB   |                           | dBm      | RSRP_51                  | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].                    |      |
| SSB with index 0   | $\hat{E}_s / I_{ot}$      | dB       | 3                        | Power of SSB with index 0 is set to be above configured msgA-RSRP-ThresholdSSB                |      |
|  | $N_{oc}$                  | Config 1 | dBm/15kHz                |   | -101 |
|  | $\hat{E}_s / N_{oc}$      |          | dB                       |   | 3    |
|  | SS-RSRP <sup>Note 3</sup> |          | dBm/ SCS                 |   | -95  |
| SSB with index 1   | $\hat{E}_s / I_{ot}$      | dB       | -17                      | Power of SSB with index 1 is set to be below configured msgA-RSRP-ThresholdSSB                |      |
|  | $N_{oc}$                  | Config 1 | dBm/15kHz                |   | -101 |
|  | $\hat{E}_s / N_{oc}$      |          | dB                       |   | -17  |
|  | SS-RSRP <sup>Note 3</sup> |          | dBm/ SCS                 |   | -115 |
| $I_o$ <sup>Note 2</sup>  | Config 1                  | dBm      | -62.2/38.16MHz           | For symbols without SSB index 1   |      |
| ss-PBCH-BlockPower   |                           | dBm/ SCS | -5                       | As defined in clause 6.3.2 in TS 38.331 [2].  |      |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ )  |                           | dBm      | 23                       | As defined in clause 6.2.4 in TS 38.101-1.  |      |
| MsgA Configuration   |                           |          | FR1 MsgA configuration 2 | As defined in A.3.20.2.2.   |      |
| Propagation Condition  |                           | -        | AWGN                     |   |      |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: SS-RSRP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purpose. They are not settable parameters.</p> <p>Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> |                           |          |                          |   |      |

#### A.6.3.2.2.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.6.3.2.2.4.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2.3.2.1, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA PRACH on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.2.2 the System Simulator shall transmit a MsgB containing a fallbackRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 containing the payload of MsgA PUSCH if the MsgB with a fallbackRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble. The UE shall monitor contention resolution as described in clause 8.2A in TS 38.213 [3].

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA and msg3 transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.6.3.2.2.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.2.3 the System Simulator shall transmit a MsgB containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.6.3.2.3 SA: RRC Connection Release with Redirection

#### A.6.3.2.3.1 Redirection from NR in FR1 to NR in FR1

##### A.6.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

##### A.6.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.1.2-2, and A.6.3.2.3.1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. Cell 1 and Cell 2 belong to different tracking areas.

**Table A.6.3.2.3.1.2-1: Redirection from NR to NR test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case**

| Parameter                  | Unit              | Value     | Comment  |
|----------------------------|-------------------|-----------|--|
| Initial conditions         | Active cell       | Cell 1    |  |
|                            | Neighbouring cell | Cell 2    |  |
| Final condition            | Active cell       | Cell 2    |  |
| Filter coefficient         |                   | 0         | L3 filtering is not used                         |
| Access Barring Information | -                 | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   | 3 $\mu$ s | Synchronous cells                                |
| T1                         | s                 | 5         |  |
| T2                         | s                 | 2.3       |  |

**Table A.6.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter                                |                  | Unit      | Cell 1                      |    | Cell 2    |    |
|--|------------------|-----------|-----------------------------|----|-----------|----|
|  |                  |           | T1                          | T2 | T1        | T2 |
| NR RF Channel Number                     |                  |           | 1                           |    | 2         |    |
| Duplex mode                              | Config 1         |           | FDD                         |    |           |    |
|  | Config 2,3       |           | TDD                         |    |           |    |
| SSB Configuration                        | Config 1         |           | SSB.1 FR1                   |    |           |    |
|  | Config 2         |           | SSB.1 FR1                   |    |           |    |
|  | Config 3         |           | SSB.2 FR1                   |    |           |    |
| CSI-RS for tracking                      | Config 1         |           | TRS.1.1 FDD                 |    |           |    |
|  | Config 2         |           | TRS.1.1 TDD                 |    |           |    |
|  | Config 3         |           | TRS.1.2 TDD                 |    |           |    |
| TDD configuration                        | Config 1         |           | Not Applicable              |    |           |    |
|  | Config 2         |           | TDDConf.1.1                 |    |           |    |
|  | Config 3         |           | TDDConf.2.1                 |    |           |    |
| BW <sub>channel</sub>                    | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP BW                                   | Config 1         | MHz       | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|  | Config 2         |           | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|  | Config 3         |           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| DRx Cycle                                |                  | ms        | Not Applicable              |    |           |    |
| PDSCH Reference measurement channel      | Config 1         |           | SR.1.1 FDD                  |    |           |    |
|  | Config 2         |           | SR.1.1 TDD                  |    |           |    |
|  | Config 3         |           | SR2.1 TDD                   |    |           |    |
| CORESET Reference Channel                | Config 1         |           | CR.1.1 FDD                  |    |           |    |
|  | Config 2         |           | CR.1.1 TDD                  |    |           |    |
|  | Config 3         |           | CR2.1 TDD                   |    |           |    |
| OCNG Patterns                            |                  |           | OCNG pattern 1              |    |           |    |
| SMTc configuration                       | Config 1,2       |           | SMTc.1 FR1                  |    |           |    |
|  | Config 3         |           | SMTc.2 FR1                  |    |           |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |    |           |    |
|  | Config 3         |           | 30 kHz                      |    |           |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz       | 15 kHz                      |    |           |    |
|  | Config 3         |           | 30 kHz                      |    |           |    |
| PRACH configuration                      |                  |           | FR1 PRACH configuration 1   |    |           |    |
| BWP configuration                        | Initial DL BWP   |           | DLBWP.0.1                   |    |           |    |
|  | Dedicated DL BWP |           | DLBWP.1.1                   |    |           |    |
|  | Initial UL BWP   |           | ULBWP.0.1                   |    |           |    |
|  | Dedicated UL BWP |           | ULBWP.1.1                   |    |           |    |
| EPRE ratio of PSS to SSS                 |                  | dB        | 0                           |    |           |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |           |                             |    |           |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |           |                             |    |           |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |           |                             |    |           |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |           |                             |    |           |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |           |                             |    |           |    |
| EPRE ratio of PDSCH to PDSCH             |                  |           |                             |    |           |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |           |                             |    |           |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |           |                             |    |           |    |
| $N_{oc}$ <sup>Note2</sup>                |                  | dBm/15kHz | -98                         |    |           |    |
| $N_{oc}$ <sup>Note2</sup>                | Config 1,2       | dBm/SCS   | -98                         |    |           |    |
|  | Config 3         |           | -95                         |    |           |    |
| $\hat{E}_s/I_{ot}$                       |                  | dB        | 4                           | 4  | -infinity | 4  |
| $\hat{E}_s/N_{oc}$                       |                  | dB        | 4                           | 4  | -infinity | 4  |

|                                 |  |                  |        |        |        |        |
|---------------------------------|--|------------------|--------|--------|--------|--------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2   | dBm/<br>9.36MHz  | -64.59 | -64.59 | -70.05 | -64.59 |
|                                 | Config 3   | dBm/<br>38.16MHz | -58.49 | -58.49 | -63.94 | -58.49 |
| Propagation condition           |  | -                | AWGN   |        |        |        |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |        |        |        |        |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |        |        |
| Note 3:                         | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |        |        |        |        |

### A.6.3.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2. The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{\text{connection\_release\_redirect\_NR}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-NR}} + T_{\text{SI-NR}} + T_{\text{RACH}},$$

where:

$T_{\text{RRC\_procedure\_delay}} = 110$  ms in the test.

$T_{\text{identify-NR}} = 680$  ms in the test.

$T_{\text{SI-NR}} = 1280$  ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

$T_{\text{RACH}} = 170$  ms in the test.

This gives a total of 2240 ms.

### A.6.3.2.3.2 Redirection from NR in FR1 to E-UTRAN

#### A.6.3.2.3.2.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to E-UTRAN requirements specified in clause 6.2.3.2.2.

#### A.6.3.2.3.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.2.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.2.2-2, A.6.3.2.3.2.2-3 and A.6.3.2.3.2.2-4.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

**Table A.6.3.2.3.2.2-1: Redirection from NR to E-UTRAN test configurations**

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

**Table A.6.3.2.3.2.2-2: General test parameters for Redirection from NR to E-UTRAN test case**

| Parameter                  |                   | Unit | Value     | Comment  |
|----------------------------|-------------------|------|-----------|--|
| Initial conditions         | Active cell       |      | Cell 1    |  |
|                            | Neighbouring cell |      | Cell 2    |  |
| Final condition            | Active cell       |      | Cell 2    |  |
| Filter coefficient         |                   |      | 0         | L3 filtering is not used                         |
| Access Barring Information |                   | -    | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   |      | 3 $\mu$ s | Synchronous cells                                |
| T1                         |                   | s    | 5         |  |
| T2                         |                   | s    | 2.3       |  |



**Table A.6.3.2.3.2.2-3: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 1)**

| Parameter                                |                  | Unit           | Cell 1                      |    |
|--|------------------|----------------|-----------------------------|----|
|  |                  |                | T1                          | T2 |
| RF Channel Number                        |                  |                | 1                           |    |
| Duplex mode                              | Config 1,4       |                | FDD                         |    |
|  | Config 2,3,5,6   |                | TDD                         |    |
| SSB Configuration                        | Config 1         |                | SSB.1 FR1                   |    |
|  | Config 2         |                | SSB.1 FR1                   |    |
|  | Config 3         |                | SSB.2 FR1                   |    |
| CSI-RS for tracking                      | Config 1         |                | TRS.1.1 FDD                 |    |
|  | Config 2         |                | TRS.1.1 TDD                 |    |
|  | Config 3         |                | TRS.1.2 TDD                 |    |
| TDD configuration                        | Config 1,4       |                | Not Applicable              |    |
|  | Config 2,5       |                | TDDConf.1.1                 |    |
|  | Config 3,6       |                | TDDConf.2.1                 |    |
| BW <sub>channel</sub>                    | Config 1,4       | MHz            | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 2,5       |                | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 3,6       |                | 40: N <sub>RB,c</sub> = 106 |    |
| BWP BW                                   | Config 1,4       | MHz            | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 2,5       |                | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 3,6       |                | 40: N <sub>RB,c</sub> = 106 |    |
| DRx Cycle                                |                  | ms             | Not Applicable              |    |
| PDSCH Reference measurement channel      | Config 1,4       |                | SR.1.1 FDD                  |    |
|  | Config 2,5       |                | SR.1.1 TDD                  |    |
|  | Config 3,6       |                | SR2.1 TDD                   |    |
| CORESET Reference Channel                | Config 1,4       |                | CR.1.1 FDD                  |    |
|  | Config 2,5       |                | CR.1.1 TDD                  |    |
|  | Config 3,6       |                | CR2.1 TDD                   |    |
| OCNG Patterns                            |                  |                | OCNG pattern 1              |    |
| SMTc configuration                       | Config 1,2,4,5   |                | SMTc.1 FR1                  |    |
|  | Config 3,6       |                | SMTc.2 FR1                  |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5   | kHz            | 15 kHz                      |    |
|  | Config 3,6       |                | 30 kHz                      |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2,4,5   | kHz            | 15 kHz                      |    |
|  | Config 3,6       |                | 30 kHz                      |    |
| PRACH configuration                      |                  |                | FR1 PRACH configuration 1   |    |
| BWP configuration                        | Initial DL BWP   |                | DLBWP.0.1                   |    |
|  | Dedicated DL BWP |                | DLBWP.1.1                   |    |
|  | Initial UL BWP   |                | ULBWP.0.1                   |    |
|  | Dedicated UL BWP |                | ULBWP.1.1                   |    |
| EPRE ratio of PSS to SSS                 |                  | dB             | 0                           |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |                |                             |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |                |                             |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |                |                             |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |                |                             |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |                |                             |    |
| EPRE ratio of PDSCH to PDSCH             |                  |                |                             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |                |                             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |                |                             |    |
| N <sub>oc</sub> <sup>Note2</sup>         |                  | dBm/15kHz<br>z | -98                         |    |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2,4,5   | dBm/SCS        | -98                         |    |
|  | Config 3,6       |                | -95                         |    |
| $\hat{E}_s/I_{ot}$                       |                  | dB             | 4                           | 4  |
| $\hat{E}_s/N_{oc}$                       |                  | dB             | 4                           | 4  |

|                                 |  |                  |        |        |
|---------------------------------|--|------------------|--------|--------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2,4,5   | dBm/<br>9.36MHz  | -64.59 | -64.59 |
|                                 | Config 3,6   | dBm/<br>38.16MHz | -58.49 | -58.49 |
| Propagation condition           |  | -                | AWGN   |        |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |        |        |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |
| Note 3:                         | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |        |        |

Table A.6.3.2.3.2.2-4: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 2)

| Parameter   | Unit  | Configuration    | Cell 2   |        |
|---|---|------------------|--|--------|
|   |   |                  | T1   | T2     |
| RF channel number   |   | 1, 2, 3, 4, 5, 6 | 2  |        |
| Duplex mode   |   | 1, 2, 3          | FDD  |        |
|   |   | 4, 5, 6          | TDD  |        |
| TDD special subframe configuration <sup>Note1</sup>                                 |   | 4, 5, 6          | 6  |        |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |   | 4, 5, 6          | 1  |        |
| BW <sub>channel</sub>   | MHz   | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |        |
| PRACH Configuration <sup>Note2</sup>  |   | 1, 2, 3          | 4  |        |
|   |   | 4, 5, 6          | 53   |        |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup>              |   | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |        |
|   |   | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |        |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup> |   | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |        |
|   |   | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |        |
| OCNG Patterns <sup>Note3</sup>  |   | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |        |
|   |   | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |        |
| PBCH_RA   | dB  | 1, 2, 3, 4, 5, 6 | 0  |        |
| PBCH_RB   |   |                  |  |        |
| PSS_RA  |   |                  |  |        |
| SSS_RA  |   |                  |  |        |
| PCFICH_RB   |   |                  |  |        |
| PHICH_RA  |   |                  |  |        |
| PHICH_RB  |   |                  |  |        |
| PDCCH_RA  |   |                  |  |        |
| PDCCH_RB  |   |                  |  |        |
| PDSCH_RA  |   |                  |  |        |
| PDSCH_RB  |   |                  |  |        |
| OCNG_RA <sup>Note4</sup>  |   |                  |  |        |
| OCNG_RB <sup>Note4</sup>  |   |                  |  |        |
| N <sub>oc</sub> <sup>Note5</sup>  |   |                  |  |        |
| $\hat{E}_s/N_{oc}$  | dB  | 1, 2, 3, 4, 5, 6 | -Infinity  | 4      |
| $\hat{E}_s/I_{ot}$ <sup>Note6</sup>   | dB  | 1, 2, 3, 4, 5, 6 | -Infinity  | 4      |
| RSRP <sup>Note6</sup>   | dBm/15kHz   | 1, 2, 3, 4, 5, 6 | -Infinity  | -94    |
| SCH_RP <sup>Note6</sup>   | dBm/15kHz   | 1, 2, 3, 4, 5, 6 | -Infinity  | -94    |
| I <sub>o</sub> <sup>Note6</sup>   | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -70.22   | -64.76 |
| Propagation Condition   |   | 1, 2, 3, 4, 5, 6 | AWGN   |        |
| Note 1:   | Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].   |                  |  |        |
| Note 2:   | PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].  |                  |  |        |
| Note 3:   | DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  |                  |  |        |
| Note 4:   | OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |  |        |
| Note 5:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                  |  |        |
| Note 6:   | $\hat{E}_s/I_{ot}$ , RSRP, SCH_RP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                  |  |        |
| Note 7:   | Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].   |                  |  |        |

### A.6.3.2.3.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2. The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{\text{connection\_release\_redirect\_E-UTRA}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-E-UTRA}} + T_{\text{SI-E-UTRA}} + T_{\text{RACH}}$$

where:

$T_{\text{RRC\_procedure\_delay}} = 110$  ms in the test.

$T_{\text{identify-E-UTRA}} = 800$  ms in the test.

$T_{\text{SI-E-UTRA}} = 1280$  ms, it is the time required for receiving all the relevant system information as defined in TS 36.331 for the target E-UTRA cell.

$T_{\text{RACH}} = 15$  ms in the test.

This gives a total of 2205 ms.

## A.6.3.3 Conditional handover

### A.6.3.3.1 Intra-frequency conditional handover from FR1 to FR1

#### A.6.3.3.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency conditional handover requirements specified in clause 6.1.4.2.

#### A.6.3.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.3.1.2-1. Both conditional handover delay and interruption length are tested by using the parameters in table A.6.3.3.1.2-2, and A.6.3.3.1.2-3.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR shall configure a condition implying handover to cell 2 during T1, at a time earlier than  $T_{\text{RRC}}$  before the beginning of T2.

**Table A.6.3.3.1.2-1: Intra-frequency conditional handover from FR1 to FR1 test configurations**

| Config   | Description  |
|--|--|
| 1  | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.6.3.3.1.2-2: General test parameters Intra-frequency conditional handover from FR1 to FR1**

| Parameter              | Unit              | Value  | Comment                  |
|------------------------|-------------------|--------|--------------------------|
| Initial conditions     | Active cell       | Cell 1 |                          |
|                        | Neighbouring cell | Cell 2 |                          |
| Final condition        | Active cell       | Cell 2 |                          |
| A3-Offset in condition | dB                | 0      |                          |
| Hysteresis             | dB                | 0      |                          |
| Time To Trigger        | s                 | 0      |                          |
| Filter coefficient     |                   | 0      | L3 filtering is not used |

|                            |   |                           |  |
|----------------------------|---|---------------------------|--|
| Access Barring Information | - | Not Sent                  | No additional delays in random access procedure.       |
| PRACH configuration index  |   | FR1 PRACH configuration 1 | As specified in table Table 6.3.3.2-3 in TS 38.211 [6] |
| Time offset between cells  |   | 3 $\mu$ s                 | Synchronous cells                                      |
| T1                         | s | 5                         |  |
| T2                         | s | $\leq 2$                  |  |

**Table A.6.3.3.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency conditional handover test case**

| Parameter                                |                  | Unit        | Cell 1                      |        | Cell 2 |        |
|--|------------------|-------------|-----------------------------|--------|--------|--------|
|  |                  |             | T1                          | T2     | T1     | T2     |
| NR RF Channel Number                     |                  |             | 1                           |        | 1      |        |
| Duplex mode                              | Config 1         |             | FDD                         |        |        |        |
|  | Config 2,3       |             | TDD                         |        |        |        |
| TDD configuration                        | Config 1         |             | Not Applicable              |        |        |        |
|  | Config 2         |             | TDDConf.1.1                 |        |        |        |
|  | Config 3         |             | TDDConf.2.1                 |        |        |        |
| BW <sub>channel</sub>                    | Config 1         | MHz         | 10: N <sub>RB,c</sub> = 52  |        |        |        |
|  | Config 2         |             | 10: N <sub>RB,c</sub> = 52  |        |        |        |
|  | Config 3         |             | 40: N <sub>RB,c</sub> = 106 |        |        |        |
| BWP BW                                   | Config 1         | MHz         | 10: N <sub>RB,c</sub> = 52  |        |        |        |
|  | Config 2         |             | 10: N <sub>RB,c</sub> = 52  |        |        |        |
|  | Config 3         |             | 40: N <sub>RB,c</sub> = 106 |        |        |        |
| DRx Cycle                                |                  | ms          | Not Applicable              |        |        |        |
| PDSCH Reference measurement channel      | Config 1         |             | SR.1.1 FDD                  |        |        |        |
|  | Config 2         |             | SR.1.1 TDD                  |        |        |        |
|  | Config 3         |             | SR2.1 TDD                   |        |        |        |
| CORESET Reference Channel                | Config 1         |             | CR.1.1 FDD                  |        |        |        |
|  | Config 2         |             | CR.1.1 TDD                  |        |        |        |
|  | Config 3         |             | CR2.1 TDD                   |        |        |        |
| TRS configuration                        | Config 1         |             | TRS.1.1 FDD                 |        |        |        |
|  | Config 2         |             | TRS.1.1 TDD                 |        |        |        |
|  | Config 3         |             | TRS.1.2 TDD                 |        |        |        |
| OCNG Patterns                            |                  |             | OCNG pattern 1              |        |        |        |
| SMTC Configuration                       |                  |             | SMTC pattern 1              |        |        |        |
| SSB Configuration                        | Config 1,2       |             | SSB.1 FR1                   |        |        |        |
|  | Config 3         |             | SSB.2 FR1                   |        |        |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz         | 15 kHz                      |        |        |        |
|  | Config 3         |             | 30 kHz                      |        |        |        |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz         | 15 kHz                      |        |        |        |
|  | Config 3         |             | 30 kHz                      |        |        |        |
| PRACH configuration                      |                  |             | FR1 PRACH configuration 1   |        |        |        |
| BWP configuration                        | Initial DL BWP   |             | DLBWP.0.1                   |        |        |        |
|  | Dedicated DL BWP |             | DLBWP.1.1                   |        |        |        |
|  | Initial UL BWP   |             | ULBWP.0.1                   |        |        |        |
|  | Dedicated UL BWP |             | ULBWP.1.1                   |        |        |        |
| EPRE ratio of PSS to SSS                 |                  | dB          | 0                           |        |        |        |
| EPRE ratio of PBCH DMRS to SSS           |                  |             |                             |        |        |        |
| EPRE ratio of PBCH to PBCH DMRS          |                  |             |                             |        |        |        |
| EPRE ratio of PDCCH DMRS to SSS          |                  |             |                             |        |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |             |                             |        |        |        |
| EPRE ratio of PDSCH DMRS to SSS          |                  |             |                             |        |        |        |
| EPRE ratio of PDSCH to PDSCH             |                  |             |                             |        |        |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |             |                             |        |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |             |                             |        |        |        |
| $N_{oc}^{Note2}$                         |                  |             | dBm/15kHz                   | -98    |        |        |
| $N_{oc}^{Note2}$                         | Config 1,2       | dBm/SCS     | -98                         |        |        |        |
|  | Config 3         |             | -95                         |        |        |        |
| $\hat{E}_s/I_{ot}$                       |                  | dB          | 8                           | -3.3   | -      | 2.36   |
| $\hat{E}_s/N_{oc}$                       |                  | dB          | 8                           | 8      | -      | 11     |
| SSB <sub>RP</sub>                        | Config 1,2       | dBm/SCS     | -90                         | -90    | -      | -87    |
|  | Config 3         | dBm/SCS     | -87                         | -87    | -      | -84    |
| $Io^{Note3}$                             | Config 1,2       | dBm/9.36MHz | -61.41                      | -57.06 | -61.41 | -57.06 |



|                       |  |                  |        |        |        |        |
|-----------------------|--|------------------|--------|--------|--------|--------|
|                       | Config 3   | dBm/<br>38.16MHz | -55.31 | -50.96 | -55.31 | -50.96 |
| Propagation condition |  | -                | AWGN   |        | AWGN   |        |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |        |        |        |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |        |        |
| Note 3:               | lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |        |        |        |        |

### A.6.3.3.1.3 Test Requirements

$T_{RRC} + T_{Event\_DU}$  occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{measure} + T_{interrupt} + T_{CHO\_execution} = 800 + 62 + 10 = 872\text{ms}$  from the start of T2 and the interruption during T2 shall not exceed  $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} = 40 + 20 + 2 = 62\text{ms}$

### A.6.3.3.2 Inter-frequency conditional handover from FR1 to FR1

#### A.6.3.3.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR conditional FR1-NR FR1 inter frequency conditional handover requirements specified in clause 6.1.4.2.

#### A.6.3.3.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.3.2.2-1. Both conditional handover delay and interruption length are tested by using the parameters in table A.6.3.3.2.2-2, and A.6.3.3.2.2-3.

The test scenario comprises of two carriers and one cell on each carrier Gap pattern ID gp0 is configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. NR shall configure a condition implying handover to cell 2 during T1, at a time earlier than  $T_{RRC}$  before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.6.3.3.2.2-1: Inter-frequency handover from FR1 to FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.3.3.2-2: General test parameters Inter-frequency handover from FR1 to FR1**

| Parameter                       |                   | Unit | Value    | Comment  |
|---------------------------------|-------------------|------|----------|--|
| Initial conditions              | Active cell       |      | Cell 1   |  |
|                                 | Neighbouring cell |      | Cell 2   |  |
| Final condition                 | Active cell       |      | Cell 2   |  |
| A3-Offset in handover condition |                   | dB   | -4       |  |
| Hysteresis                      |                   | dB   | 0        |  |
| Time To Trigger                 |                   | s    | 0        |  |
| Filter coefficient              |                   |      | 0        | L3 filtering is not used                         |
| Access Barring Information      |                   | -    | Not Sent | No additional delays in random access procedure. |
| T1                              |                   | s    | 5        |  |
| T2                              |                   | s    | ≤2       |  |

**Table A.6.3.3.2.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case**

| Parameter                                |                  | Unit        | Cell 1                      |        | Cell 2    |        |
|--|------------------|-------------|-----------------------------|--------|-----------|--------|
|  |                  |             | T1                          | T2     | T1        | T2     |
| NR RF Channel Number                     |                  |             | 1                           |        | 2         |        |
| Duplex mode                              | Config 1         |             | FDD                         |        |           |        |
|  | Config 2,3       |             | TDD                         |        |           |        |
| TDD configuration                        | Config 1         |             | Not Applicable              |        |           |        |
|  | Config 2         |             | TDDConf.1.1                 |        |           |        |
|  | Config 3         |             | TDDConf.2.1                 |        |           |        |
| BW <sub>channel</sub>                    | Config 1         | MHz         | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 2         |             | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 3         |             | 40: N <sub>RB,c</sub> = 106 |        |           |        |
| BWP BW                                   | Config 1         | MHz         | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 2         |             | 10: N <sub>RB,c</sub> = 52  |        |           |        |
|  | Config 3         |             | 40: N <sub>RB,c</sub> = 106 |        |           |        |
| TRS configuration                        | Config 1         |             | TRS.1.1 FDD                 |        |           |        |
|  | Config 2         |             | TRS.1.1 TDD                 |        |           |        |
|  | Config 3         |             | TRS.1.2 TDD                 |        |           |        |
| DRx Cycle                                |                  | ms          | Not Applicable              |        |           |        |
| Gap pattern ID                           |                  |             | gp0                         |        |           |        |
| PDSCH Reference measurement channel      | Config 1         |             | SR.1.1 FDD                  |        |           |        |
|  | Config 2         |             | SR.1.1 TDD                  |        |           |        |
|  | Config 3         |             | SR2.1 TDD                   |        |           |        |
| CORESET Reference Channel                | Config 1         |             | CR.1.1 FDD                  |        |           |        |
|  | Config 2         |             | CR.1.1 TDD                  |        |           |        |
|  | Config 3         |             | CR2.1 TDD                   |        |           |        |
| OCNG Patterns                            |                  |             | OCNG pattern 1              |        |           |        |
| SMTc Configuration                       |                  |             | SMTc pattern 1              |        |           |        |
| SSB Configuration                        | Config 1,2       |             | SSB.1 FR1                   |        |           |        |
|  | Config 3         |             | SSB.2 FR1                   |        |           |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz         | 15 kHz                      |        |           |        |
|  | Config 3         |             | 30 kHz                      |        |           |        |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz         | 15 kHz                      |        |           |        |
|  | Config 3         |             | 30 kHz                      |        |           |        |
| PRACH configuration                      |                  |             | FR1 PRACH configuration 1   |        |           |        |
| BWP                                      | Initial DL BWP   |             | DLBWP.0.1                   |        |           |        |
|  | Dedicated DL BWP |             | DLBWP.1.1                   |        |           |        |
|  | Initial UL BWP   |             | ULBWP.0.1                   |        |           |        |
|  | Dedicated UL BWP |             | ULBWP.1.1                   |        |           |        |
| EPRE ratio of PSS to SSS                 |                  | dB          | 0                           |        |           |        |
| EPRE ratio of PBCH DMRS to SSS           |                  |             |                             |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS          |                  |             |                             |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS          |                  |             |                             |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |             |                             |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS          |                  |             |                             |        |           |        |
| EPRE ratio of PDSCH to PDSCH             |                  |             |                             |        |           |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |             |                             |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |             |                             |        |           |        |
| N <sub>oc</sub> <sup>Note2</sup>         |                  | dBm/15kHz   | -98                         |        | -98       |        |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2       | dBm/SCS     | -98                         |        | -98       |        |
|  | Config 3         |             | -95                         |        | -95       |        |
| $\hat{E}_s / I_{ot}$                     |                  | dB          | 4                           | 4      | -Infinity | 5      |
| $\hat{E}_s / N_{oc}$                     |                  | dB          | 4                           | 4      | -Infinity | 5      |
| SSB <sub>RP</sub>                        | Config 1,2       | dBm/SCS     | -94                         | -94    | -Infinity | -93    |
|  | Config 3         | dBm/SCS     | -91                         | -91    | -Infinity | -90    |
| I <sub>o</sub> <sup>Note3</sup>          |                  | dBm/9.36MHz | -64.59                      | -64.59 | -70.05    | -63.85 |

|                       |  |                  |        |        |        |        |
|-----------------------|--|------------------|--------|--------|--------|--------|
|                       | Config 3   | dBm/<br>38.16MHz | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition |  | -                | AWGN   |        | AWGN   |        |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |        |        |        |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |        |        |
| Note 3:               | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |        |        |        |        |

### A.6.3.3.2.3 Test Requirements

$T_{RRC} + T_{Event\_DU}$  occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{measure} + T_{interrupt} + T_{CHO\_execution} = 920 + 62 + 10 = 992$  ms from the start of T2 and the interruption during T2 shall not exceed  $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} = 40 + 20 + 2 = 62$ ms excluding any transmissions which do not occur due to measurement gaps.

Inter-frequency CHO FR1-FR1  $920 (T_{measure}) + 62 (T_{interrupt}) + 10 (T_{CHO\_execution}) = 992$  62 m

## A.6.4 Timing

### A.6.4.1 UE transmit timing

#### A.6.4.1.1 NR UE Transmit Timing Test for FR1

##### A.6.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table A.6.4.1.1.1-1.

**Table A.6.4.1.1.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description  |
|---------------|--|
| 1             | NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                               |
| 2             | NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                               |
| 3             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                               |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

For this test a single NR cell is used. Table A.6.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.6.4.1.1.1-3.

**Table A.6.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter                                | Unit        | Config | Test1                       | Test2                       |
|--|-------------|--------|-----------------------------|-----------------------------|
| SSB ARFCN                                |             | 1,2,3  | 1                           | 1                           |
| TDD configuration                        |             | 1      | Not Applicable              |                             |
|  |             | 2      | TDDConf.1.1                 |                             |
|  |             | 3      | TDDConf.2.1                 |                             |
| BW <sub>channel</sub>                    | MHz         | 1      | 10: N <sub>RB,c</sub> = 52  |                             |
|  |             | 2      | 10: N <sub>RB,c</sub> = 52  |                             |
|  |             | 3      | 40: N <sub>RB,c</sub> = 106 |                             |
| Initial BWP Configuration                |             | 1,2,3  | DLBWP.0.1<br>ULBWP.0.1      |                             |
| Dedicated BWP Configuration              |             | 1,2,3  | DLBWP.1.1<br>ULBWP.1.1      |                             |
| DRx Cycle                                | ms          | 1,2,3  | N/A                         | DRX.8 <sup>Note5</sup>      |
| PDSCH Reference measurement channel      |             | 1      | SR.1.1 FDD                  |                             |
|  |             | 2      | SR.1.1 TDD                  |                             |
|  |             | 3      | SR.2.1 TDD                  |                             |
| RMSI CORESET Reference Channel           |             | 1      | CR.1.1 FDD                  |                             |
|  |             | 2      | CR.1.1 TDD                  |                             |
|  |             | 3      | CR.2.1 TDD                  |                             |
| Dedicated CORESET Reference Channel      |             | 1      | CCR.1.1 FDD                 |                             |
|  |             | 2      | CCR.1.1 TDD                 |                             |
|  |             | 3      | CCR.2.1 TDD                 |                             |
| OCNG Patterns                            |             | 1,2,3  | OP.1                        |                             |
| SSB configuration                        |             | 1,2    | SSB.1 FR1                   |                             |
|  |             | 3      | SSB.2 FR1                   |                             |
| SMTC Configuration                       |             | 1,2    | SMTC.1                      |                             |
|  |             | 3      | SMTC.2                      |                             |
| TRS configuration                        |             | 1      | TRS.1.1 FDD                 |                             |
|  |             | 2      | TRS.1.1 TDD                 |                             |
|  |             | 3      | TRS.1.2 TDD                 |                             |
| EPRE ratio of PSS to SSS                 | dB          | 1,2,3  | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS           |             |        |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS          |             |        |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS          |             |        |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS        |             |        |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS          |             |        |                             |                             |
| EPRE ratio of PDSCH to PDSCH             |             |        |                             |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |             |        |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |             |        |                             |                             |
| $N_{oc}$ <sup>Note2</sup>                |             |        |                             |                             |
| $N_{oc}$ <sup>Note2</sup>                | dBm/SCS     | 1,2    | -98                         | -98                         |
|  |             | 3      | -95                         | -95                         |
| $\hat{E}_s/I_{ot}$                       |             | 1,2,3  | 3                           | 3                           |
| $\hat{E}_s/N_{oc}$                       |             | 1,2,3  | 3                           | 3                           |
| SS-RSRP <sup>Note3</sup>                 | dBm/SCS     | 1,2    | -95                         | -95                         |
|  |             | 3      | -92                         | -92                         |
| I <sub>o</sub> <sup>Note3</sup>          | dBm/9.36MHz | 1,2    | -65.2                       | -65.2                       |
|  | dBm/38.1MHz | 3      | -59.2                       | -59.2                       |
| Propagation condition                    |             | 1,2,3  | AWGN                        |                             |
| SRS Config                               |             | 1,2    | SRSCConf.1 <sup>Note6</sup> | SRSCConf.3 <sup>Note6</sup> |
|  |             | 3      | SRSCConf.1 <sup>Note6</sup> | SRSCConf.2 <sup>Note6</sup> |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |
| Note 5: | DRx related parameters are given in Table A.3.3.8-1  |
| Note 6: | SRS configs are given in Table A.6.4.1.1.1-3   |

**Table A.6.4.1.1.1-3: SRS Configuration for Timing Accuracy Test**

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

**Table A.6.4.1.1.1-4: Void****A.6.4.1.1.2 Test requirements**

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Setup NR PCell according to parameters given in Table A.6.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.



- a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600
  - b. The  $T_c$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.6.4.1.1.2-1

**Table A.6.4.1.1.2-1: Adjustment Value for DL Timing**

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

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

## A.6.4.2 UE timer accuracy

### A.6.4.3 Timing advance

#### A.6.4.3.1 SA FR1 timing advance adjustment accuracy

##### A.6.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

##### A.6.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.6.4.3.1.2-2, A.6.4.3.1.2-3 and A.6.4.3.1.2-4.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.6.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.6.4.3.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.3.2.1, the UE adjusts its uplink timing at slot  $n+k$  for a timing advance command received in slot  $n$ . This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

**Table A.6.4.3.1.2-1: Timing advance supported test configurations**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.6.4.3.1.2-2: General test parameters for timing advance**

| Parameter  | Unit | Value     | Comment  |
|--|------|-----------|--|
| RF channel number                                |      | 1         |  |
| Initial DL BWP                                   |      | DLBWP.0.1 | As specified in Table A.3.9.2.1-1  |
| Dedicated DL BWP                                 |      | DLBWP.1.1 | As specified in Table A.3.9.2.2-1  |
| Initial UL BWP                                   |      | ULBWP.0.1 | As specified in Table A.3.9.3.1-1  |
| Dedicated UL BWP                                 |      | ULBWP.1.1 | As specified in Table A.3.9.3.2-1  |
| Timing Advance Command ( $T_A$ ) value during T1 |      | 31        | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2                |
| Timing Advance Command ( $T_A$ ) value during T2 |      | 39        | For 15 kHz SCS $N_{TA\_new} = N_{TA\_old} + 8192 * T_c$<br>For 30 kHz SCS $N_{TA\_new} = N_{TA\_old} + 4096 * T_c$<br>(based on equation in clause 4.2 of TS 38.213 [3]) |
| T1   | s    | 5         |  |
| T2   | s    | 5         |  |

**Table A.6.4.3.1.2-3: Cell specific test parameters for timing advance**

| Parameter                                |            | Unit         | Test1                       |    |
|--|------------|--------------|-----------------------------|----|
|  |            |              | T1                          | T2 |
| Duplex mode                              | Config 1   |              | FDD                         |    |
|  | Config 2,3 |              | TDD                         |    |
| TDD configuration                        | Config 1   |              | Not Applicable              |    |
|  | Config 2   |              | TDDConf.1.1                 |    |
|  | Config 3   |              | TDDConf.2.1                 |    |
| BW <sub>channel</sub>                    | Config 1   | MHz          | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 2   |              | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 3   |              | 40: N <sub>RB,c</sub> = 106 |    |
| BWP BW                                   | Config 1   | MHz          | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 2   |              | 10: N <sub>RB,c</sub> = 52  |    |
|  | Config 3   |              | 40: N <sub>RB,c</sub> = 106 |    |
| DRx Cycle                                |            | ms           | Not Applicable              |    |
| PDSCH Reference measurement channel      | Config 1   |              | SR.1.1 FDD                  |    |
|  | Config 2   |              | SR.1.1 TDD                  |    |
|  | Config 3   |              | SR2.1 TDD                   |    |
| RMSI CORESET Reference Channel           | Config 1   |              | CR.1.1 FDD                  |    |
|  | Config 2   |              | CR.1.1 TDD                  |    |
|  | Config 3   |              | CR2.1 TDD                   |    |
| CORESET Reference Channel                | Config 1   |              | CCR.1.1 FDD                 |    |
|  | Config 2   |              | CCR.1.1 TDD                 |    |
|  | Config 3   |              | CCR.2.1 TDD                 |    |
| TRS configuration                        | Config 1,4 |              | TRS.1.1 FDD                 |    |
|  | Config 2,5 |              | TRS.1.1 TDD                 |    |
|  | Config 3,6 |              | TRS.1.2 TDD                 |    |
| OCNG Patterns                            |            |              | OCNG pattern 1              |    |
| SMTC configuration                       | Config 1,2 |              | SMTC.1 FR1                  |    |
|  | Config 3   |              | SMTC.2 FR1                  |    |
| SSB configuration                        | Config 1,2 |              | SSB.1 FR1                   |    |
|  | Config 3   |              | SSB.2 FR1                   |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2 | kHz          | 15 kHz                      |    |
|  | Config 3   |              | 30 kHz                      |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2 | kHz          | 15 kHz                      |    |
|  | Config 3   |              | 30 kHz                      |    |
| EPRE ratio of PSS to SSS                 |            | dB           | 0                           |    |
| EPRE ratio of PBCH DMRS to SSS           |            |              |                             |    |
| EPRE ratio of PBCH to PBCH DMRS          |            |              |                             |    |
| EPRE ratio of PDCCH DMRS to SSS          |            |              |                             |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |              |                             |    |
| EPRE ratio of PDSCH DMRS to SSS          |            |              |                             |    |
| EPRE ratio of PDSCH to PDSCH             |            |              |                             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |              |                             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |              |                             |    |
| $N_{oc}$ <sup>Note2</sup>                |            |              |                             |    |
| $N_{oc}$ <sup>Note2</sup>                | Config 1,2 | dBm/SCS      | -98                         |    |
|  | Config 3   |              | -95                         |    |
| $\hat{E}_s / I_{\alpha}$                 |            | dB           | 3                           |    |
| $\hat{E}_s / N_{oc}$                     |            | dB           | 3                           |    |
| $I_0$ <sup>Note3</sup>                   | Config 1,2 | dBm/9.36MHz  | -67.57                      |    |
|  | Config 3   | dBm/38.16MHz | -62.58                      |    |
| Propagation condition                    |            | -            | AWGN                        |    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{ac}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |

**Table A.6.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance**

| Field                    | Value  | Comment   |
|--------------------------|--|---|
| c-SRS                    | Config 1,2   | Frequency hopping is disabled   |
|                          | Config 3   |   |
| b-SRS                    | 0  |   |
| b-hop                    | 0  |   |
| freqDomainPosition       | 0  | Frequency domain position of SRS  |
| freqDomainShift          | 0  |   |
| groupOrSequenceHopping   | neither  | No group or sequence hopping  |
| SRS-PeriodicityAndOffset | sl5=2 for SCS<br>15kHz<br>sl5=4 for SCS<br>30kHz           | Once every 5 slots  |
| pathlossReferenceRS      | ssb-Index=0  | SSB #0 is used for SRS path loss estimation   |
| usage                    | Codebook   | Codebook based UL transmission  |
| startPosition            | 0  | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols              | n1   |   |
| repetitionFactor         | n1   |   |
| combOffset-n2            | 0  | transmissionComb setting  |
| cyclicShift-n2           | 0  |   |
| nrofSRS-Ports            | port1  | Number of antenna ports used for SRS transmission   |
| Note:                    | For further information see clause 6.3.2 in TS 38.331 [2]. |   |

### A.6.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e.  $k+1$  slots after the reception of the timing advance command, where  $k=5$ .

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3.2.2.

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

## A.6.5 Signalling characteristics

### A.6.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means no uplink signal.

### A.6.5.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

#### A.6.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.6.5.1.1.1-1. The test parameters are given in Tables A.6.5.1.1.1-2, A.6.5.1.1.1-3, and A.6.5.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

**Table A.6.5.1.1.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description  |
|---------------|--|
| 1             | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 2             | TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 3             | TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                                    |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.6.5.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode**

| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active PCell                                 |  |      | Cell 1                      |
| RF Channel Number                            |  |      | 1                           |
| Duplex mode                                  | Config 1   |      | FDD                         |
|  | Config 2, 3  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1   | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3   |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3   |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3   |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3   |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1   |      | Not Applicable              |
|  | Config 2   |      | TDDConf.1.1                 |
|  | Config 3   |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1   |      | CR.1.1 FDD                  |
|  | Config 2   |      | CR.1.1 TDD                  |
|  | Config 3   |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1   |      | CCR.1.3 FDD                 |
|  | Config 2   |      | CCR.1.3 TDD                 |
|  | Config 3   |      | CCR.2.2 TDD                 |
| SSB Configuration                            | Config 1   |      | SSB.1 FR1                   |
|  | Config 2   |      | SSB.1 FR1                   |
|  | Config 3   |      | SSB.2 FR1                   |
| SMTC Configuration                           | Config 1, 2  |      | SMTC.1                      |
|  | Config 3   |      | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2  |      | 15 kHz                      |
|  | Config 3   |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2  |      | Table A.3.8.2.1-1           |
|  | Config 3   |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| Out of sync transmission parameters          | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 8                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|  | DMRS precoder granularity  |      | REG bundle size             |
|  | REG bundle size  |      | 6                           |
| DRX  |  |      | OFF                         |
| Gap pattern ID                               |  |      | gp0                         |
| Layer 3 filtering                            |  |      | Enabled                     |
| T310 timer                                   |  | ms   | 0                           |
| T311 timer                                   |  | ms   | 1000                        |
| N310   |  |      | 1                           |
| N311   |  |      | 1                           |



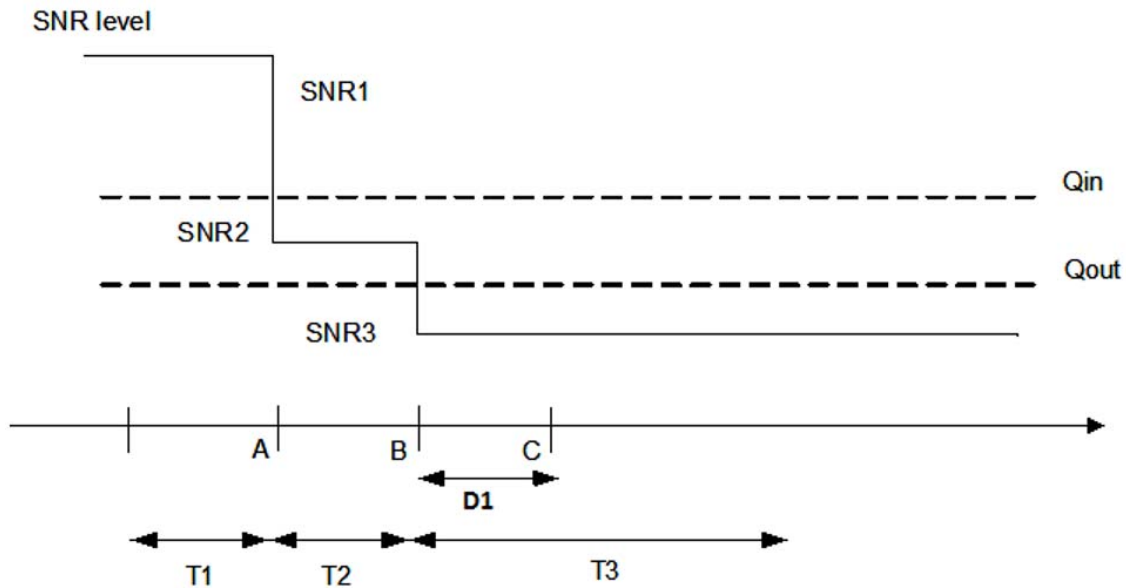
|   |          |   |                |
|---|----------|---|----------------|
| CSI-RS configuration for CSI reporting  | Config 1 |   | CSI-RS.1.1 FDD |
|   | Config 2 |   | CSI-RS.1.1 TDD |
|   | Config 3 |   | CSI-RS.2.1 TDD |
| CSI-RS for tracking   | Config 1 |   | TRS.1.1 FDD    |
|   | Config 2 |   | TRS.1.1 TDD    |
|   | Config 3 |   | TRS.1.2 TDD    |
| T1  |          | s | 0.2            |
| T2  |          | s | 0.48           |
| T3  |          | s | 0.48           |
| D1  |          | s | 0.44           |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |          |   |                |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |          |   |                |

**Table A.6.5.1.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter   | Unit     | Test 1    |                   |    |     |
|---|----------|-----------|-------------------|----|-----|
|   |          | T1        | T2                | T3 |     |
| EPRE ratio of PDCCH DMRS to SSS   | dB       | 4         |                   |    |     |
| EPRE ratio of PDCCH to PDCCH DMRS   | dB       | 0         |                   |    |     |
| EPRE ratio of PBCH DMRS to SSS  | dB       | 0         |                   |    |     |
| EPRE ratio of PBCH to PBCH DMRS   | dB       |           |                   |    |     |
| EPRE ratio of PSS to SSS  | dB       |           |                   |    |     |
| EPRE ratio of PDSCH DMRS to SSS   | dB       |           |                   |    |     |
| EPRE ratio of PDSCH to PDSCH DMRS   | dB       |           |                   |    |     |
| EPRE ratio of OCNG DMRS to SSS  | dB       |           |                   |    |     |
| EPRE ratio of OCNG to OCNG DMRS   | dB       |           |                   |    |     |
| SNR on RLM-RS   | Config 1 | dB        | 1                 | -7 | -15 |
|   | Config 2 |           | 1                 | -7 | -15 |
|   | Config 3 |           | 1                 | -7 | -15 |
| $N_{oc}$  | Config 1 | dBm/15kHz | -98               |    |     |
|   | Config 2 |           | -98               |    |     |
|   | Config 3 |           | -98               |    |     |
| $N_{oc}$  | Config 1 | dBm/SCS   | -98               |    |     |
|   | Config 2 |           | -98               |    |     |
|   | Config 3 |           | -95               |    |     |
| Propagation condition   |          |           | TDL-C 300ns 100Hz |    |     |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.      |          |           |                   |    |     |
| Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.   |          |           |                   |    |     |
| Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  |          |           |                   |    |     |
| Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1.1.1-1.   |          |           |                   |    |     |
| Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. |          |           |                   |    |     |

**Table A.6.5.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode**

| Field   | Test 1 |
|---|--------|
|   | Value  |
| gapOffset   | 0      |
| Note: Ensure that RLM RS is partially overlapped with measurement gap |        |



**Figure A.6.5.1.1.1-1: SNR variation for out-of-sync testing**

#### A.6.5.1.1.2 Test Requirements

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

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

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

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

#### A.6.5.1.2 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

##### A.6.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.6.5.1.2.1-1. The test parameters are given in Tables A.6.5.1.2.1-2, and A.6.5.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

**Table A.6.5.1.2.1-1: Supported test configurations for FR1 PCell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 2                    | TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 3                    | TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                                    |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.6.5.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode**

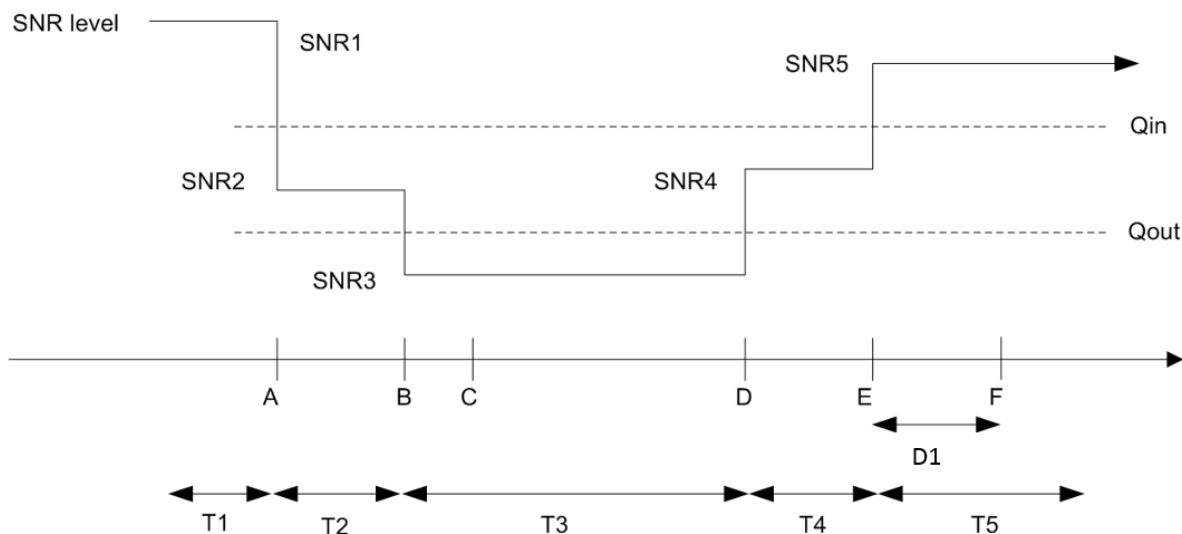
| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active PCell                                 |  |      | Cell 1                      |
| RF Channel Number                            |  |      | 1                           |
| Duplex mode                                  | Config 1   |      | FDD                         |
|  | Config 2, 3  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1   | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3   |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3   |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3   |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3   |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1   |      | Not Applicable              |
|  | Config 2   |      | TDDConf.1.1                 |
|  | Config 3   |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1   |      | CR.1.1 FDD                  |
|  | Config 2   |      | CR.1.1 TDD                  |
|  | Config 3   |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1   |      | CCR.1.1 FDD                 |
|  | Config 2   |      | CCR.1.1 TDD                 |
|  | Config 3   |      | CCR.2.1 TDD                 |
| SSB Configuration                            | Config 1   |      | SSB.1 FR1                   |
|  | Config 2   |      | SSB.1 FR1                   |
|  | Config 3   |      | SSB.2 FR1                   |
| SMTC Configuration                           | Config 1, 2  |      | SMTC.1                      |
|  | Config 3   |      | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2  |      | 15 kHz                      |
|  | Config 3   |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2  |      | Table A.3.8.2.1-1           |
|  | Config 3   |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| In sync transmission parameters              | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 4                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                           |
|  | DMRS precoder granularity  |      | REG bundle size             |
|  | REG bundle size  |      | 6                           |
| Out of sync transmission parameters          | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 8                           |

|   |  |    |                 |
|---|--|----|-----------------|
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB | 4               |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4               |
|   | DMRS precoder granularity  |    | REG bundle size |
|   | REG bundle size  |    | 6               |
| DRX   |  |    | <i>OFF</i>      |
| Gap pattern ID  |  |    | N.A.            |
| Layer 3 filtering   |  |    | <i>Enabled</i>  |
| T310 timer  |  | ms | 1000            |
| T311 timer  |  | ms | 1000            |
| N310  |  |    | 1               |
| N311  |  |    | 1               |
| CSI-RS configuration for CSI reporting  | Config 1   |    | CSI-RS.1.1 FDD  |
|   | Config 2   |    | CSI-RS.1.1 TDD  |
|   | Config 3   |    | CSI-RS.2.1 TDD  |
| CSI-RS for tracking   | Config 1, 4  |    | TRS.1.1 FDD     |
|   | Config 2, 5  |    | TRS.1.1 TDD     |
|   | Config 3, 6  |    | TRS.1.2 TDD     |
| T1  |  | s  | 0.2             |
| T2  |  | s  | 0.2             |
| T3  |  | s  | 0.24            |
| T4  |  | s  | 0.2             |
| T5  |  | s  | 0.88            |
| D1  |  | s  | 0.84            |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |    |                 |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |    |                 |

**Table A.6.5.1.2.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter   |          | Unit              | Test 1            |    |     |      |    |
|---|----------|-------------------|-------------------|----|-----|------|----|
|   |          |                   | T1                | T2 | T3  | T4   | T5 |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of PBCH DMRS to SSS  |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of PSS to SSS  |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of OCNG DMRS to SSS  |          | dB                | 0                 |    |     |      |    |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB                | 0                 |    |     |      |    |
| SNR on RLM-RS   | Config 1 | dB                | 1                 | -7 | -15 | -4.5 | 1  |
|   | Config 2 |                   | 1                 | -7 | -15 | -4.5 | 1  |
|   | Config 3 |                   | 1                 | -7 | -15 | -4.5 | 1  |
| $N_{oc}$  | Config 1 | dBm/<br>15<br>kHz | -98               |    |     |      |    |
|   | Config 2 |                   | -98               |    |     |      |    |
|   | Config 3 |                   | -98               |    |     |      |    |
| $N_{oc}$  | Config 1 | dBm/<br>SCS       | -98               |    |     |      |    |
|   | Config 2 |                   | -98               |    |     |      |    |
|   | Config 3 |                   | -95               |    |     |      |    |
| Propagation condition   |          |                   | TDL-C 300ns 100Hz |    |     |      |    |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.2.1-1.</p> <p>Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.</p> |          |                   |                   |    |     |      |    |

**Table A.6.5.1.2.1-4: Void**



**Figure A.6.5.1.2.1-1: SNR variation for in-sync testing**

### A.6.5.1.2.2 Test Requirements

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

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

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

### A.6.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

#### A.6.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.6.5.1.3.1-1. The test parameters are given in Tables A.6.5.1.3.1-2, and A.6.5.1.3.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.6.5.1.3.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description  |
|---------------|--|
| 1             | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 2             | TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 3             | TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                                    |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR1 |



**Table A.6.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in DRX mode**

| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active PCell                                 |  |      | Cell 1                      |
| RF Channel Number                            |  |      | 1                           |
| Duplex mode                                  | Config 1   |      | FDD                         |
|  | Config 2, 3  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1   | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3   |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3   |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3   |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3   |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1   |      | Not Applicable              |
|  | Config 2   |      | TDDConf.1.1                 |
|  | Config 3   |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1   |      | CR.1.1 FDD                  |
|  | Config 2   |      | CR.1.1 TDD                  |
|  | Config 3   |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1   |      | CCR.1.3 FDD                 |
|  | Config 2   |      | CCR.1.3 TDD                 |
|  | Config 3   |      | CCR.2.2 TDD                 |
| SSB Configuration                            | Config 1   |      | SSB.1 FR1                   |
|  | Config 2   |      | SSB.1 FR1                   |
|  | Config 3   |      | SSB.2 FR1                   |
| SMTTC Configuration                          | Config 1, 2  |      | SMTTC.1                     |
|  | Config 3   |      | SMTTC.1                     |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2  |      | 15 kHz                      |
|  | Config 3   |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2  |      | Table A.3.8.2.1-1           |
|  | Config 3   |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| Out of sync transmission parameters          | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 8                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |

|   |                           |    |                 |
|---|---------------------------|----|-----------------|
|   | DMRS precoder granularity |    | REG bundle size |
|   | REG bundle size           |    | 6               |
| DRX Configuration   |                           |    | DRX.3           |
| Gap pattern ID  |                           |    | N.A.            |
| Layer 3 filtering   |                           |    | <i>Enabled</i>  |
| T310 timer  |                           | ms | 0               |
| T311 timer  |                           | ms | 1000            |
| N310  |                           |    | 1               |
| N311  |                           |    | 1               |
| CSI-RS configuration for CSI reporting  | Config 1                  |    | CSI-RS.1.1 FDD  |
|   | Config 2                  |    | CSI-RS.1.1 TDD  |
|   | Config 3                  |    | CSI-RS.2.1 TDD  |
| CSI-RS for tracking   | Config 1                  |    | TRS.1.1 FDD     |
|   | Config 2                  |    | TRS.1.1 TDD     |
|   | Config 3                  |    | TRS.1.2 TDD     |
| T1  |                           | s  | 0.2             |
| T2  |                           | s  | 0.68            |
| T3  |                           | s  | 0.68            |
| D1  |                           | s  | 0.64            |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |                           |    |                 |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |                           |    |                 |

**Table A.6.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter   |          | Unit       | Test 1            |    |     |
|---|----------|------------|-------------------|----|-----|
|   |          |            | T1                | T2 | T3  |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB         | 4                 |    |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB         | 0                 |    |     |
| EPRE ratio of PBCH DMRS to SSS  |          | dB         | 0                 |    |     |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB         |                   |    |     |
| EPRE ratio of PSS to SSS  |          | dB         |                   |    |     |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB         |                   |    |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB         |                   |    |     |
| EPRE ratio of OCNG DMRS to SSS  |          | dB         |                   |    |     |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB         |                   |    |     |
| SNR on RLM-RS   | Config 1 | dB         | 1                 | -7 | -15 |
|   | Config 2 |            | 1                 | -7 | -15 |
|   | Config 3 |            | 1                 | -7 | -15 |
| $N_{oc}$  | Config 1 | dBm/15 kHz | -98               |    |     |
|   | Config 2 |            | -98               |    |     |
|   | Config 3 |            | -98               |    |     |
| $N_{oc}$  | Config 1 | dBm/S CS   | -98               |    |     |
|   | Config 2 |            | -98               |    |     |
|   | Config 3 |            | -95               |    |     |
| Propagation condition   |          |            | TDL-C 300ns 100Hz |    |     |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.      |          |            |                   |    |     |
| Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.   |          |            |                   |    |     |
| Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  |          |            |                   |    |     |
| Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1.3.1-1.   |          |            |                   |    |     |
| Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. |          |            |                   |    |     |

Table A.6.5.1.3.1-4: Void

Table A.6.5.1.3.1-5: Void

Table A.6.5.1.3.1-6: Void

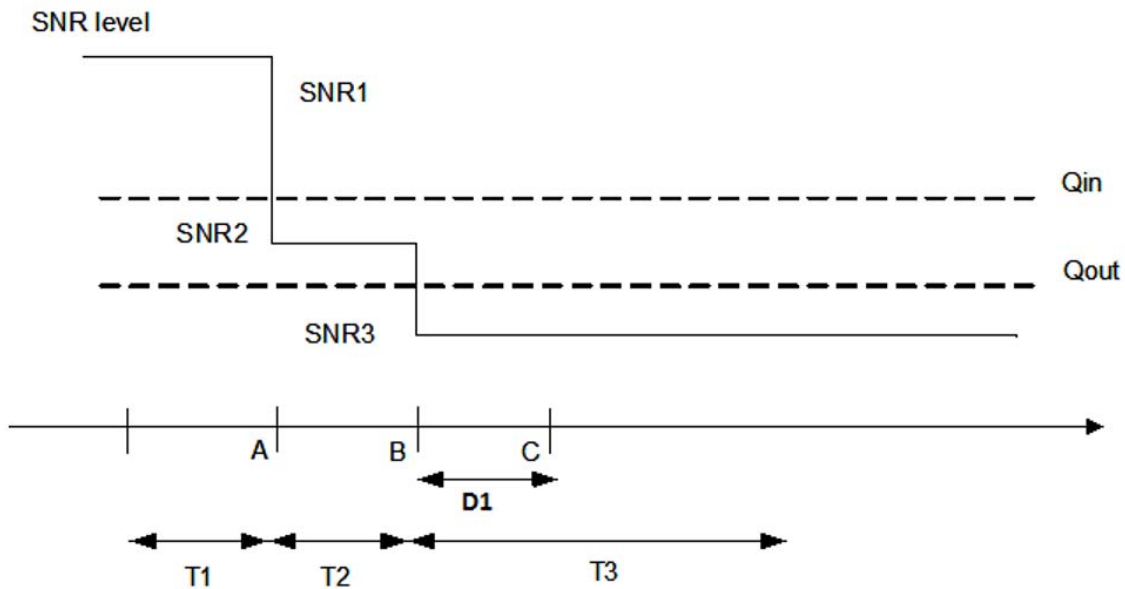


Figure A.6.5.1.3.1-1: SNR variation for out-of-sync testing

### A.6.5.1.3.2 Test Requirements

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

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

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

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

### A.6.5.1.4 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

#### A.6.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.6.5.1.4.1-1. The test parameters are given in Tables A.6.5.1.4.1-2, and A.6.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.6.5.1.4.1-1: Supported test configurations for FR1 PCell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 2                    | TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                                    |
| 3                    | TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                                    |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.6.5.1.4.1-2: General test parameters for FR1 in-sync testing in DRX mode**

| Parameter                                    |  | Unit | Value                       |
|--|--|------|-----------------------------|
|  |  |      | Test 1                      |
| Active PCell                                 |  |      | Cell 1                      |
| RF Channel Number                            |  |      | 1                           |
| Duplex mode                                  | Config 1   |      | FDD                         |
|  | Config 2, 3  |      | TDD                         |
| BW <sub>channel</sub>                        | Config 1   | MHz  | 10: N <sub>RB,c</sub> = 52  |
|  | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |
|  | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |
| DL initial BWP configuration                 | Config 1, 2, 3   |      | DLBWP.0.1                   |
| DL dedicated BWP configuration               | Config 1, 2, 3   |      | DLBWP.1.1                   |
| UL initial BWP configuration                 | Config 1, 2, 3   |      | ULBWP.0.1                   |
| UL dedicated BWP configuration               | Config 1, 2, 3   |      | ULBWP.1.1                   |
| TDD Configuration                            | Config 1   |      | Not Applicable              |
|  | Config 2   |      | TDDConf.1.1                 |
|  | Config 3   |      | TDDConf.2.1                 |
| RMSI CORESET Reference Channel               | Config 1   |      | CR.1.1 FDD                  |
|  | Config 2   |      | CR.1.1 TDD                  |
|  | Config 3   |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel          | Config 1   |      | CCR.1.1 FDD                 |
|  | Config 2   |      | CCR.1.1 TDD                 |
|  | Config 3   |      | CCR.2.1 TDD                 |
| SSB Configuration                            | Config 1   |      | SSB.1 FR1                   |
|  | Config 2   |      | SSB.1 FR1                   |
|  | Config 3   |      | SSB.2 FR1                   |
| SMTTC Configuration                          | Config 1, 2  |      | SMTTC.1                     |
|  | Config 3   |      | SMTTC.1                     |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2  |      | 15 kHz                      |
|  | Config 3   |      | 30 kHz                      |
| PRACH Configuration                          | Config 1, 2  |      | Table A.3.8.2.1-1           |
|  | Config 3   |      | Table A.3.8.2.1-1           |
| SSB index assigned as RLM RS                 |  |      | 0                           |
| OCNG parameters                              |  |      | OP.1                        |
| CP length                                    |  |      | Normal                      |
| Correlation Matrix and Antenna Configuration |  |      | 2x2 Low                     |
| In sync transmission parameters              | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 4                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                           |
|  | DMRS precoder granularity  |      | REG bundle size             |
|  | REG bundle size  |      | 6                           |
| Out of sync transmission parameters          | DCI format   |      | 1-0                         |
|  | Number of Control OFDM symbols                                   |      | 2                           |
|  | Aggregation level  | CCE  | 8                           |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|  | DMRS precoder granularity  |      | REG bundle size             |
|  | REG bundle size  |      | 6                           |
| DRX Configuration                            |  |      | DRX.3                       |

|   |          |    |                |
|---|----------|----|----------------|
| Gap pattern ID  |          |    | N.A.           |
| Layer 3 filtering   |          |    | <i>Enabled</i> |
| T310 timer  |          | ms | 2000           |
| T311 timer  |          | ms | 1000           |
| N310  |          |    | 1              |
| N311  |          |    | 1              |
| CSI-RS configuration for CSI reporting  | Config 1 |    | CSI-RS.1.1 FDD |
|   | Config 2 |    | CSI-RS.1.1 TDD |
|   | Config 3 |    | CSI-RS.2.1 TDD |
| CSI-RS for tracking   | Config 1 |    | TRS.1.1 FDD    |
|   | Config 2 |    | TRS.1.1 TDD    |
|   | Config 3 |    | TRS.1.2 TDD    |
| T1  |          | s  | 0.2            |
| T2  |          | s  | 0.2            |
| T3  |          | s  | 0.64           |
| T4  |          | s  | 0.2            |
| T5  |          | s  | 0.88           |
| D1  |          | s  | 0.84           |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |          |    |                |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |          |    |                |

**Table A.6.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in DRX mode**

| Parameter  |          | Unit       | Test 1            |    |     |      |    |
|--|----------|------------|-------------------|----|-----|------|----|
|  |          |            | T1                | T2 | T3  | T4   | T5 |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB         | 0                 |    |     |      |    |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB         | 0                 |    |     |      |    |
| EPRE ratio of PBCH DMRS to SSS   |          | dB         | 0                 |    |     |      |    |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB         |                   |    |     |      |    |
| EPRE ratio of PSS to SSS   |          | dB         |                   |    |     |      |    |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB         |                   |    |     |      |    |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB         |                   |    |     |      |    |
| EPRE ratio of OCNG DMRS to SSS   |          | dB         |                   |    |     |      |    |
| EPRE ratio of OCNG to OCNG DMRS  |          | dB         |                   |    |     |      |    |
| SNR on RLM-RS  | Config 1 | dB         | 1                 | -7 | -15 | -4.5 | 1  |
|  | Config 2 |            | 1                 | -7 | -15 | -4.5 | 1  |
|  | Config 3 |            | 1                 | -7 | -15 | -4.5 | 1  |
| $N_{oc}$   | Config 1 | dBm/15 kHz | -98               |    |     |      |    |
|  | Config 2 |            | -98               |    |     |      |    |
|  | Config 3 |            | -98               |    |     |      |    |
| $N_{oc}$   | Config 1 | dBm/S CS   | -98               |    |     |      |    |
|  | Config 2 |            | -98               |    |     |      |    |
|  | Config 3 |            | -95               |    |     |      |    |
| Propagation condition  |          |            | TDL-C 300ns 100Hz |    |     |      |    |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |          |            |                   |    |     |      |    |
| Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  |          |            |                   |    |     |      |    |
| Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.   |          |            |                   |    |     |      |    |
| Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.4.1-1.  |          |            |                   |    |     |      |    |
| Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6. |          |            |                   |    |     |      |    |



Table A.6.5.1.4.1-4: Void

Table A.6.5.1.4.1-5: Void

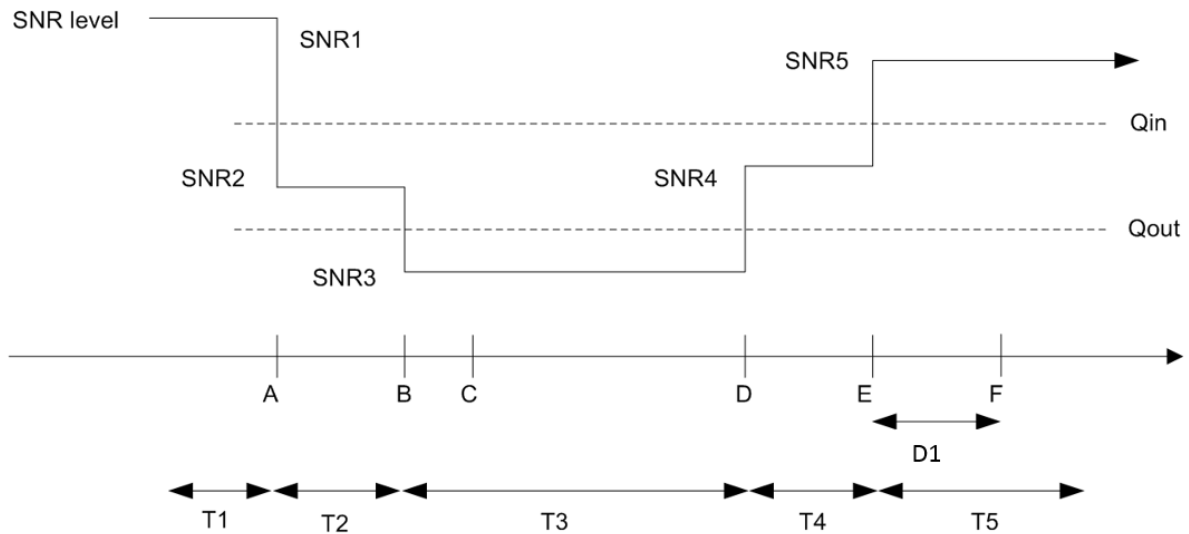


Figure A.6.5.1.4.1-1: SNR variation for in-sync testing.

A.6.5.1.4.2 Test Requirements

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

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

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

A.6.5.1.5 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

A.6.5.1.5.1 Test Purpose and Environment

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

The test parameters are given in Tables A.6.5.1.5.1-1, A.6.5.1.5.1-2, A.6.5.1.5.1-3, and A.6.5.1.5.1-3A below. There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.5.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.5.1-1: Supported test configurations for FR1 PCell

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

**Table A.6.5.1.5.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in non-DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
|  |   |      | Test 1                     |
| Active PCell                                 |   |      | Cell 1                     |
| RF Channel Number                            |   |      | 1                          |
| Duplex mode                                  | Config 1  |      | FDD                        |
|  | Config 2, 3   |      | TDD                        |
| TDD Configuration                            | Config 1  |      | Not Applicable             |
|  | Config 2  |      | TDDConf.1.1                |
|  | Config 3  |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3  |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3  |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3  |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3  |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1  |      | CR.1.1 FDD                 |
|  | Config 2  |      | CR.1.1 TDD                 |
|  | Config 3  |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1  |      | CCR.1.3 FDD                |
|  | Config 2  |      | CCR.1.3 TDD                |
|  | Config 3  |      | CCR.2.2 TDD                |
| SSB Configuration                            | Config 1  |      | SSB.1 FR1                  |
|  | Config 2  |      | SSB.1 FR1                  |
|  | Config 3  |      | SSB.2 FR1                  |
| SMTC Configuration                           | Config 1, 2   |      | SMTC.1                     |
|  | Config 3  |      | SMTC.1                     |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2   |      | 15 kHz                     |
|  | Config 3  |      | 30 kHz                     |
| TRS configuration                            | Config 1  |      | TRS.1.1 FDD                |
|  | Config 2  |      | TRS.1.1 TDD                |
|  | Config 3  |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1  |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2  |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3  |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| DRX  |   |      | OFF                        |
| Gap pattern ID                               |   |      | gp0                        |
| Layer 3 filtering                            |   |      | Enabled                    |
| T310 timer                                   |   | ms   | 0                          |
| T311 timer                                   |   | ms   | 1000                       |
| N310   |   |      | 1                          |
| N311   |   |      | 1                          |
| CSI-RS configuration for CSI reporting       | Config 1  |      | CSI-RS.1.1 FDD             |

|   |          |   |                |
|---|----------|---|----------------|
|   | Config 2 |   | CSI-RS.1.1 TDD |
|   | Config 3 |   | CSI-RS.2.1 TDD |
| T1  |          | s | 0.2            |
| T2  |          | s | 0.88           |
| T3  |          | s | 0.88           |
| D1  |          | s | 0.84           |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |          |   |                |

**Table A.6.5.1.5.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Parameter  |          | Unit      | Test 1            |    |     |
|--|----------|-----------|-------------------|----|-----|
|  |          |           | T1                | T2 | T3  |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB        | 4                 |    |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |          |           | 0                 |    |     |
| EPRE ratio of PBCH DMRS to SSS   |          |           |                   |    |     |
| EPRE ratio of PBCH to PBCH DMRS  |          |           |                   |    |     |
| EPRE ratio of PSS to SSS   |          |           |                   |    |     |
| EPRE ratio of PDSCH DMRS to SSS  |          |           |                   |    |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |          |           |                   |    |     |
| EPRE ratio of OCNG DMRS to SSS   |          |           |                   |    |     |
| EPRE ratio of OCNG to OCNG DMRS  |          |           |                   |    |     |
| SNR on RLM-RS  | Config 1 | dB        | 1                 | -7 | -15 |
|  | Config 2 |           | 1                 | -7 | -15 |
|  | Config 3 |           | 1                 | -7 | -15 |
| $N_{oc}$   | Config 1 | dBm/15kHz | -98               |    |     |
|  | Config 2 |           | -98               |    |     |
|  | Config 3 |           | -98               |    |     |
| Propagation condition  |          |           | TDL-C 300ns 100Hz |    |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.5.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].</p> |          |           |                   |    |     |

**Table A.6.5.1.5.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Field        | Test 1 |
|--------------|--------|
|              | Value  |
| gapOffset    | 0      |
| Note 1: Void |        |

Table A.6.5.1.5.1-4: Void

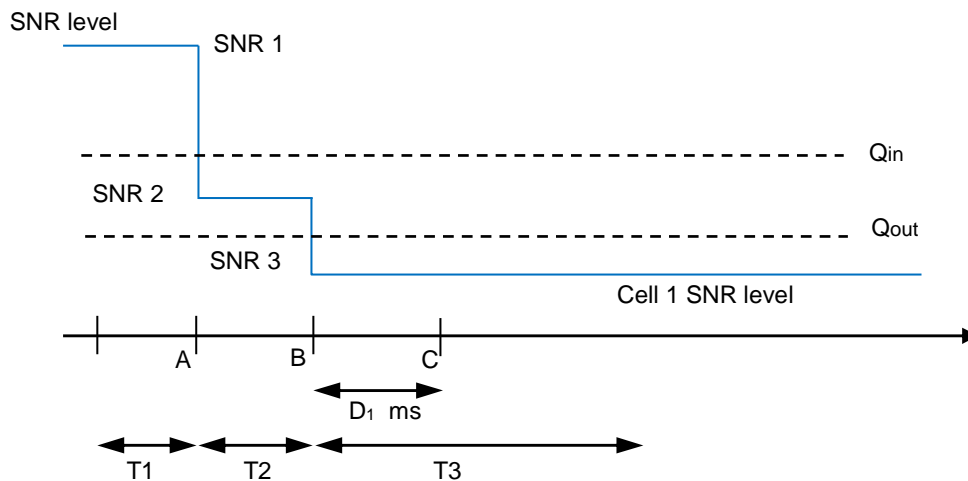


Figure A.6.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

A.6.5.1.5.2 Test Requirements

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ( $D_1$  ms after the start of the time duration T3) on the PCell.

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

A.6.5.1.6 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

A.6.5.1.6.1 Test Purpose and Environment

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

The test parameters are given in Tables A.6.5.1.6.1-1, A.6.5.1.6.1-2, and A.6.5.1.6.1-3 below. There is one cells, cell 1 which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.6.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.6.1-1: Supported test configurations for FR1 PCell

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

**Table A.6.5.1.6.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
|  |   |      | Test 1                     |
| Active PCell                                 |   |      | Cell 1                     |
| RF Channel Number                            |   |      | 1                          |
| Duplex mode                                  | Config 1  |      | FDD                        |
|  | Config 2, 3   |      | TDD                        |
| TDD Configuration                            | Config 1  |      | Not Applicable             |
|  | Config 2  |      | TDDConf.1.1                |
|  | Config 3  |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3  |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3  |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3  |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3  |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1  |      | CR.1.1 FDD                 |
|  | Config 2  |      | CR.1.1 TDD                 |
|  | Config 3  |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1  |      | CCR.1.1 FDD                |
|  | Config 2  |      | CCR.1.1 TDD                |
|  | Config 3  |      | CCR.2.1 TDD                |
| SSB Configuration                            | Config 1  |      | SSB.1 FR1                  |
|  | Config 2  |      | SSB.1 FR1                  |
|  | Config 3  |      | SSB.2 FR1                  |
| SMTTC Configuration                          | Config 1, 2   |      | SMTTC.1                    |
|  | Config 3  |      | SMTTC.1                    |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2   |      | 15 kHz                     |
|  | Config 3  |      | 30 kHz                     |
| TRS configuration                            | Config 1  |      | TRS.1.1 FDD                |
|  | Config 2  |      | TRS.1.1 TDD                |
|  | Config 3  |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1  |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2  |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3  |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| In sync transmission parameters              | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 4                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                          |

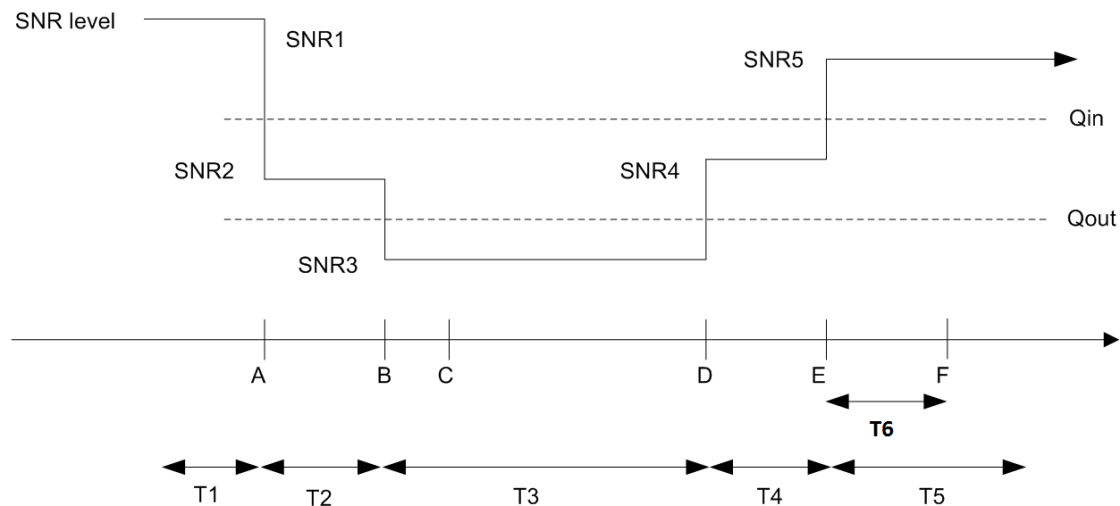
|   |   |    |                 |
|---|---|----|-----------------|
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0               |
|   | DMRS precoder granularity   |    | REG bundle size |
|   | REG bundle size   |    | 6               |
| DRX   |   |    | <i>OFF</i>      |
| Gap pattern ID  |   |    | N.A.            |
| Layer 3 filtering   |   |    | <i>Enabled</i>  |
| T310 timer  |   | ms | 1000            |
| T311 timer  |   | ms | 1000            |
| N310  |   |    | 1               |
| N311  |   |    | 1               |
| CSI-RS configuration for CSI reporting                        | Config 1  |    | CSI-RS.1.1 FDD  |
|   | Config 2  |    | CSI-RS.1.1 TDD  |
|   | Config 3  |    | CSI-RS.2.1 TDD  |
| T1  |   | s  | 0.2             |
| T2  |   | s  | 0.2             |
| T3  |   | s  | 0.44            |
| T4  |   | s  | 0.2             |
| T5  |   | s  | 0.88            |
| T6  |   | S  | 0.84            |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |    |                 |



**Table A.6.5.1.6.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter  |          | Unit      | Test 1            |    |     |      |    |
|--|----------|-----------|-------------------|----|-----|------|----|
|  |          |           | T1                | T2 | T3  | T4   | T5 |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB        | 0                 |    |     |      |    |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB        | 0                 |    |     |      |    |
| EPRE ratio of PBCH DMRS to SSS   |          | dB        |                   |    |     |      |    |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB        |                   |    |     |      |    |
| EPRE ratio of PSS to SSS   |          | dB        |                   |    |     |      |    |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB        |                   |    |     |      |    |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB        |                   |    |     |      |    |
| EPRE ratio of OCNB DMRS to SSS   |          | dB        |                   |    |     |      |    |
| EPRE ratio of OCNB to OCNB DMRS  |          | dB        |                   |    |     |      |    |
| SNR on RLM-RS  | Config 1 | dB        | 1                 | -7 | -15 | -4.5 | 1  |
|  | Config 2 |           | 1                 | -7 | -15 | -4.5 | 1  |
|  | Config 3 |           | 1                 | -7 | -15 | -4.5 | 1  |
| $N_{oc}$   | Config 1 | dBm/15kHz | -98               |    |     |      |    |
|  | Config 2 |           | -98               |    |     |      |    |
|  | Config 3 |           | -98               |    |     |      |    |
| Propagation condition  |          |           | TDL-C 300ns 100Hz |    |     |      |    |
| <p>Note 1: OCNB shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNB.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.6.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.</p> |          |           |                   |    |     |      |    |

**Table A.6.5.1.6.1-4: Void**



**Figure A.6.5.1.6.1-1: SNR variation for CSI-RS in-sync testing**

**A.6.5.1.6.2 Test Requirements**

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

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

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

**A.6.5.1.7 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode**

**A.6.5.1.7.1 Test Purpose and Environment**

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.6.5.1.7.1-1, A.6.5.1.7.1-2, and A.6.5.1.7.1-3 below. There is one cell, cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.7.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 is configured as the BFD-RS.

**Table A.6.5.1.7.1-1: Supported test configurations for FR1 PCell**

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

**Table A.6.5.1.7.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
| Active PCell                                 |   |      | Cell 1                     |
| RF Channel Number                            |   |      | 1                          |
| Duplex mode                                  | Config 1  |      | FDD                        |
|  | Config 2, 3   |      | TDD                        |
| TDD Configuration                            | Config 1  |      | Not Applicable             |
|  | Config 2  |      | TDDConf.1.1                |
|  | Config 3  |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3  |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3  |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3  |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3  |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1  |      | CR.1.1 FDD                 |
|  | Config 2  |      | CR.1.1 TDD                 |
|  | Config 3  |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1  |      | CCR.1.3 FDD                |
|  | Config 2  |      | CCR.1.3 TDD                |
|  | Config 3  |      | CCR.2.2 TDD                |
| SSB Configuration                            | Config 1  |      | SSB.1 FR1                  |
|  | Config 2  |      | SSB.1 FR1                  |
|  | Config 3  |      | SSB.2 FR1                  |
| SMTTC Configuration                          | Config 1, 2   |      | SMTTC.1                    |
|  | Config 3  |      | SMTTC.1                    |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2   |      | 15 kHz                     |
|  | Config 3  |      | 30 kHz                     |
| TRS configuration                            | Config 1  |      | TRS.1.1 FDD                |
|  | Config 2  |      | TRS.1.1 TDD                |
|  | Config 3  |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1  |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2  |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3  |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity<br>REG bundle size                        |      | REG bundle size<br>6       |
| DRX  |   |      | DRX.3                      |
| Gap pattern ID                               |   |      | N.A.                       |
| Layer 3 filtering                            |   |      | Enabled                    |
| T310 timer                                   |   | ms   | 0                          |
| T311 timer                                   |   | ms   | 1000                       |
| N310   |   |      | 1                          |
| N311   |   |      | 1                          |
| CSI-RS configuration for CSI reporting       | Config 1  |      | CSI-RS.1.1 FDD             |
|  | Config 2  |      | CSI-RS.1.1 TDD             |
|  | Config 3  |      | CSI-RS.2.1 TDD             |
| T1   |   | s    | 0.2                        |

|   |   |      |
|---|---|------|
| T2  | s | 1.28 |
| T3  | s | 1.28 |
| D1  | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |      |

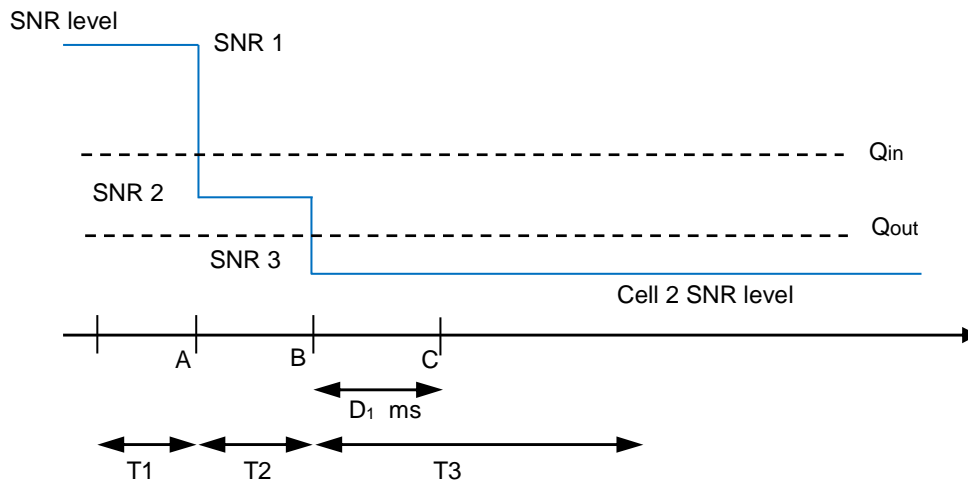
**Table A.6.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter  |          | Unit      | Test 1            |    |     |
|--|----------|-----------|-------------------|----|-----|
|  |          |           | T1                | T2 | T3  |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB        | 4                 |    |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB        | 0                 |    |     |
| EPRE ratio of PBCH DMRS to SSS   |          | dB        |                   |    |     |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB        |                   |    |     |
| EPRE ratio of PSS to SSS   |          | dB        |                   |    |     |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB        |                   |    |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB        |                   |    |     |
| EPRE ratio of OCNG DMRS to SSS   |          | dB        |                   |    |     |
| EPRE ratio of OCNG to OCNG DMRS  |          | dB        |                   |    |     |
| SNR on RLM-RS  | Config 1 | dB        | 1                 | -7 | -15 |
|  | Config 2 |           | 1                 | -7 | -15 |
|  | Config 3 |           | 1                 | -7 | -15 |
| $N_{oc}$   | Config 1 | dBm/15kHz | -98               |    |     |
|  | Config 2 |           | -98               |    |     |
|  | Config 3 |           | -98               |    |     |
| Propagation condition  |          |           | TDL-C 300ns 100Hz |    |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.7.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.</p> |          |           |                   |    |     |

**Table A.6.5.1.7.1-4: Void**

**Table A.6.5.1.7.1-5: Void**

**Table A.6.5.1.7.1-6: Void**



**Figure A.6.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing**

**A.6.5.1.7.2 Test Requirements**

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ( $D_1$  ms after the start of the time duration T3) on the PCell.

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

**A.6.5.1.8 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode**

**A.6.5.1.8.1 Test Purpose and Environment**

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.6.5.1.8.1-1, A.6.5.1.8.1-2, A.6.5.1.8.1-3 and A.6.5.1.8.1-3A below. There is one cells, cell 1 which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.8.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 is configured as the BFD-RS.

**Table A.6.5.1.8.1-1: Supported test configurations for FR1 PCell**

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

**Table A.6.5.1.8.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter                                    |   | Unit | Value                      |
|--|---|------|----------------------------|
|  |   |      | Test 1                     |
| Active PCell                                 |   |      | Cell 1                     |
| RF Channel Number                            |   |      | 1                          |
| Duplex mode                                  | Config 1  |      | FDD                        |
|  | Config 2, 3   |      | TDD                        |
| TDD Configuration                            | Config 1  |      | Not Applicable             |
|  | Config 2  |      | TDDConf.1.1                |
|  | Config 3  |      | TDDConf.2.1                |
| DL initial BWP configuration                 | Config 1, 2, 3  |      | DLBWP.0.1                  |
| DL dedicated BWP configuration               | Config 1, 2, 3  |      | DLBWP.1.1                  |
| UL initial BWP configuration                 | Config 1, 2, 3  |      | ULBWP.0.1                  |
| UL dedicated BWP configuration               | Config 1, 2, 3  |      | ULBWP.1.1                  |
| RMSI CORESET Reference Channel               | Config 1  |      | CR.1.1 FDD                 |
|  | Config 2  |      | CR.1.1 TDD                 |
|  | Config 3  |      | CR.2.1 TDD                 |
| Dedicated CORESET Reference Channel          | Config 1  |      | CCR.1.1 FDD                |
|  | Config 2  |      | CCR.1.1 TDD                |
|  | Config 3  |      | CCR.2.1 TDD                |
| SSB Configuration                            | Config 1  |      | SSB.1 FR1                  |
|  | Config 2  |      | SSB.1 FR1                  |
|  | Config 3  |      | SSB.2 FR1                  |
| SMTTC Configuration                          | Config 1, 2   |      | SMTTC.1                    |
|  | Config 3  |      | SMTTC.1                    |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2   |      | 15 kHz                     |
|  | Config 3  |      | 30 kHz                     |
| TRS configuration                            | Config 1  |      | TRS.1.1 FDD                |
|  | Config 2  |      | TRS.1.1 TDD                |
|  | Config 3  |      | TRS.1.2 TDD                |
| CSI-RS for RLM                               | Config 1  |      | Resource #4 in TRS.1.1 FDD |
|  | Config 2  |      | Resource #4 in TRS.1.1 TDD |
|  | Config 3  |      | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH            |   |      | TCI.State.2                |
| OCNG parameters                              |   |      | OP.1                       |
| CP length                                    |   |      | Normal                     |
| Correlation Matrix and Antenna Configuration |   |      | 2x2 Low                    |
| Out of sync transmission parameters          | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 8                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4                          |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4                          |
|  | DMRS precoder granularity   |      | REG bundle size            |
|  | REG bundle size   |      | 6                          |
| In sync transmission parameters              | DCI format  |      | 1-0                        |
|  | Number of Control OFDM symbols                                      |      | 2                          |
|  | Aggregation level   | CCE  | 4                          |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                          |



|   |   |    |                 |
|---|---|----|-----------------|
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0               |
|   | DMRS precoder granularity   |    | REG bundle size |
|   | REG bundle size   |    | 6               |
| DRX   |   |    | DRX.3           |
| Gap pattern ID  |   |    | gp0             |
| Layer 3 filtering   |   |    | Enabled         |
| T310 timer  |   | ms | 2000            |
| T311 timer  |   | ms | 1000            |
| N310  |   |    | 1               |
| N311  |   |    | 1               |
| CSI-RS configuration for CSI reporting                        | Config 1  |    | CSI-RS.1.1 FDD  |
|   | Config 2  |    | CSI-RS.1.1 TDD  |
|   | Config 3  |    | CSI-RS.2.1 TDD  |
| T1  |   | s  | 0.2             |
| T2  |   | s  | 0.2             |
| T3  |   | s  | 1.24            |
| T4  |   | s  | 0.2             |
| T5  |   | s  | 1.88            |
| T6  |   | s  | 1.84            |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |    |                 |

**Table A.6.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter  |          | Unit      | Test 1            |    |     |      |    |
|--|----------|-----------|-------------------|----|-----|------|----|
|  |          |           | T1                | T2 | T3  | T4   | T5 |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB        | 0                 |    |     |      |    |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB        | 0                 |    |     |      |    |
| EPRE ratio of PBCH DMRS to SSS   |          | dB        |                   |    |     |      |    |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB        |                   |    |     |      |    |
| EPRE ratio of PSS to SSS   |          | dB        |                   |    |     |      |    |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB        |                   |    |     |      |    |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB        |                   |    |     |      |    |
| EPRE ratio of OCNB DMRS to SSS   |          | dB        |                   |    |     |      |    |
| EPRE ratio of OCNB to OCNB DMRS  |          | dB        |                   |    |     |      |    |
| SNR on RLM-RS  | Config 1 | dB        |                   |    |     |      |    |
|  | Config 2 |           | 1                 | -7 | -15 | -4.5 | 1  |
|  | Config 3 |           | 1                 | -7 | -15 | -4.5 | 1  |
| $N_{oc}$   | Config 1 | dBm/15kHz | -98               |    |     |      |    |
|  | Config 2 |           | -98               |    |     |      |    |
|  | Config 3 |           | -98               |    |     |      |    |
| Propagation condition  |          |           | TDL-C 300ns 100Hz |    |     |      |    |
| <p>Note 1: OCNB shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNB.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.8.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.</p> |          |           |                   |    |     |      |    |

**Table A.6.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in non-DRX mode**

| Field        | Test 1 |
|--------------|--------|
|              | Value  |
| gapOffset    | 0      |
| Note 1: Void |        |

Table A.6.5.1.8.1-4: Void

Table A.6.5.1.8.1-5: Void

Table A.6.5.1.8.1-6: Void

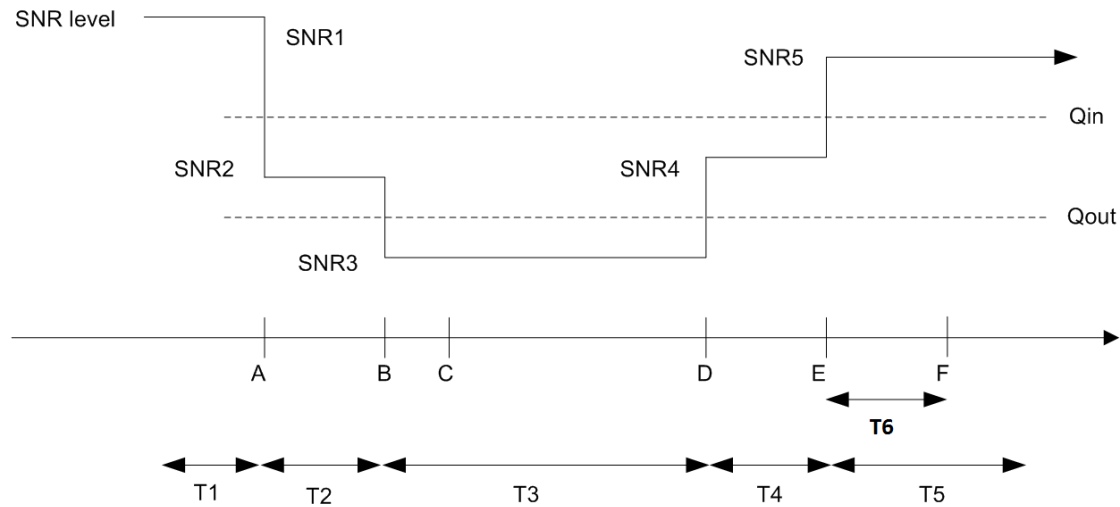


Figure A.6.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

### A.6.5.1.8.2 Test Requirements

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

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

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

## A.6.5.2 Interruption

### A.6.5.2.1 Interruptions during measurements on deactivated NR SCC in FR1

#### A.6.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations are shown in table A.6.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.6.5.2.1.1-2 and A.6.5.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, PCell is continuously scheduled in DL.

**Table A.6.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations**

| Config  | Description   |
|---------|---|
| 1       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD – FDD duplex mode   |
| 2       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD – TDD duplex mode   |
| 3       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD – FDD duplex mode   |
| 4       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD – TDD duplex mode   |
| 5       | NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD – TDD duplex mode   |
| Note 1: | The UE is only required to be tested in one of the supported test configurations  |
| Note 2: | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration, |

**Table A.6.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR**

| Parameter                                | Unit | Value  | Comment                                      |
|--|------|--------|--|
| RF Channel Number                        |      | 1, 2   | Two NR RF channels                           |
| Active PCell                             |      | Cell1  | PCell on NR RF channel number 1.             |
| Configured deactivated SCell             |      | Cell2  | Deactivated SCell on NR RF channel number 2. |
| CP length                                |      | Normal | Applicable to Cell1 and Cell2                |
| DRX                                      |      | OFF    |  |
| Measurement gap pattern Id               |      | OFF    |  |
| SCell measurement cycle (measCycleSCell) | ms   | 640    |  |
| T1                                       | s    | 10     |  |

**Table A.6.5.2.1.1-3: NR cell specific test parameters for interruptions during measurements on deactivated NR SCC in standalone NR**

| Parameter                                    |                | Unit | Cell1                  | Cell2                  |
|--|----------------|------|------------------------|------------------------|
| Frequency Range                              |                |      | FR1                    | FR1                    |
| Duplex mode                                  | Config 1       |      | FDD                    | FDD                    |
|  | Config 2,5     |      | TDD                    | TDD                    |
|  | Config 3       |      | TDD                    | FDD                    |
|  | Config 4       |      | FDD                    | TDD                    |
| TDD configuration                            | Config 1       |      | Not Applicable         | Not Applicable         |
|  | Config 2       |      | TDDConf.1.1            | TDDConf.1.1            |
|  | Config 3       |      | TDDConf.1.1            | Not Applicable         |
|  | Config 4       |      | Not Applicable         | TDDConf.1.1            |
|  | Config 5       |      | TDDConf.2.1            | TDDConf.2.1            |
| BW <sub>channel</sub>                        | Config 1,2,3,4 |      | Note 9                 | Note 9                 |
|  | Config 5       |      | Note 9                 | Note 9                 |
| BW <sub>occupied</sub>                       | Config 1,2,3,4 | RB   | 52 <sup>Note 7</sup>   | 52 <sup>Note 7</sup>   |
|  | Config 5       |      | 106 <sup>Note 8</sup>  | 106 <sup>Note 8</sup>  |
| Initial DL BWP Configuration                 | Config 1,2,3,4 |      | DLBWP.0.1              | DLBWP.0.1              |
|  | Config 5       |      | DLBWP.0.1              | DLBWP.0.1              |
| Dedicated DL BWP Configuration               | Config 1,2,3,4 |      | DLBWP.1.1              | DLBWP.1.1              |
|  | Config 5       |      | DLBWP.1.1              | DLBWP.1.1              |
| Initial UL BWP Configuration                 | Config 1,2,3,4 |      | ULBWP.0.1              |                        |
|  | Config 5       |      | ULBWP.0.1              |                        |
| Dedicated UL BWP Configuration               | Config 1,2,3,4 |      | ULBWP.1.1              |                        |
|  | Config 5       |      | ULBWP.1.1              |                        |
| PDSCH Reference measurement channel          | Config 1       |      | SR.1.1 FDD             | SR.1.1 FDD             |
|  | Config 2       |      | SR.1.2 TDD             | SR.1.2 TDD             |
|  | Config 3       |      | SR.1.2 TDD             | SR.1.1 FDD             |
|  | Config 4       |      | SR.1.1 FDD             | SR.1.2 TDD             |
|  | Config 5       |      | SR.2.1 TDD             | SR.2.1 TDD             |
| CSI-RS for tracking                          | Config 1       |      | TRS.1.1 FDD            | TRS.1.1 FDD            |
|  | Config 2       |      | TRS.1.1 TDD            | TRS.1.1 TDD            |
|  | Config 3       |      | TRS.1.1 TDD            | TRS.1.1 FDD            |
|  | Config 4       |      | TRS.1.1 FDD            | TRS.1.1 TDD            |
|  | Config 5       |      | TRS.1.2 TDD            | TRS.1.2 TDD            |
| RMSI CORESET parameters                      | Config 1       |      | CR.1.1 FDD             | CR.1.1 FDD             |
|  | Config 2       |      | CR.1.1 TDD             | CR.1.1 TDD             |
|  | Config 3       |      | CR.1.1 TDD             | CR.1.1 FDD             |
|  | Config 4       |      | CR.1.1 FDD             | CR.1.1 TDD             |
|  | Config 5       |      | CR.2.1 TDD             | CR.2.1 TDD             |
| Dedicated CORESET parameters                 | Config 1       |      | CCR.1.1 FDD            | CCR.1.1 FDD            |
|  | Config 2       |      | CCR.1.1 TDD            | CCR.1.1 TDD            |
|  | Config 3       |      | CCR.1.1 TDD            | CCR.1.1 FDD            |
|  | Config 4       |      | CCR.1.1 FDD            | CCR.1.1 TDD            |
|  | Config 5       |      | CCR.2.1 TDD            | CCR.2.1 TDD            |
| OCNG Patterns                                | Config 1,2,3,4 |      | OP.1 <sup>Note 7</sup> | OP.1 <sup>Note 7</sup> |
|  | Config 5       |      | OP.1 <sup>Note 8</sup> | OP.1 <sup>Note 8</sup> |
| SMTC Configuration                           |                |      | SMTC.1                 | SMTC.4                 |
| SSB Configuration                            | Config 1,2,3,4 |      | SSB.1 FR1              | SSB.5 FR1              |
|  | Config 5       |      | SSB.2 FR1              | SSB.6 FR1              |
| Correlation Matrix and Antenna Configuration |                |      | 1x2 Low                | 1x2 Low                |
| EPRE ratio of PSS to SSS                     |                | dB   | 0                      | 0                      |
| EPRE ratio of PBCH DMRS to SSS               |                |      |                        |                        |
| EPRE ratio of PBCH to PBCH DMRS              |                |      |                        |                        |
| EPRE ratio of PDCCH DMRS to SSS              |                |      |                        |                        |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |      |                        |                        |
| EPRE ratio of PDSCH DMRS to SSS              |                |      |                        |                        |
| EPRE ratio of PDSCH to PDSCH                 |                |      |                        |                        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |      |                        |                        |

|   |                |              |        |        |
|---|----------------|--------------|--------|--------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                |              |        |        |
| $N_{oc}$ Note 2   |                | dBm/15 kHz   | -104   | -104   |
| SS-RSRP Note 3  |                | dBm/15 kHz   | -87    | -87    |
| $\bar{E}_s/I_{ot}$  |                | dB           | 17     | 17     |
| $\bar{E}_s/N_{oc}$  |                | dB           | 17     | 17     |
| $N_{oc}$ Note 2   | Config 1,2,3,4 | dBm/SCS      | -104   | -104   |
|   | Config 5       |              | -101   | -101   |
| $I_o$ Note 3  | Config 1,2,3,4 | dBm/9.36MHz  | -58.96 | -58.96 |
|   | Config 5       | dBm/38.16MHz | -52.86 | -52.86 |
| Time offset to Cell1 Note 5   |                | $\mu$ s      | -      | 3      |
| Propagation Condition   |                |              | AWGN   | AWGN   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled within <math>BW_{occupied}</math>.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.</p> <p>Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].</p> <p>Note 7: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 10 MHz, 52 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>Note 8: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 40 MHz, 106 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>Note 9: <math>N_{RB,c}</math> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured <math>BW_{channel}</math>.</p> |                |              |        |        |

#### A.6.5.2.1.2 Test Requirements

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-1.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-2.

**Table A.6.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 1                   |
| 1     | 0.5                 | 1                   |

**Table A.6.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|-------|---------------------|---------------------|
| 0     | 1                   | 2 + SMTC duration   |
| 1     | 0.5                 | 2 + SMTC duration   |

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

## A.6.5.2.2 SA interruptions at NR SRS carrier based switching

### A.6.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS, the UE can perform carrier based switching to one carrier not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission. The test will partly verify the interruption requirements on PCell in clause 8.2.2.2.9.

### A.6.5.2.2.2 Test Parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the FR1 PCell and Cell 2 is activated SCell on the TDD SCC which operates in downlink without PUCCH/PUSCH. The UE is configured with the SRS switching between PCell and SCell. The test parameters for PCell and SCell are given in Table A.6.5.2.2.2-2 and A.6.5.2.2.2-3 below. The test consists of two successive time periods, with duration of T1 and T2, respectively. Immediately at the beginning of T2, the UE is triggered for SRS switching.

The test equipment verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell.

**Table A.6.5.2.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode                           |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode                           |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode                           |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.5.2.2-2: General test parameters for SA interruptions at NR SRS carrier based switching**

| Parameter                                    | Unit | Value   | Comment   |
|--|------|---|---|
| RF Channel Number                            |      | 1,2   | Two NR radio channel (1, 2) are used for this test                              |
| Active PCell                                 |      | Cell 1  | Primary cell on NR RF channel number 1  |
| Configured SCell                             |      | Cell 2  | Activated secondary cell on NR RF channel number 2                              |
| CP length                                    |      | Normal  |   |
| DRX  |      | OFF   | Continuous monitoring of primary cell   |
| Cell2 timing offset to cell1                 | μs   | 0   |   |
| Time alignment error between cell2 and cell1 | μs   | ≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1   | s    | 5   |   |
| T2   | ms   | 40  | UE shall perform SRS switching during T2  |

**Table A.6.5.2.2-3: Cell specific test parameters for SA interruptions at NR SRS carrier based switching**

| Parameter                          |            | Unit | T1                          |             | T2     |             |
|------------------------------------|------------|------|-----------------------------|-------------|--------|-------------|
|                                    |            |      | Cell 1                      | Cell 2      | Cell 1 | Cell 2      |
| Duplex mode                        | Config 1   |      | FDD                         | TDD         | FDD    | TDD         |
|                                    | Config 2,3 |      | TDD                         |             |        |             |
| TDD configuration                  | Config 1   |      | N/A                         | TDDConf.1.1 | N/A    | TDDConf.1.1 |
|                                    | Config 2   |      | TDDConf.1.1                 |             |        |             |
|                                    | Config 3   |      | TDDConf.2.1                 |             |        |             |
| BW <sub>channel</sub>              | Config 1,2 | MHz  | 10: N <sub>RB,c</sub> = 52  |             |        |             |
|                                    | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |             |        |             |
| Downlink initial BWP Configuration |            |      | DLBWP.0.1                   |             |        |             |



|   |                |            |             |             |             |             |
|---|----------------|------------|-------------|-------------|-------------|-------------|
| Downlink dedicated BWP Configuration  |                |            | DLBWP.1.1   |             |             |             |
| Uplink initial BWP configuration  |                |            | ULBWP.0.1   |             |             |             |
| Uplink dedicated BWP configuration  |                |            | ULBWP.1.1   |             |             |             |
| TCI state   |                |            | TCI.State.0 |             |             |             |
| TRS Configuration   |                |            | TRS.1.1 TDD |             |             |             |
| PDSCH Reference measurement channel   | Config 1       |            | SR.1.1 FDD  | SR.1.1 TDD  | SR.1.1 FDD  | SR.1.1 TDD  |
|   | Config 2       |            | SR.1.1 TDD  | SR.1.1 TDD  | SR.1.1 TDD  | SR.1.1 TDD  |
|   | Config 3       |            | SR2.1 TDD   | SR2.1 TDD   | SR2.1 TDD   | SR2.1 TDD   |
| Dedicated CORESET parameters  | Config 1       |            | CCR.1.1 FDD | CCR.1.1 TDD | CCR.1.1 FDD | CCR.1.1 TDD |
|   | Config 2       |            | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
|   | Config 3       |            | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| RMSI CORESET parameters   | Config 1       |            | CR.1.1 FDD  | CR.1.1 TDD  | CR.1.1 FDD  | CR.1.1 TDD  |
|   | Config 2       |            | CR.1.1 TDD  | CR.1.1 TDD  | CR.1.1 TDD  | CR.1.1 TDD  |
|   | Config 3       |            | CR2.1 TDD   | CR2.1 TDD   | CR2.1 TDD   | CR2.1 TDD   |
| OCNG Patterns   |                |            | OP.1        |             |             |             |
| SRS Configuration   | Config 1,2     |            | SRS.1 TDD   |             |             |             |
|   | Config 3       |            | SRS.2 TDD   |             |             |             |
| SSB Configuration   | Config 1,2     |            | SSB.1 FR1   |             |             |             |
|   | Config 3       |            | SSB.2 FR1   |             |             |             |
| SMTC configuration  |                |            | SMTC.1      |             |             |             |
| EPRE ratio of PSS to SSS  |                | dB         | 0           |             |             |             |
| EPRE ratio of PBCH DMRS to SSS  |                |            |             |             |             |             |
| EPRE ratio of PBCH to PBCH DMRS   |                |            |             |             |             |             |
| EPRE ratio of PDCCH DMRS to SSS   |                |            |             |             |             |             |
| EPRE ratio of PDCCH to PDCCH DMRS   |                |            |             |             |             |             |
| EPRE ratio of PDSCH DMRS to SSS   |                |            |             |             |             |             |
| EPRE ratio of PDSCH to PDSCH  |                |            |             |             |             |             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                |            |             |             |             |             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                |            |             |             |             |             |
| $N_{oc}$ <sup>Note2</sup>   | Config 1,2,4,5 | dBm/15kHz  | -104        |             |             |             |
|   | Config 3,6     |            | -101        |             |             |             |
| $\hat{E}_s / I_{ot}$  |                | dB         | 17          |             |             |             |
| $\hat{E}_s / N_{oc}$  |                | dB         | 17          |             |             |             |
| SS-RSRP <sup>Note3</sup>  | Config 1,2,4,5 | dBm/SCS    | -87         |             |             |             |
|   | Config 3,6     |            | -84         |             |             |             |
| SCH_RP <sup>Note 3</sup>  |                | dBm/15 kHz | -87         |             |             |             |
| Propagation condition   |                | -          | AWGN        |             |             |             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |                |            |             |             |             |             |

|         |  |
|---------|--|
| Note 3: | SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.                                      |

**Table A.6.5.2.2-4: Void**

### A.6.5.2.2.3 Test Requirements

The UE shall be scheduled on PCell continuously throughout the test. During the time duration T2, the interruption on PCell shall not be more than the values specified for SA in clause 8.2.2.2.9.

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

## A.6.5.3 SCell Activation and Deactivation Delay

### A.6.5.3.1 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 160ms SCell measurement cycle

#### A.6.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.6.5.3.1.1-1 below. The test parameters are given in Tables A.6.5.3.1.1-2 and cell-specific parameters in A.6.5.3.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted  $n$ , defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot  $n + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$ , as defined in clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$ , as defined in clause 8.3, where  $N_{\text{interruption}}$  is the interruption length given in clause 8.2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted  $m$ , is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $m + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3, and The starting point of any PCell interruption due to the deactivation shall occur in the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

**Table A.6.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations**

| Config  | Description   |
|---|---|
| 1   | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode |
| 2   | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode |
| 3   | NR 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations  |   |
| Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration, |   |

**Table A.6.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter   | Unit          | Value  | Comment   |
|---|---------------|--|---|
| RF Channel Number                                     |               | 1,2  | Two NR radio channel (1, 2) are used for this test  |
| Active PCell  |               | Cell 1   | Primary cell on NR RF channel number 1.   |
| Configured deactivated SCell                          |               | Cell 2   | Configured deactivated secondary cell on NR RF channel number 2   |
| CP length   |               | Normal   |   |
| DRX   |               | OFF  | Continuous monitoring of primary cell   |
| Cell-individual offset for cells on NR channel number | dB            | 0  | Individual offset for cells on primary component carrier.   |
| SCell measurement cycle (measCycleSCell)              | ms            | 160  |   |
| Cell2 timing offset to cell1                          | $\mu\text{s}$ | 0  |   |
| Time alignment error between cell2 and cell1          | $\mu\text{s}$ | $\leq$ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.   |
| T1  | s             | 7  | During this time the PSCell shall be known and the SCell configured and detected.   |
| T2  | s             | 1  | During this time the UE shall activate the SCell.   |
| T3  | s             | 1  | During this time the UE shall deactivate the SCell.   |
| $T_{\text{HARQ}}$                                     | ms            | Config 1: 2<br>Config 2: 3<br>Config 3: 2.5                                | $k_1 \times \text{NR slot length}$<br><br>$k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by <i>dl-DataToUL-ACK</i> , the value of $k$ should be the minimum value defined in TS 38.213 [3] that will meet the timing constraints of this test case. |
| $T_{\text{CSI\_Reporting}}$                           | ms            | 15   | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]   |

**Table A.6.5.3.1.1-3: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter                                       |            | Unit        | Cell 1                 |    |    | Cell 2 |    |    |
|---|------------|-------------|------------------------|----|----|--------|----|----|
|   |            |             | T1                     | T2 | T3 | T1     | T2 | T3 |
| Duplex mode                                     | Config 1   |             | FDD                    |    |    |        |    |    |
|   | Config 2,3 |             | TDD                    |    |    |        |    |    |
| TDD configuration                               | Config 1   |             | Not applicable         |    |    |        |    |    |
|   | Config 2   |             | TDDConf.1.1            |    |    |        |    |    |
|   | Config 3   |             | TDDConf.2.1            |    |    |        |    |    |
| BW <sub>channel</sub>                           | Config 1,2 | MHz         | Note 7                 |    |    |        |    |    |
|   | Config 3   |             | Note 7                 |    |    |        |    |    |
| BW <sub>occupied</sub>                          | Config 1,2 | RB          | 52 <sup>Note 5</sup>   |    |    |        |    |    |
|   | Config 3   |             | 106 <sup>Note 6</sup>  |    |    |        |    |    |
| Initial BWP configuration                       |            |             | DLBWP.0.2              |    |    |        |    |    |
| TCI state                                       |            |             | TCI.State.0            |    |    |        |    |    |
| TRS Configuration                               | Config 1   |             | TRS.1.1 FDD            |    |    |        |    |    |
|   | Config 2   |             | TRS.1.1 TDD            |    |    |        |    |    |
|   | Config 3   |             | TRS.1.2 TDD            |    |    |        |    |    |
| PDSCH Reference measurement channel             | Config 1   |             | SR.1.1 FDD             |    |    | -      |    |    |
|   | Config 2   |             | SR.1.1 TDD             |    |    | -      |    |    |
|   | Config 3   |             | SR.2.1 TDD             |    |    | -      |    |    |
| Dedicated CORESET parameters                    | Config 1   |             | CCR.1.1 FDD            |    |    | -      |    |    |
|   | Config 2   |             | CCR.1.1 TDD            |    |    | -      |    |    |
|   | Config 3   |             | CCR.2.1 TDD            |    |    | -      |    |    |
| RMSI CORESET parameters                         | Config 1   |             | CR.1.1 FDD             |    |    | -      |    |    |
|   | Config 2   |             | CR.1.1 TDD             |    |    | -      |    |    |
|   | Config 3   |             | CR.2.1 TDD             |    |    | -      |    |    |
| OCNG Patterns                                   | Config 1,2 |             | OP.1 <sup>Note 5</sup> |    |    |        |    |    |
|   | Config 3,  |             | OP.1 <sup>Note 6</sup> |    |    |        |    |    |
| SSB Configuration                               | Config 1,2 |             | SSB.1 FR1              |    |    |        |    |    |
|   | Config 3   |             | SSB.2 FR1              |    |    |        |    |    |
| CSI-RS configuration for CSI reporting (Note 8) | Config 1   |             | CSI-RS.1.1 FDD         |    |    |        |    |    |
|   | Config 2   |             | CSI-RS.1.1 TDD         |    |    |        |    |    |
|   | Config 3   |             | CSI-RS.2.1 TDD         |    |    |        |    |    |
| SMTc configuration                              |            |             | SMTc.1                 |    |    |        |    |    |
| reportConfigType                                |            |             | periodic               |    |    | N/A    |    |    |
| reportQuantity                                  |            |             | cri-RI-PMI-CQI         |    |    | N/A    |    |    |
| CSI reporting periodicity for PCell             | Config 1,2 | slot        | 5                      |    |    | N/A    |    |    |
|   | Config 3   |             | 10                     |    |    | N/A    |    |    |
| CSI reporting offset for PCell                  | Config 1,2 | slot        | 3                      |    |    | N/A    |    |    |
|   | Config 3   |             | 5                      |    |    | N/A    |    |    |
| CSI reporting periodicity for SCell             | Config 1,2 | slot        | 5                      |    |    | N/A    |    |    |
|   | Config 3   |             | 10                     |    |    | N/A    |    |    |
| CSI reporting offset for SCell                  | Config 1,2 | slot        | 2                      |    |    | N/A    |    |    |
|   | Config 3   |             | 4                      |    |    | N/A    |    |    |
| EPRE ratio of PSS to SSS                        |            | dB          | 0                      |    |    |        |    |    |
| EPRE ratio of PBCH DMRS to SSS                  |            |             |                        |    |    |        |    |    |
| EPRE ratio of PBCH to PBCH DMRS                 |            |             |                        |    |    |        |    |    |
| EPRE ratio of PDCCH DMRS to SSS                 |            |             |                        |    |    |        |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS               |            |             |                        |    |    |        |    |    |
| EPRE ratio of PDSCH DMRS to SSS                 |            |             |                        |    |    |        |    |    |
| EPRE ratio of PDSCH to PDSCH                    |            |             |                        |    |    |        |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)          |            |             |                        |    |    |        |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)        |            |             |                        |    |    |        |    |    |
| $N_{oc}$ <sup>Note2</sup>                       | Config 1,2 | dBm/SC<br>S | -104                   |    |    |        |    |    |
|   | Config 3   |             | -101                   |    |    |        |    |    |
| $\hat{E}_s/I_{ot}$                              |            | dB          | 17                     |    |    |        |    |    |
| $\hat{E}_s/N_{oc}$                              |            | dB          | 17                     |    |    |        |    |    |
| SS-RSRP <sup>Note3</sup>                        | Config 1,2 | dBm/SC<br>S | -87                    |    |    |        |    |    |
|   | Config 3   |             | -84                    |    |    |        |    |    |

|   |            |              |        |
|---|------------|--------------|--------|
| SCH_RP <sup>Note 3</sup>  |            | dBm/15 kHz   | -87    |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1,2 | dBm/9.36MHz  | -58.96 |
|   | Config 3   | dBm/38.16MHz | -52.87 |
| Propagation condition   |            | -            | AWGN   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled within <math>BW_{occupied}</math>.</p> <p>Note 3: SS-RSRP, I<sub>o</sub> and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.</p> <p>Note 5: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 10 MHz, 52 RBs) from <math>F_{C,low}</math>, and I<sub>o</sub> is independent of the <math>BW_{channel}</math> configured.</p> <p>Note 6: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 40 MHz, 106 RBs) from <math>F_{C,low}</math>, and I<sub>o</sub> is independent of the <math>BW_{channel}</math> configured.</p> <p>Note 7: <math>N_{RB,c}</math> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured <math>BW_{channel}</math>.</p> <p>Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 cl. 5.2.2.5.</p> |            |              |        |

### A.6.5.3.1.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $(n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length})$ . UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $n + \frac{T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting}}{NR\ slot\ length}$ ,  $T_{activation\_time} = T_{FirstSSB} + 5ms$ , as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot  $m + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ , as defined in clause 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot  $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $n + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption}$ , as defined in clause 8.3.

During T3 the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot  $m + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $m + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ , as defined in clause 8.3.

The interruption on any activated serving cell shall not be more than the values specified for SA in clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot  $\frac{T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting}}{NR\ slot\ length}$  as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### A.6.5.3.2 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 640 ms SCell measurement cycle

#### A.6.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1. The supported test configurations are the same as defined in clause A.6.5.3.1.1. The test parameters are the same except those described in the following

clause. The listed parameter values in Tables A.6.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-1.

**Table A.6.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 640 ms SCell measurement cycle**

| Parameter                                | Unit | Value | Comment |
|--|------|-------|---------|
| SCell measurement cycle (measCycleSCell) | ms   | 640   |         |

### A.6.5.3.2.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{FirstSSB\_MAX}} + T_{\text{rs}} + 5\text{ms}$ .

### A.6.5.3.3 SCell Activation and deactivation of unknown SCell in FR1 in non-DRX

#### A.6.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.6.5.3.1.1-1 below. The test parameters are given in Tables A.6.5.3.1.1-2 and cell-specific parameters in A.6.5.3.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted  $n$ , defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot  $n + \frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{\text{NR slot length}}$ , as defined in clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$ , as defined in clause 8.3, where  $N_{\text{interruption}}$  is the interruption length given in clause 8.2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted  $m$ , is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $m + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3, and The starting point of any PCell interruption due to the deactivation shall occur in the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

**Table A.6.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment  |
|-----------|------|-------|--|
| T1        | ms   | 100   | During this time the PSCell shall be known and the SCell configured, but not detected. |

### A.6.5.3.3.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{\text{activation\_time}}$  will be replaced with the value  $T_{\text{FirstSSB\_MAX}} + T_{\text{SMTc\_MAX}} + 2 \cdot T_{\text{rs}} + 5\text{ms}$  as defined in clause 8.3.

### A.6.5.3.4 Direct SCell activation at SCell addition of known SCell in FR1

#### A.6.5.3.4.1 Test Purpose and Environment

The purpose of this test is to verify fulfillment of direct SCell activation delay and interruption requirements at SCell addition as defined in clause 8.3.4 and 8.2.2, respectively. The supported test configurations are shown in Table A.6.5.3.4.1-1.

The test scenario comprises one PCell (Cell 1) and one SCell (Cell 2) as outlined in Table A.6.5.3.4.1-2. Cell-specific parameters are provided in Table A.6.5.3.4.1-3.

The test consists of two successive time periods with duration  $T_1$  and  $T_2$ , respectively. There are two carriers, each with one cell. Cell 1 (PCell) is on RF channel 1 (PCC), and Cell 2 (SCell) is on RF channel 2 (SCC). Cell 1 and Cell 2 both operate according to one of the configurations in Table A.6.5.3.4.1-1.

Before the test starts the UE is connected to Cell 1 on RF channel 1. The UE is only monitoring RF channel 1 and is not aware of Cell 2 on RF channel 2.

The UE is continuously scheduled in PCell throughout the test.

At the beginning of  $T_1$  the UE is configured to measure RF channel 2 in measurement gaps. During  $T_1$ , the UE detects and measures Cell 2 on RF channel 2, and sends a measurement report containing Cell 2 to the test equipment. After having received a measurement report containing Cell 2, the test equipment deconfigures the measurement gaps and thereafter sends a RRC connection reconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state (*sCellState* is set to *activated*). The time between reception of the last measurement report carrying SCell and transmission of the RRC connection reconfiguration message directly activating SCell is kept short enough to allow the SCell to remain known to the UE.

Time period  $T_2$  starts when the UE receives the RRC connection reconfiguration message at the UE antenna connector. The corresponding slot at which the message is received at the UE antenna connector is denoted  $n$ . The UE shall complete activation of the SCell no later than in slot  $n + \frac{N_{\text{direct}}}{\text{NR slot length}}$ , as specified in clause 8.3.4. From slot  $n + \frac{N_{\text{direct}}}{\text{NR slot length}}$  and onwards the UE shall report valid CSI both for PCell and SCell.

The test equipment verifies the activation time by counting the slots between the RRC connection reconfiguration message is sent and until CSI report with non-zero CQI for both PCell and SCell is received.

The test equipment verifies that interruptions on other serving cells are within the requirements by counting ACK/NACKs transmitted in PCell.

**Table A.6.5.3.4.1-1: Supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                              |
| Note:  | The UE is only required to be tested in one of the supported test configurations |



Table A.6.5.3.4.1-2: General test parameters

| Parameter                                   | Unit    | Value       | Comment  |
|---|---------|-------------|--|
| NR RF Channel Number                        |         | 1, 2        | Two NR radio channels are used for this test   |
| Active PCell                                |         | Cell 1      | Primary cell on NR RF channel number 1.  |
| Inter-frequency neighbor cell (SCell to-be) |         | Cell 2      | Inter-frequency neighbor cell on NR RF channel number 2  |
| CP length                                   |         | Normal      |  |
| DRX   |         | OFF         | Continuous monitoring of primary cell  |
| Measurement gap pattern                     |         | gp0         | Measurement gap is used during parts of time period T1 for detection of Cell 2.                                    |
| CSI reporting periodicity                   | ms      | 2           | CSI reporting periodicity for periodic reporting of CQI for PCell and, when added, SCell.                          |
| SCell measurement cycle (measCycleSCell)    | ms      | 160         | Measurement cycle for SCell does not come into effect in direct activation at SCell addition.                      |
| Timing offset between Cell 1 and Cell 2     | $\mu$ s | $\leq$ MRTD | The value of maximum timing offset depends upon the carrier aggregation scenario.                                  |
| T1  | s       | 7           | During this time period the PCell shall be known and Cell 2 shall be detected as an inter-frequency neighbor cell. |
| T2  | s       | 1           | During this time period Cell 2 shall be configured and directly activated as SCell.                                |

Table A.6.5.3.4.1-3: NR Cell specific test parameters

| Parameter  |              | Unit         | Cell 1                      |    | Cell 2 |                |
|--|--------------|--------------|-----------------------------|----|--------|----------------|
|  |              |              | T1                          | T2 | T1     | T2             |
| Duplex mode                                      | Config 1     |              | FDD                         |    |        |                |
|  | Config 2,3   |              | TDD                         |    |        |                |
| TDD configuration                                | Config 2     |              | TDDConf.1.1                 |    |        |                |
|  | Config 3     |              | TDDConf.2.1                 |    |        |                |
| BW <sub>channel</sub>                            | Config 1,2   | MHz          | 10: N <sub>RB,c</sub> = 52  |    |        |                |
|  | Config 3     |              | 40: N <sub>RB,c</sub> = 106 |    |        |                |
| BWP configuration                                | Initial DL   |              | DLBWP.0.1                   |    | ---    | DLBWP.0.1      |
|  | Initial UL   |              | ULBWP.0.1                   |    |        | ---            |
|  | Dedicated DL |              | DLBWP.1.1                   |    |        | DLBWP.1.1      |
|  | Dedicated UL |              | ULBWP.1.1                   |    |        | ---            |
| TCI state  |              |              | TCI.State.0                 |    | ---    | TCI.State.0    |
| CSI-RS configuration for CSI reporting           | Config 1     |              | CSI-RS.1.1 FDD              |    | ---    | CSI-RS.1.1 FDD |
|  | Config 2     |              | CSI-RS.1.1 TDD              |    |        | CSI-RS.1.1 TDD |
|  | Config 3     |              | CSI-RS.2.1 TDD              |    |        | CSI-RS.2.1 TDD |
| TRS Configuration                                | Config 1     |              | TRS.1.1 FDD                 |    | ---    | TRS.1.1 FDD    |
|  | Config 2     |              | TRS.1.1 TDD                 |    |        | TRS.1.1 TDD    |
|  | Config 3     |              | TRS.1.2 TDD                 |    |        | TRS.1.2 TDD    |
| PDSCH Reference measurement channel              | Config 1     |              | SR.1.1 FDD                  |    | ---    | SR.1.1 FDD     |
|  | Config 2     |              | SR.1.1 TDD                  |    |        | SR.1.1 TDD     |
|  | Config 3     |              | SR.2.1 TDD                  |    |        | SR.2.1 TDD     |
| Dedicated CORESET parameters                     | Config 1     |              | CCR.1.1 FDD                 |    | ---    | CCR.1.1 FDD    |
|  | Config 2     |              | CCR.1.1 TDD                 |    |        | CCR.1.1 TDD    |
|  | Config 3     |              | CCR.2.1 TDD                 |    |        | CCR.2.1 TDD    |
| RMSI CORESET parameters                          | Config 1     |              | CR.1.1 FDD                  |    | ---    |                |
|  | Config 2     |              | CR.1.1 TDD                  |    |        |                |
|  | Config 3     |              | CR.2.1 TDD                  |    |        |                |
| OCNG Pattern                                     |              |              | OP.1                        |    |        | OP.1           |
| SSB Configuration                                | Config 1,2   |              | SSB.1 FR1                   |    |        | SSB.1 FR1      |
|  | Config 3     |              | SSB.2 FR1                   |    |        | SSB.2 FR1      |
| SMTc configuration                               |              |              | SMTc.1                      |    |        | SMTc.1         |
| EPRE ratio of PSS to SSS                         |              | dB           | 0                           |    |        |                |
| EPRE ratio of PBCH DMRS to SSS                   |              |              |                             |    |        |                |
| EPRE ratio of PBCH to PBCH DMRS                  |              |              |                             |    |        |                |
| EPRE ratio of PDCCH DMRS to SSS                  |              |              |                             |    |        |                |
| EPRE ratio of PDCCH to PDCCH DMRS                |              |              |                             |    |        |                |
| EPRE ratio of PDSCH DMRS to SSS                  |              |              |                             |    |        |                |
| EPRE ratio of PDSCH to PDSCH                     |              |              |                             |    |        |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>  |              |              |                             |    |        |                |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup> |              |              |                             |    |        |                |
| N <sub>oc</sub> <sup>Note2</sup>                 | Config 1,2   | dBm/15kHz    | -104                        |    |        | -104           |
|  | Config 3     |              | -101                        |    |        | -101           |
| $\hat{E}_s/I_{ot}$                               |              | dB           | 17                          |    |        | 17             |
| $\hat{E}_s/N_{oc}$                               |              | dB           | 17                          |    |        | 17             |
| SS-RSRP <sup>Note3</sup>                         | Config 1,2   | dBm/SCS      | -87                         |    |        | -87            |
|  | Config 3     |              | -84                         |    |        | -84            |
| I <sub>o</sub> <sup>Note3</sup>                  | Config 1,2   | dBm/9.36 MHz | -59.0                       |    |        | -59.0          |
|  | Config 3     |              | -52.9                       |    |        | -52.9          |
| Propagation condition                            |              |              | AWGN                        |    |        | AWGN           |
| Correlation Matrix and Antenna Configuration     |              |              | 1x2 Low                     |    |        | 1x2 Low        |

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 3: SS-RSRP, SCH<sub>RP</sub>, and I<sub>o</sub> levels have been derived from other parameters for information purpose. They are not settable parameters themselves.

### A.6.5.3.4.2 Test Requirements

The UE shall complete the direct activation of the SCell no later than at slot  $n + \frac{N_{\text{direct}}}{\text{NR slot length}}$ .

The UE shall report non-zero CQI for SCell from slot  $n + \frac{N_{\text{direct}}}{\text{NR slot length}}$  and onwards throughout time period T2.

The interruption on PCell during direct activation of the SCell shall occur within the interruption window specified in clause 8.3.4 and shall not exceed the length specified in clause 8.2.2.2.11.

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

### A.6.5.3.5 Direct SCell activation at handover with known SCell in FR1

#### A.6.5.3.5.1 Test Purpose and Environment

This test is to verify the requirement for the FDD-FDD and TDD-TDD intra frequency handover with direct SCell activation requirements specified in subclause 8.3.5.

Supported test configurations are shown in table A.6.5.3.5.1-1. Both handover with direct SCell activation requirements are tested by using the parameters in table A.6.5.3.5.1-2, and A.6.5.3.5.1-3.

The test scenario comprises of three NR FDD or NR TDD FR1 carriers and the 3 cells as given in tables A.6.5.3.5.1-1 and A.6.5.3.5.1-2. The test consists of three successive time periods, with time durations of T1, T2, and T3 respectively.

At the start of time duration T1, the UE is in connected mode with PCell and SCell1 (cell 2) is in activated state and UE is reporting CQI for both PCell and SCell1.

Time period T2 starts when UE receives a handover command to Cell 3 that also activates SCell1 (Cell2). This is done using an *RRCReconfiguration* message with parameter *sCellState* set to *activated* for the SCell1 (Cell 2). The message is sent from the test equipment to the UE and is received in a subframe # denoted n at the UE antenna connector. The UE shall accomplish the activation of the SCell no later than subframe  $(n + N_{\text{direct}})$ .

Time period T3 starts at  $(n + N_{\text{direct}})$ , at which point UE shall be reporting a valid CQI for both PCell and SCell1.

**Table A.6.5.3.5.1-1: Intra-frequency handover with direct SCell activation from FR1 to FR1 test configurations**

| Config | Description  |
|--------|--|
| 1      | PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>SCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>SCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | PCell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>SCell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.6.5.3.5.1-2: General test parameters Intra-frequency handover with direct SCell activation from FR1 to FR1**

| Parameter                  | Unit           | Value                     | Comment  |
|----------------------------|----------------|---------------------------|--|
| Initial conditions         | PCell          | Cell 1                    |  |
|                            | SCell          | Cell 2                    |  |
|                            | Target cell    | Cell 3                    |  |
| Final condition            | PCell          | Cell 3                    |  |
|                            | SCell          | Cell 2                    |  |
|                            | neighbour cell | Cell 1                    |  |
| Access Barring Information | -              | Not Sent                  | No additional delays in random access procedure.       |
| PRACH configuration index  |                | FR1 PRACH configuration 1 | As specified in table Table 6.3.3.2-3 in TS 38.211 [6] |

|                             |      |  |   |
|-----------------------------|------|--|---|
| Time offset between cells   |      | $3 \mu\text{s}$  | Synchronous cells   |
| T1                          | s    | 5  | UE is in connected mode with PCell and SCell1 (cell 2) is in activated state. UE receives a handover command  |
| T2                          | s    | $N_{\text{direct}}$  | UE shall accomplish the activation of the SCell   |
| T3                          | s    | 1  |   |
| $T_{\text{HARQ}}$           | slot | k  | k is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by <i>dl-DataToUL-ACK</i> if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3] |
| $T_{\text{CSI\_Reporting}}$ | ms   | 2  | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]  |
| k                           | ms   | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe}, \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [3]   |

**Table A.6.5.3.5.1-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover with direct SCell activation test case**

| Parameter                                |                  | Unit | Cell 1                      |    |    | Cell 2 |    |    | Cell 3 |    |    |
|--|------------------|------|-----------------------------|----|----|--------|----|----|--------|----|----|
|  |                  |      | T1                          | T2 | T3 | T1     | T2 | T3 | T1     | T2 | T3 |
| NR RF Channel Number                     |                  |      | 1                           |    |    | 2      |    |    | 1      |    |    |
| Duplex mode                              | Config 1         |      | FDD                         |    |    |        |    |    |        |    |    |
|  | Config 2,3       |      | TDD                         |    |    |        |    |    |        |    |    |
| TDD configuration                        | Config 1         |      | Not Applicable              |    |    |        |    |    |        |    |    |
|  | Config 2         |      | TDDConf.1.1                 |    |    |        |    |    |        |    |    |
|  | Config 3         |      | TDDConf.2.1                 |    |    |        |    |    |        |    |    |
| BW <sub>channel</sub>                    | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    |    |        |    |    |        |    |    |
|  | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    |    |        |    |    |        |    |    |
|  | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    |    |        |    |    |        |    |    |
| BWP BW                                   | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    |    |        |    |    |        |    |    |
|  | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    |    |        |    |    |        |    |    |
|  | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    |    |        |    |    |        |    |    |
| DRx Cycle                                |                  | ms   | Not Applicable              |    |    |        |    |    |        |    |    |
| PDSCH Reference measurement channel      | Config 1         |      | SR.1.1 FDD                  |    |    |        |    |    |        |    |    |
|  | Config 2         |      | SR.1.1 TDD                  |    |    |        |    |    |        |    |    |
|  | Config 3         |      | SR2.1 TDD                   |    |    |        |    |    |        |    |    |
| CORESET Reference Channel                | Config 1         |      | CR.1.1 FDD                  |    |    |        |    |    |        |    |    |
|  | Config 2         |      | CR.1.1 TDD                  |    |    |        |    |    |        |    |    |
|  | Config 3         |      | CR2.1 TDD                   |    |    |        |    |    |        |    |    |
| TRS configuration                        | Config 1         |      | TRS.1.1 FDD                 |    |    |        |    |    |        |    |    |
|  | Config 2         |      | TRS.1.1 TDD                 |    |    |        |    |    |        |    |    |
|  | Config 3         |      | TRS.1.2 TDD                 |    |    |        |    |    |        |    |    |
| OCNG Patterns                            |                  |      | OCNG pattern 1              |    |    |        |    |    |        |    |    |
| SMTc Configuration                       |                  |      | SMTc pattern 1              |    |    |        |    |    |        |    |    |
| SSB Configuration                        | Config 1,2       |      | SSB.1 FR1                   |    |    |        |    |    |        |    |    |
|  | Config 3         |      | SSB.2 FR1                   |    |    |        |    |    |        |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz  | 15 kHz                      |    |    |        |    |    |        |    |    |
|  | Config 3         |      | 30 kHz                      |    |    |        |    |    |        |    |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz  | 15 kHz                      |    |    |        |    |    |        |    |    |
|  | Config 3         |      | 30 kHz                      |    |    |        |    |    |        |    |    |
| PRACH configuration                      |                  |      | FR1 PRACH configuration 1   |    |    |        |    |    |        |    |    |
| BWP configuration                        | Initial DL BWP   |      | DLBWP.0.1                   |    |    |        |    |    |        |    |    |
|  | Dedicated DL BWP |      | DLBWP.1.1                   |    |    |        |    |    |        |    |    |
|  | Initial UL BWP   |      | ULBWP.0.1                   |    |    |        |    |    |        |    |    |
|  | Dedicated UL BWP |      | ULBWP.1.1                   |    |    |        |    |    |        |    |    |
| EPRE ratio of PSS to SSS                 |                  | dB   | 0                           |    |    |        |    |    |        |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |      |                             |    |    |        |    |    |        |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |      |                             |    |    |        |    |    |        |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |      |                             |    |    |        |    |    |        |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |      |                             |    |    |        |    |    |        |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |      |                             |    |    |        |    |    |        |    |    |
| EPRE ratio of PDSCH to PDSCH             |                  |      |                             |    |    |        |    |    |        |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |      |                             |    |    |        |    |    |        |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |      |                             |    |    |        |    |    |        |    |    |

|   |            |              |        |        |        |        |        |        |        |        |        |
|---|------------|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| $N_{oc}^{Note2}$  |            | dBm/15 kHz   | -98    |        |        |        |        |        |        |        |        |
| $N_{oc}^{Note2}$  | Config 1,2 | dBm/S CS     | -98    |        |        |        |        |        |        |        |        |
|   | Config 3   | CS           | -95    |        |        |        |        |        |        |        |        |
| $\hat{E}_s/I_{ot}$  |            | dB           | 8      | 8      | 8      | 8      | 8      | 8      | 8      | 8      | 8      |
| $\hat{E}_s/N_{oc}$  |            | dB           | 8      | 8      | 8      | 8      | 8      | 8      | 8      | 8      | 8      |
| SSB_RP  | Config 1,2 | dBm/S CS     | -90    | -90    | -90    | -90    | -90    | -90    | -90    | -90    | -90    |
|   | Config 3   | dBm/S CS     | -87    | -87    | -87    | -87    | -87    | -87    | -87    | -87    | -87    |
| $I_o^{Note3}$   | Config 1,2 | dBm/9.36MHz  | -61.41 | -57.06 | -57.06 | -61.41 | -57.06 | -61.41 | -57.06 | -57.06 | -61.41 |
|   | Config 3   | dBm/38.16MHz | -55.31 | -50.96 | -50.96 | -55.31 | -50.96 | -55.31 | -50.96 | -50.96 | -55.31 |
| Propagation condition   |            | -            | AWGN   |        |        | AWGN   |        |        | AWGN   |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |            |              |        |        |        |        |        |        |        |        |        |

### A.6.5.3.5.2 Test Requirements

The UE shall be capable to transmit valid CSI report for the directly activated SCell1 no later than in subframe  $n+N_{direct}$ .

The rate of correct observed SCell1 direct activation delay during repeated tests shall be at least 90%.

NOTE: The SCell activation delay,  $N_{direct}$ , can be expressed as:  $N_{direct} = T_{RRC\_process} + T_{interrupt} + T_2 + T_3 + T_{activation\_time} + T_{CSI\_Reporting} - 3ms$ , where:

$T_{RRC\_Process}$ : RRC procedure delay defined in clause 12 of TS 38.331 [2],

$T_{interrupt}$ : Interruption time during handover as specified in clause 6.1.1,

$T_2$ : Delay from slot  $n + \frac{T_{RRC\_Process} + T_{interrupt}}{NR\ slot\ length}$  until UE has obtained a valid TA command for the target PCell,

$T_3$ : Delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to  $k+1$  slot, where  $k$  is defined in clause 4.2 in TS 38.213,

$T_{activation\_time}$  and  $T_{CSI\_Reporting}$  are specified in clause 8.3.2, where the following definitions of  $T_{FirstSSB}$  and  $T_{FirstSSB\_MAX}$  as defined in section 8.3.5 shall apply:

-  $T_{FirstSSB}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{(T_{RRC\_Process} + T_{interrupt} + T_2 + T_3)}{(NR\ slot\ length)}$

-  $T_{FirstSSB\_MAX}$ : the time to the end of the first complete SSB burst indicated by the SMTC after slot  $n + \frac{(T_{RRC\_Process} + T_{interrupt} + T_2 + T_3)}{(NR\ slot\ length)}$

This gives a total of  $N_{direct} = 10 + 52 + T_{IU} + T_2 + T_3 + T_{activation\_time} + T_{CSI\_Reporting} - 3\ ms = 62 + 10 + 13 + 6 + 20 + 2 - 3 = 94\ ms$  for test configurations 1 and 2.

This gives a total of  $N_{direct} = 10 + 52 + T_{IU} + T_2 + T_3 + T_{activation\_time} + T_{CSI\_Reporting} - 3\ ms = 62 + 10 + 13 + 6 + 20 + 2 - 3 = 94\ ms$  for test configuration 3.

During T3 the UE shall send valid CSI reports for PCell and SCell1 with non-zero CQI index and continue to send CSI reports for PCell and SCell1 (Cell 2) with non-zero CQI index until the end of T3.

All of the above test requirements shall be fulfilled in order for the observed SCell1 direct activation delay to be counted as correct.

## A.6.5.4 UE UL carrier RRC reconfiguration Delay

### A.6.5.4.1 UE UL carrier RRC reconfiguration Delay

#### Table A.6.5.4.1-1 - Table A.6.5.4.1-4 : Void

#### A.6.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are two cells: FR1 PCell (cell 1) and FR1 SCell (cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test parameters for PCell and SCell are given in Table A. 6.5.4.1.1-1, Table A.6.5.4.1.1-2, Table A.6.5.4.1.1-3 and Table A.6.5.4.1.1-4 below. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 2 is configured to UE. At the start of T2, a supplementary uplink of cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementary uplink on cell 2 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.



Table A.6.5.4.1.1-1: Supported test configurations

| Configuration | PCell (Cell 1)  | SCell (Cell 2)  |
|---------------|---|---|
| 1             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  | DL and UL: 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode;<br>SUL: 15 kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 2             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  | DL and UL: 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode;<br>SUL: 15 kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 3             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode  | DL and UL: 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, $\geq 40$ MHz bandwidth, SUL duplex mode   |
| 4             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  | DL and UL: 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode;<br>SUL: 15 kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 5             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  | DL and UL: 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode;<br>SUL: 15 kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 6             | 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode  | DL and UL: 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, $\geq 40$ MHz bandwidth, SUL duplex mode   |
| 7             | 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  | DL and UL: 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD duplex mode;<br>SUL: 15 kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 8             | 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  | DL and UL: 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD duplex mode;<br>SUL: 15 kHz SCS, $\geq 10$ MHz bandwidth, SUL duplex mode |
| 9             | 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode  | DL and UL: 30kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, $\geq 40$ MHz bandwidth, SUL duplex mode   |
| Note 1:       | The UE is only required to be tested in one of the supported test configurations  |   |
| Note 2:       | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration, |   |

**Table A.6.5.4.1.1-2: General test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on Pcell**

| Parameter                  | Unit | Test configuration             | Value                                  | Comment  |
|----------------------------|------|--------------------------------|--|--|
| RF Channel Number          |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 1, 2                                   | Two radio channels are used for these two tests.                 |
| Active cell                |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell | PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length                  |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Normal                                 |  |
| DRX                        |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF                                    |  |
| Measurement gap pattern Id |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF                                    |  |
| Filter coefficient         |      | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 0                                      | L3 filtering is not used   |
| T1                         | s    | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5                                      |  |
| T2                         | s    | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5                                      |  |
| T3                         | s    | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5                                      |  |

**Table A.6.5.4.1.1-3: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)**

| Parameter  | Unit        | Test Configuration             | Test 1                 |             |    | Test 2                 |    |    |
|--|-------------|--------------------------------|------------------------|-------------|----|------------------------|----|----|
|  |             |                                | T1                     | T2          | T3 | T1                     | T2 | T3 |
| Channel number   |             | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1                      |             |    | 1                      |    |    |
| TDD configuration  |             | Conf 1, 2, 3                   | N/A                    |             |    | N/A                    |    |    |
|  |             | Conf 4, 5, 6                   | TDD Conf.1.1           |             |    | TDD Conf.1.1           |    |    |
|  |             | Conf 7, 8, 9                   | TDD Conf.2.1           |             |    | TDD Conf.2.1           |    |    |
| BW <sub>channel</sub>  | MHz         | Conf 1, 2, 3                   | Note 6                 |             |    | Note 6                 |    |    |
|  |             | Conf 4, 5, 6                   | Note 6                 |             |    | Note 6                 |    |    |
|  |             | Conf 7, 8, 9                   | Note 6                 |             |    | Note 6                 |    |    |
| BW <sub>occupied</sub>   | RB          | Conf 1, 2, 3                   | 52 <sup>Note 4</sup>   |             |    | 52 <sup>Note 4</sup>   |    |    |
|  |             | Conf 4, 5, 6                   | 52 <sup>Note 4</sup>   |             |    | 52 <sup>Note 4</sup>   |    |    |
|  |             | Conf 7, 8, 9                   | 106 <sup>Note 5</sup>  |             |    | 106 <sup>Note 5</sup>  |    |    |
| PDSCH reference measurement channel as defined in A.3.1.1        |             | Conf 1, 2, 3                   | SR.1.1 FDD             |             |    | SR.1.1 FDD             |    |    |
|  |             | Conf 4, 5, 6                   | SR.1.1 TDD             |             |    | SR.1.1 TDD             |    |    |
|  |             | Conf 7, 8, 9                   | SR.2.1 TDD             |             |    | SR.2.1 TDD             |    |    |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |             | Conf 1, 2, 3                   | CR.1.1 FDD             |             |    | CR.1.1 FDD             |    |    |
|  |             | Conf 4, 5, 6                   | CR.1.1 TDD             |             |    | CR.1.1 TDD             |    |    |
|  |             | Conf 7, 8, 9                   | CR.2.1 TDD             |             |    | CR.2.1 TDD             |    |    |
| RMC CORESET reference measurement channel as defined in A.3.1.3  |             | Conf 1, 2, 3                   | CCR.1.1 FDD            |             |    | CCR.1.1 FDD            |    |    |
|  |             | Conf 4, 5, 6                   | CCR.1.1 TDD            |             |    | CCR.1.1 TDD            |    |    |
|  |             | Conf 7, 8, 9                   | CCR.2.1 TDD            |             |    | CCR.2.1 TDD            |    |    |
| OCNG Pattern <sup>Note 1</sup>                                   |             | Conf 1, 2, 3, 4, 5, 6          | OP.1 <sup>Note 4</sup> |             |    | OP.1 <sup>Note 4</sup> |    |    |
|  |             | Config 7, 8, 9                 | OP.1 <sup>Note 5</sup> |             |    | OP.1 <sup>Note 5</sup> |    |    |
| SSB configuration  |             | Conf 1, 2, 3, 4, 5, 6          | SSB.1 FR1              |             |    | SSB.1 FR1              |    |    |
|  |             | Conf 7, 8, 9                   | SSB.2 FR1              |             |    | SSB.2 FR1              |    |    |
| SMTC configuration   |             | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1                 |             |    | SMTC.1                 |    |    |
| CSI-RS for tracking  |             | Conf 1                         | TRS.1.1 FDD            |             |    | TRS.1.1 FDD            |    |    |
|  |             | Conf 2                         | TRS.1.1 FDD            |             |    | TRS.1.1 FDD            |    |    |
|  |             | Conf 3                         | TRS.1.1 FDD            |             |    | TRS.1.1 FDD            |    |    |
|  |             | Conf 4                         | TRS.1.1 TDD            |             |    | TRS.1.1 TDD            |    |    |
|  |             | Conf 5                         | TRS.1.1 TDD            |             |    | TRS.1.1 TDD            |    |    |
|  |             | Conf 6                         | TRS.1.1 TDD            |             |    | TRS.1.1 TDD            |    |    |
|  |             | Conf 7                         | TRS.1.2 TDD            |             |    | TRS.1.2 TDD            |    |    |
|  |             | Conf 8                         | TRS.1.2 TDD            |             |    | TRS.1.2 TDD            |    |    |
| Conf 9   | TRS.1.2 TDD |                                |                        | TRS.1.2 TDD |    |                        |    |    |
| DL initial BWP configuration                                     |             | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1              |             |    | DLBWP.0.1              |    |    |
| DL dedicated BWP configuration                                   |             | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1              |             |    | DLBWP.1.1              |    |    |
| UL dedicated BWP configuration                                   |             | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1              |             |    | ULBWP.1.1              |    |    |
| EPRE ratio of PSS to SSS   | dB          | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0                      |             |    | 0                      |    |    |
| EPRE ratio of PBCH_DMRS to SSS                                   |             |                                |                        |             |    |                        |    |    |
| EPRE ratio of PBCH to PBCH_DMRS                                  |             |                                |                        |             |    |                        |    |    |

|  |               |                                |       |       |       |       |       |       |
|--|---------------|--------------------------------|-------|-------|-------|-------|-------|-------|
| EPRE ratio of PDCCH_DMRS to SSS  |               |                                |       |       |       |       |       |       |
| EPRE ratio of PDCCH to PDCCH_DMRS  |               |                                |       |       |       |       |       |       |
| EPRE ratio of PDSCH_DMRS to SSS  |               |                                |       |       |       |       |       |       |
| EPRE ratio of PDSCH to PDSCH_DMRS  |               |                                |       |       |       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |               |                                |       |       |       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |               |                                |       |       |       |       |       |       |
| $N_{oc}$ <sup>Note 2</sup>   | dBm / 15kHz   | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102  |       |       | -102  |       |       |
|  | dBm/SCS       | Conf 1,2,3,4,5,6               | -102  |       |       | -102  |       |       |
|  |               | Conf 7,8,9                     | -99   |       |       | -99   |       |       |
| $\hat{E}_s/N_{oc}$   | dB            | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16    | 16    | 16    | 16    | 16    | 16    |
| $\hat{E}_s/I_{ot}$ <sup>Note 3</sup>   | dB            | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16    | 16    | 16    | 16    | 16    | 16    |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS       | Conf 1,2,3,4,5,6               | -86   | -86   | -86   | -86   | -86   | -86   |
|  |               | Conf 7,8,9                     | -83   | -83   | -83   | -83   | -83   | -83   |
| $I_o$ <sup>Note 3</sup>  | dBm/9.36 MHz  | Conf 1,2,3,4,5,6               | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 |
|  | dBm/38.16 MHz | Conf 7,8,9                     | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation Condition  |               | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN  |       |       | AWGN  |       |       |
| Antenna configuration  |               | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 |       |       | 1 x 2 |       |       |
| <p>NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled within <math>BW_{occupied}</math>.</p> <p>NOTE 3: <math>\hat{E}_s/I_{ot}</math>, <math>I_o</math>, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 10 MHz, 52 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 5: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 40 MHz, 106 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 6: <math>N_{RB,c}</math> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured <math>BW_{channel}</math>.</p> |               |                                |       |       |       |       |       |       |

**Table A.6.5.4.1.1-4: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SCell (Cell 2)**

| Parameter   | Unit | Test Configuration             | Test 1                    |                           |                           | Test 2                    |                           |                           |
|---|------|--------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
|   |      |                                | T1                        | T2                        | T3                        | T1                        | T2                        | T3                        |
| Channel number  |      | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 2                         |                           |                           | 2                         |                           |                           |
| TDD configuration   |      | Conf 1, 4, 7                   | N/A                       |                           |                           | N/A                       |                           |                           |
|   |      | Conf 2, 5, 8                   | TDDConf.1.1               |                           |                           | TDDConf.1.1               |                           |                           |
|   |      | Conf 3, 6, 9                   | TDDConf.2.1               |                           |                           | TDDConf.2.1               |                           |                           |
| BW <sub>channel</sub>                                     | MHz  | Conf 1, 4, 7                   | Note 6                    |                           |                           | Note 6                    |                           |                           |
|   |      | Conf 2, 5, 8                   | Note 6                    |                           |                           | Note 6                    |                           |                           |
|   |      | Conf 3, 6, 9                   | Note 6                    |                           |                           | Note 6                    |                           |                           |
| BW <sub>occupied</sub>                                    | RB   | Conf 1, 4, 7                   | 52 <sup>Note 4</sup>      |                           |                           | 52 <sup>Note 4</sup>      |                           |                           |
|   |      | Conf 2, 5, 8                   | 52 <sup>Note 4</sup>      |                           |                           | 52 <sup>Note 4</sup>      |                           |                           |
|   |      | Conf 3, 6, 9                   | 106 <sup>Note 5</sup>     |                           |                           | 106 <sup>Note 5</sup>     |                           |                           |
| PUSCH parameters for NR UL carrier                        |      | Conf 1, 4, 7                   | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | N/A                       |
|   |      | Conf 2, 5, 8                   | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | N/A                       |
|   |      | Conf 3, 6, 9                   | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       | N/A                       | G-FR1-A3-14 in [13]       | N/A                       |
| PUCCH parameters For NR UL carrier                        |      | Conf 1, 4, 7                   | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | N/A                       | N/A                       | N/A                       |
|   |      | Conf 2, 5, 8                   | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | N/A                       | N/A                       | N/A                       |
|   |      | Conf 3, 6, 9                   | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | N/A                       | N/A                       | N/A                       |
| PUSCH parameters for supplementary UL                     |      | Conf 1, 4, 7                   | N/A                       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       |
|   |      | Conf 2, 5, 8                   | N/A                       | G-FR1-A3-10 in [13]       | N/A                       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       | G-FR1-A3-10 in [13]       |
|   |      | Conf 3, 6, 9                   | N/A                       | G-FR1-A3-14 in [13]       | N/A                       | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       | G-FR1-A3-14 in [13]       |
| PUCCH parameters for supplementary UL                     |      | Conf 1, 4, 7                   | N/A                       | N/A                       | N/A                       | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
|   |      | Conf 2, 5, 8                   | N/A                       | N/A                       | N/A                       | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
|   |      | Conf 3, 6, 9                   | N/A                       | N/A                       | N/A                       | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] |
| PDSCH reference measurement channel as defined in A.3.1.1 |      | Conf 1, 4, 7                   | SR.1.1 FDD                |                           |                           | SR.1.1 FDD                |                           |                           |
|   |      | Conf 2, 5, 8                   | SR.1.1 TDD                |                           |                           | SR.1.1 TDD                |                           |                           |
|   |      | Conf 3, 6, 9                   | SR 2.1 TDD                |                           |                           | SR 2.1 TDD                |                           |                           |

|  |         |                                |                        |                        |
|--|---------|--------------------------------|------------------------|------------------------|
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |         | Conf 1, 4, 7                   | CR.1.1 FDD             | CR.1.1 FDD             |
|  |         | Conf 2, 5, 8                   | CR.1.1 TDD             | CR.1.1 TDD             |
|  |         | Conf 3, 6, 9                   | CR.2.1 TDD             | CR.2.1 TDD             |
| RMC CORESET reference measurement channel as defined in A.3.1.3  |         | Conf 1, 4, 7                   | CCR.1.1 FDD            | CCR.1.1 FDD            |
|  |         | Conf 2, 5, 8                   | CCR.1.1 TDD            | CCR.1.1 TDD            |
|  |         | Conf 3, 6, 9                   | CCR.2.1 TDD            | CCR.2.1 TDD            |
| OCNG Pattern <sup>Note 1</sup>                                   |         | Conf 1, 2, 4, 5, 7, 8          | OP.1 <sup>Note 4</sup> | OP.1 <sup>Note 4</sup> |
|  |         | Conf 3, 6, 9                   | OP.1 <sup>Note 5</sup> | OP.1 <sup>Note 5</sup> |
| SSB configuration  |         | Conf 1, 2, 4, 5, 7, 8          | SSB.1 FR1              | SSB.1 FR1              |
|  |         | Conf 3, 6, 9                   | SSB.2 FR1              | SSB.2 FR1              |
| SMTC configuration   |         | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1                 | SMTC.1                 |
| CSI-RS for tracking  |         | Conf 1                         | TRS.1.1 FDD            | TRS.1.1 FDD            |
|  |         | Conf 2                         | TRS.1.1 TDD            | TRS.1.1 TDD            |
|  |         | Conf 3                         | TRS.1.2 TDD            | TRS.1.2 TDD            |
|  |         | Conf 4                         | TRS.1.1 FDD            | TRS.1.1 FDD            |
|  |         | Conf 5                         | TRS.1.1 TDD            | TRS.1.1 TDD            |
|  |         | Conf 6                         | TRS.1.2 TDD            | TRS.1.2 TDD            |
|  |         | Conf 7                         | TRS.1.1 FDD            | TRS.1.1 FDD            |
|  |         | Conf 8                         | TRS.1.1 TDD            | TRS.1.1 TDD            |
|  |         | Conf 9                         | TRS.1.2 TDD            | TRS.1.2 TDD            |
| DL initial BWP configuration                                     |         | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1              | DLBWP.0.1              |
| DL dedicated BWP configuration                                   |         | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1              | DLBWP.1.1              |
| UL dedicated BWP configuration                                   |         | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1              | ULBWP.1.1              |
| EPRE ratio of PSS to SSS   | dB      | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0                      | 0                      |
| EPRE ratio of PBCH_DMRS to SSS                                   |         |                                |                        |                        |
| EPRE ratio of PBCH to PBCH_DMRS                                  |         |                                |                        |                        |
| EPRE ratio of PDCCH_DMRS to SSS                                  |         |                                |                        |                        |
| EPRE ratio of PDCCH to PDCCH_DMRS                                |         |                                |                        |                        |
| EPRE ratio of PDSCH_DMRS to SSS                                  |         |                                |                        |                        |
| EPRE ratio of PDSCH to PDSCH_DMRS                                |         |                                |                        |                        |
| EPRE ratio of OCNG DMRS to SSS                                   |         |                                |                        |                        |
| EPRE ratio of OCNG to OCNG DMRS                                  |         |                                |                        |                        |
| $N_{oc}$ <sup>Note 2</sup>                                       |         |                                |                        |                        |
|  | dBm/SCS | Conf 1, 2, 4, 5, 7, 8          | -102                   | -102                   |
|  |         | Conf 3, 6, 9                   | -99                    | -99                    |



|  |               |                                |       |       |       |       |       |       |
|--|---------------|--------------------------------|-------|-------|-------|-------|-------|-------|
| $\hat{E}_s / N_{oc}$   | dB            | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16    | 16    | 16    | 16    | 16    | 16    |
| $\hat{E}_s / I_{ot}$ <sup>Note 3</sup>   | dB            | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16    | 16    | 16    | 16    | 16    | 16    |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS       | Conf 1, 2, 4, 5, 7, 8          | -86   | -86   | -86   | -86   | -86   | -86   |
|  |               | Conf 3, 6, 9                   | -83   | -83   | -83   | -83   | -83   | -83   |
| $I_o$ <sup>Note 3</sup>  | dBm/9.36 MHz  | Conf 1, 2, 4, 5, 7, 8          | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 |
|  | dBm/38.16 MHz | Conf 3, 6, 9                   | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation Condition  |               | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN  |       |       | AWGN  |       |       |
| Antenna configuration  |               | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 |       |       | 1 x 2 |       |       |
| <p>NOTE 1: OCNB shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled within <math>BW_{occupied}</math>.</p> <p>NOTE 3: <math>\hat{E}_s / I_{ot}</math>, <math>I_o</math>, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 10 MHz, 52 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 5: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 40 MHz, 106 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>NOTE 6: <math>N_{RB,c}</math> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured <math>BW_{channel}</math>.</p> |               |                                |       |       |       |       |       |       |

#### A.6.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

#### A.6.5.4.2 Void

### A.6.5.5 Beam Failure Detection and Link recovery procedures

#### A.6.5.5.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.6.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.1.1-1, A.6.5.5.1.1-2, A.6.5.5.1.1-3 and A.6.5.5.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.1.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.6.5.5.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

**Table A.6.5.5.1.1-1: Supported test configurations for FR1 PCell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 2                    | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 3                    | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth                                  |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.6.5.5.1.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

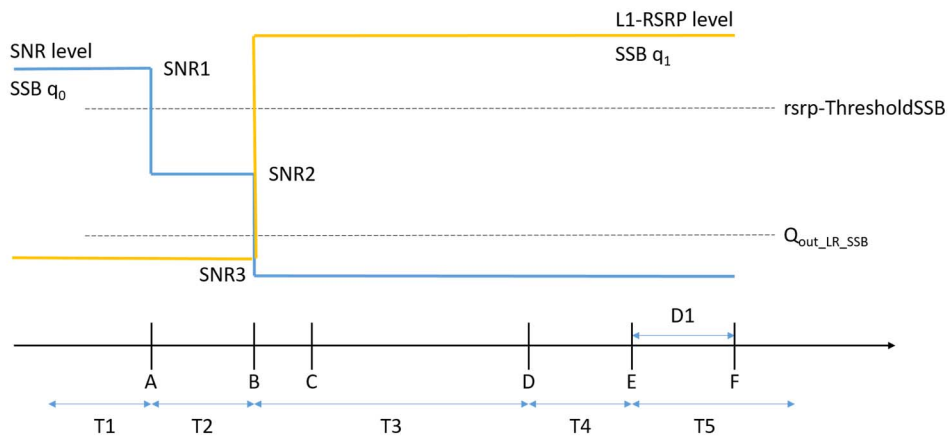
| Parameter                                      |  | Unit | Value             | Comment |
|--|--|------|-------------------|---------|
|  |  |      | Test 1            |         |
| Active PSCell                                  |  |      | Cell 1            |         |
| RF Channel Number                              |  |      | 1                 |         |
| Duplex mode                                    | Config 1   |      | FDD               |         |
|  | Config 2, 3  |      | TDD               |         |
| BWchannel                                      | Config 1   | MHz  | 10: NRB,c = 52    |         |
|  | Config 2   |      | 10: NRB,c = 52    |         |
|  | Config 3   |      | 40: NRB,c = 106   |         |
| DL initial BWP configuration                   | Config 1, 2, 3   |      | DLBWP.0.1         |         |
| DL dedicated BWP configuration                 | Config 1, 2, 3   |      | DLBWP.1.1         |         |
| UL initial BWP configuration                   | Config 1, 2, 3   |      | ULBWP.0.1         |         |
| UL dedicated BWP configuration                 | Config 1, 2, 3   |      | ULBWP.1.1         |         |
| TDD Configuration                              | Config 1   |      | Not Applicable    |         |
|  | Config 2   |      | TDDConf.1.1       |         |
|  | Config 3   |      | TDDConf.2.1       |         |
| RMSI CORESET Reference Channel                 | Config 1   |      | CR.1.1 FDD        |         |
|  | Config 2   |      | CR.1.1 TDD        |         |
|  | Config 3   |      | CR.2.1 TDD        |         |
| Dedicated CORESET Reference Channel            | Config 1   |      | CCR.1.1 FDD       |         |
|  | Config 2   |      | CCR.1.1 TDD       |         |
|  | Config 3   |      | CCR.2.1 TDD       |         |
| SSB Configuration                              | Config 1   |      | SSB.3 FR1         |         |
|  | Config 2   |      | SSB.3 FR1         |         |
|  | Config 3   |      | SSB.4 FR1         |         |
| SMTC Configuration                             | Config 1, 2  |      | SMTC.1            |         |
|  | Config 3   |      | SMTC.1            |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1, 2  |      | 15 KHz            |         |
|  | Config 3   |      | 30 KHz            |         |
| PRACH Configuration                            | Config 1, 2  |      | Table A.3.8.2.2-1 |         |
|  | Config 3   |      | Table A.3.8.2.2-1 |         |
| SSB Index assigned as BFD RS ( $q_0$ )         |  |      | 0                 |         |
| SSB Index assigned as CBD RS ( $q_1$ )         |  |      | 1                 |         |
| OCNG parameters                                |  |      | OP.1              |         |
| CP length                                      |  |      | Normal            |         |
| Correlation Matrix and Antenna Configuration   |  |      | 2x2 Low           |         |
| Beam failure detection transmission parameters | DCI format   |      | 1-0               |         |
|  | Number of Control OFDM symbols                                 |      | 2                 |         |
|  | Aggregation level  | CCE  | 8                 |         |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB   | 0                 |         |

|   |  |             |                 |  |
|---|--|-------------|-----------------|--|
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB          | 0               |  |
|   | DMRS precoder granularity  |             | REG bundle size |  |
|   | REG bundle size  |             | 6               |  |
| DRX   |  |             | OFF             |  |
| Gap pattern ID  |  |             | gp0             |  |
| gapOffset   |  |             | 0               |  |
| rlmInSyncOutOfSyncThreshold   |  |             | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2  | dBm/SCS kHz | -98             | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|   | Config 3   |             | -95             |  |
| powerControlOffsetSS  |  |             | db0             | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount   |  |             | n1              | see clause 5.17 of TS 38.321 [7]                                       |
| beamFailureDetectionTimer   |  |             | pbfd4           | see clause 5.17 of TS 38.321 [7]                                       |
| CSI-RS configuration for CSI reporting  | Config 1   |             | CSI-RS.1.1 FDD  |  |
|   | Config 2   |             | CSI-RS.1.1 TDD  |  |
|   | Config 3   |             | CSI-RS.2.1 TDD  |  |
| CSI-RS for tracking   | Config 1   |             | TRS.1.1 FDD     |  |
|   | Config 2   |             | TRS.1.1 TDD     |  |
|   | Config 3   |             | TRS.1.2 TDD     |  |
| SSB Index assigned as RLM RS  |  |             | 0, 1            |  |
| T310 Timer  |  | ms          | 1000            |  |
| N310  |  |             | 2               |  |
| T1  |  | s           | 0.2             | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |  | s           | 0.37            |  |
| T3  |  | s           | 0.24            |  |
| T4  |  | s           | 0               |  |
| T5  |  | s           | 0.17            |  |
| D1  |  | s           | 0.13            |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |             |                 |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |             |                 |  |

**Table A.6.5.5.1.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |          | Unit            | Test 1            |      |     |     |     |
|--|----------|-----------------|-------------------|------|-----|-----|-----|
|  |          |                 | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB              | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |          |                 |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS  |          |                 |                   |      |     |     |     |
| EPRE ratio of PSS to SSS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS  |          |                 |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |          |                 |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS   |          |                 |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS  |          |                 |                   |      |     |     |     |
| SNR_SSB of set $q_0$   | Config 1 | dB              | 5                 | -3   | -12 | -12 | -12 |
|  | Config 2 |                 | 5                 | -3   | -12 | -12 | -12 |
|  | Config 3 |                 | 5                 | -3   | -12 | -12 | -12 |
| SNR_SSB of set $q_1$   | Config 1 | dB              | -10               | -10  | 10  | 10  | 10  |
|  | Config 2 |                 | -10               | -10  | 10  | 10  | 10  |
|  | Config 3 |                 | -10               | -10  | 10  | 10  | 10  |
| SSB_RP of set $q_1$  | Config 1 | dBm/S<br>CS kHz | -108              | -108 | -88 | -88 | -88 |
|  | Config 2 |                 | -108              | -108 | -88 | -88 | -88 |
|  | Config 3 |                 | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$   | Config 1 | dBm/15<br>KHz   | -98               |      |     |     |     |
|  | Config 2 |                 | -98               |      |     |     |     |
|  | Config 3 |                 | -98               |      |     |     |     |
| Propagation condition  |          |                 | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |          |                 |                   |      |     |     |     |

**Table A.6.5.5.1.1-4: Void**



**Figure A.6.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### A.6.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 120 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.6.5.5.2 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode

### A.6.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.2.1-1, A.6.5.5.2.1-2, A.6.5.5.2.1-3, A.6.5.5.2.1-4 and A.6.5.5.2.1-5 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.2.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.6.5.5.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.6.5.5.2.1-1: Supported test configurations for FR1 PCell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 2                    | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 3                    | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth                                  |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |



**Table A.6.5.5.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter                                      |                                | Unit | Value             | Comment |
|--|--------------------------------|------|-------------------|---------|
|  |                                |      | Test 1            |         |
| Active PSCell                                  |                                |      | Cell 1            |         |
| RF Channel Number                              |                                |      | 1                 |         |
| Duplex mode                                    | Config 1                       |      | FDD               |         |
|  | Config 2, 3                    |      | TDD               |         |
| BWchannel                                      | Config 1                       | MHz  | 10: NRB,c = 52    |         |
|  | Config 2                       |      | 10: NRB,c = 52    |         |
|  | Config 3                       |      | 40: NRB,c = 106   |         |
| DL initial BWP configuration                   | Config 1, 2, 3                 |      | DLBWP.0.1         |         |
| DL dedicated BWP configuration                 | Config 1, 2, 3                 |      | DLBWP.1.1         |         |
| UL initial BWP configuration                   | Config 1, 2, 3                 |      | ULBWP.0.1         |         |
| UL dedicated BWP configuration                 | Config 1, 2, 3                 |      | ULBWP.1.1         |         |
| TDD Configuration                              | Config 1                       |      | Not Applicable    |         |
|  | Config 2                       |      | TDDConf.1.1       |         |
|  | Config 3                       |      | TDDConf.2.1       |         |
| RMSI CORESET Reference Channel                 | Config 1                       |      | CR.1.1 FDD        |         |
|  | Config 2                       |      | CR.1.1 TDD        |         |
|  | Config 3                       |      | CR.2.1 TDD        |         |
| Dedicated CORESET Reference Channel            | Config 1                       |      | CCR.1.1 FDD       |         |
|  | Config 2                       |      | CCR.1.1 TDD       |         |
|  | Config 3                       |      | CCR.2.1 TDD       |         |
| SSB Configuration                              | Config 1                       |      | SSB.3 FR1         |         |
|  | Config 2                       |      | SSB.3 FR1         |         |
|  | Config 3                       |      | SSB.4 FR1         |         |
| SMTC Configuration                             | Config 1, 2                    |      | SMTC.1            |         |
|  | Config 3                       |      | SMTC.1            |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1, 2                    |      | 15 KHz            |         |
|  | Config 3                       |      | 30 KHz            |         |
| PRACH Configuration                            | Config 1, 2                    |      | Table A.3.8.2.2-1 |         |
|  | Config 3                       |      | Table A.3.8.2.2-1 |         |
| SSB Index assigned as BFD RS (q <sub>0</sub> ) |                                |      | 0                 |         |
| SSB Index assigned as CBD RS (q <sub>1</sub> ) |                                |      | 1                 |         |
| OCNG parameters                                |                                |      | OP.1              |         |
| CP length                                      |                                |      | Normal            |         |
| Correlation Matrix and Antenna Configuration   |                                |      | 2x2 Low           |         |
| Beam failure detection transmission parameters | DCI format                     |      | 1-0               |         |
|  | Number of Control OFDM symbols |      | 2                 |         |
|  | Aggregation level              | CCE  | 8                 |         |

|  |  |             |                 |  |
|--|--|-------------|-----------------|--|
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB          | 0               |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB          | 0               |  |
|  | DMRS precoder granularity  |             | REG bundle size |  |
|  | REG bundle size  |             | 6               |  |
| DRX                                    |  |             | DRX.7           | A.3.3.7  |
| Gap pattern ID                         |  |             | N.A.            |  |
| rlmInSyncOutOfSyncThreshold            |  |             | Absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB                      | Config 1, 2  | dBm/SCS kHz | -98             | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|  | Config 3   |             | -95             |  |
| powerControlOffsetSS                   |  |             | db0             | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount            |  |             | n1              | see clause 5.17 of TS 38.321 [7]                                       |
| beamFailureDetectionTimer              |  |             | pbfd4           | see clause 5.17 of TS 38.321 [7]                                       |
| CSI-RS configuration for CSI reporting | Config 1   |             | CSI-RS.1.1 FDD  |  |
|  | Config 2   |             | CSI-RS.1.1 TDD  |  |
|  | Config 3   |             | CSI-RS.2.1 TDD  |  |
| CSI-RS for tracking                    | Config 1   |             | TRS.1.1 FDD     |  |
|  | Config 2   |             | TRS.1.1 TDD     |  |
|  | Config 3   |             | TRS.1.2 TDD     |  |
| SSB Index assigned as RLM RS           |  |             | 0, 1            |  |
| T310 Timer                             |  | ms          | 1000            |  |
| N310                                   |  |             | 2               |  |
| T1                                     |  | s           | 1               | During this time the UE shall be fully synchronized to cell 1          |
| T2                                     |  | s           | 5.17            |  |
| T3                                     |  | s           | 3.24            |  |

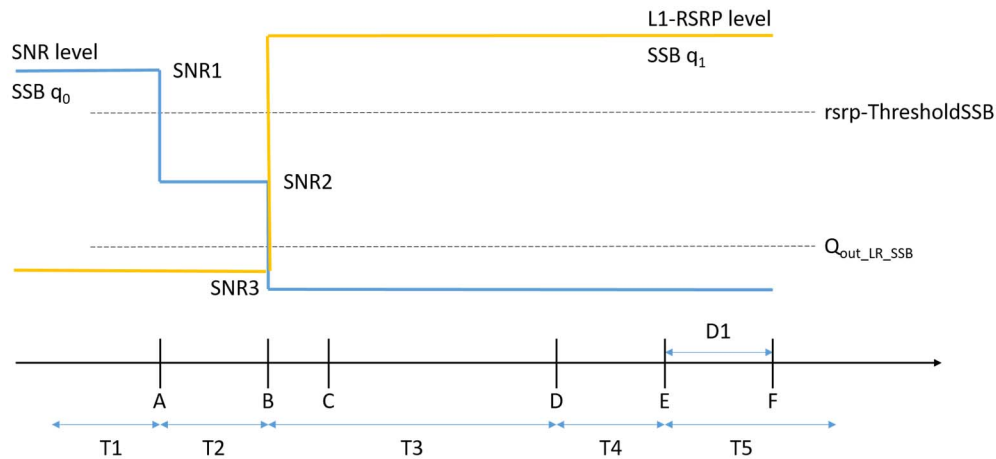
|   |   |      |  |
|---|---|------|--|
| T4  | s | 0    |  |
| T5  | s | 1.97 |  |
| D1  | s | 1.93 |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |   |      |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |   |      |  |

**Table A.6.5.5.2.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter   |          | Unit            | Test 1            |      |     |     |     |
|---|----------|-----------------|-------------------|------|-----|-----|-----|
|   |          |                 | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB              | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |          |                 |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |          |                 |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          |                 |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |          |                 |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |          |                 |                   |      |     |     |     |
| SNR_SSB of set q <sub>0</sub>   | Config 1 | dB              | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2 |                 | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3 |                 | 5                 | -3   | -12 | -12 | -12 |
| SNR_SSB of set q <sub>1</sub>   | Config 1 | dB              | -10               | -10  | 10  | 10  | 10  |
|   | Config 2 |                 | -10               | -10  | 10  | 10  | 10  |
|   | Config 3 |                 | -10               | -10  | 10  | 10  | 10  |
| SSB_RP of set q <sub>1</sub>  | Config 1 | dBm/S<br>CS kHz | -108              | -108 | -88 | -88 | -88 |
|   | Config 2 |                 | -108              | -108 | -88 | -88 | -88 |
|   | Config 3 |                 | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1 | dBm/15<br>KHz   | -98               |      |     |     |     |
|   | Config 2 |                 | -98               |      |     |     |     |
|   | Config 3 |                 | -98               |      |     |     |     |
| Propagation condition   |          |                 | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |          |                 |                   |      |     |     |     |

**Table A.6.5.5.2.1-4: Void**

**Table A.6.5.5.2.1-5: Void**



**Figure A.6.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### A.6.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 1920 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.6.5.5.3 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.6.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.3.1-1, A.6.5.5.3.1-2, and below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.3.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.6.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 3 ms. In the test, DRX configuration is not enabled.

**Table A.6.5.5.3.1-1: Supported test configurations for FR1 PCell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 2                    | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 3                    | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth                                  |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.6.5.5.3.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |   | Unit | Value                     | Comment |
|---|---|------|---------------------------|---------|
|   |   |      | Test 1                    |         |
| Active PCell  |   |      | Cell 1                    |         |
| RF Channel Number   |   |      | 1                         |         |
| Duplex mode   | Config 1  |      | FDD                       |         |
|   | Config 2, 3   |      | TDD                       |         |
| TDD Configuration   | Config 1  |      | Not Applicable            |         |
|   | Config 2  |      | TDDConf.1.1               |         |
|   | Config 3  |      | TDDConf.2.1               |         |
| RMSI CORESET Reference Channel                                    | Config 1  |      | CR.1.1 FDD                | A.3.1.2 |
|   | Config 2  |      | CR.1.1 TDD                |         |
|   | Config 3  |      | CR.2.1 TDD                |         |
| Dedicated CORESET Reference Channel                               | Config 1  |      | CCR.1.1 FDD               | A.3.1.3 |
|   | Config 2  |      | CCR.1.1 TDD               |         |
|   | Config 3  |      | CCR.2.1 TDD               |         |
| SSB Configuration   | Config 1  |      | SSB.3 FR1                 | A.3.10  |
|   | Config 2  |      | SSB.3 FR1                 |         |
|   | Config 3  |      | SSB.4 FR1                 |         |
| SMTTC Configuration   | Config 1, 2   |      | SMTTC.1                   | A.3.11  |
|   | Config 3  |      | SMTTC.1                   |         |
| PDSCH/PDCCH subcarrier spacing                                    | Config 1, 2   |      | 15 KHz                    |         |
|   | Config 3  |      | 30 KHz                    |         |
| PRACH Configuration   | Config 1, 2   |      | FR1 PRACH configuration 4 | A.3.8.2 |
|   | Config 3  |      | FR1 PRACH configuration 4 | A.3.8.2 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$   |   |      | 0                         |         |
| OCNG parameters   |   |      | OP.1                      | A.3.2.1 |
| CP length   |   |      | Normal                    |         |
| Correlation Matrix and Antenna Configuration                      |   |      | 2x2 Low                   |         |
| Beam failure detection transmission parameters                    | DCI format  |      | 1-0                       |         |
|   | Number of Control OFDM symbols                                      |      | 2                         |         |
|   | Aggregation level   | CCE  | 8                         |         |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                         |         |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0                         |         |
|   | DMRS precoder granularity   |      | REG bundle size           |         |
|   |   |      | 6                         |         |
| DRX   |   |      | OFF                       |         |
| Gap pattern ID  |   |      | N.A.                      |         |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ |   |      | 1                         | N       |



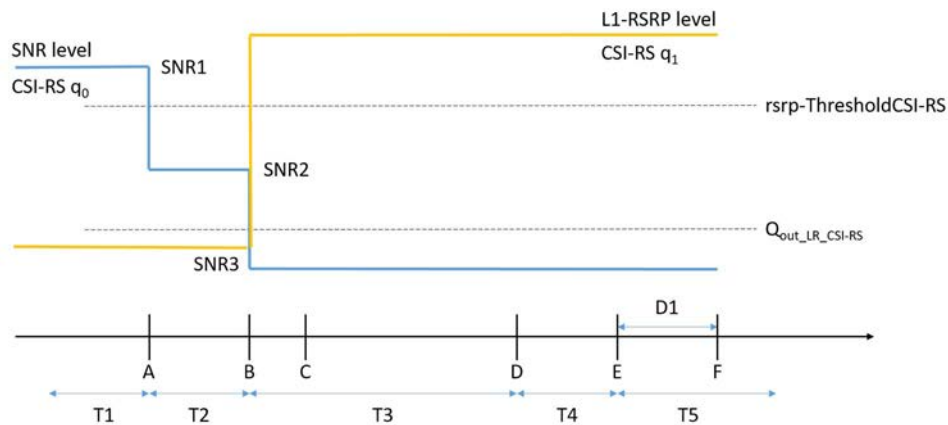
|   |             |             |                |  |
|---|-------------|-------------|----------------|--|
| rlmInSyncOutOfSyncThreshold                                   |             |             | absent         | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2 | dBm/SCS kHz | -98            | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|   | Config 3    |             | -95            |  |
| powerControlOffsetSS  |             |             | db0            | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount                                   |             |             | n1             | see clause 5.17 of TS 38.321 [7]                                       |
| beamFailureDetectionTimer                                     |             |             | pbfd4          | see clause 5.17 of TS 38.321 [7]                                       |
| CSI-RS configuration for $q_0$ and $q_1$                      | Config 1    |             | CSI-RS.1.2 FDD | A.3.14   |
|   | Config 2    |             | CSI-RS.1.2 TDD |  |
|   | Config 3    |             | CSI-RS.2.2 TDD |  |
| CSI-RS configuration for CSI reporting                        | Config 1    |             | CSI-RS.1.1 FDD | A.3.14   |
|   | Config 2    |             | CSI-RS.1.1 TDD |  |
|   | Config 3    |             | CSI-RS.2.1 TDD |  |
| TRS configuration   | Config 1    |             | TRS.1.1 FDD    |  |
|   | Config 2    |             | TRS.1.1 TDD    |  |
|   | Config 3    |             | TRS.1.2 TDD    |  |
| CSI-RS-Index assigned as RLM RS                               | Config 1    |             | CSI-RS.1.2 FDD | A.3.14   |
|   | Config 2    |             | CSI-RS.1.2 TDD |  |
|   | Config 3    |             | CSI-RS.2.2 TDD |  |
| T310 Timer  |             | ms          | 1000           |  |
| N310  |             |             | 2              |  |
| T1  |             | s           | 0.2            | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |             | s           | 0.18           |  |
| T3  |             | s           | 0.14           |  |
| T4  |             | s           | 0              |  |
| T5  |             | s           | 0.08           |  |
| D1  |             | s           | 0.04           |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |             |             |                |  |

**Table A.6.5.5.3.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |          | Unit            | Test 1            |      |     |     |     |
|---|----------|-----------------|-------------------|------|-----|-----|-----|
|   |          |                 | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB              | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |          |                 |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |          |                 |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |          |                 |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          |                 |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |          |                 |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |          |                 |                   |      |     |     |     |
| SNR_CSI-RS of set q <sub>0</sub>  | Config 1 | dB              | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2 |                 | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3 |                 | 5                 | -3   | -12 | -12 | -12 |
| SNR_CSI-RS of set q <sub>1</sub>  | Config 1 | dB              | -10               | -10  | 10  | 10  | 10  |
|   | Config 2 |                 | -10               | -10  | 10  | 10  | 10  |
|   | Config 3 |                 | -10               | -10  | 10  | 10  | 10  |
| CSI-RS_RP of set q <sub>1</sub>   | Config 1 | dBm/S<br>CS kHz | -108              | -108 | -88 | -88 | -88 |
|   | Config 2 |                 | -108              | -108 | -88 | -88 | -88 |
|   | Config 3 |                 | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1 | dBm/15<br>KHz   | -98               |      |     |     |     |
|   | Config 2 |                 | -98               |      |     |     |     |
|   | Config 3 |                 | -98               |      |     |     |     |
| Propagation condition   |          |                 | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |          |                 |                   |      |     |     |     |

**Table A.6.5.5.3.1-4: Void**

**Table A.6.5.5.3.1-5: Void**



**Figure A.6.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

### A.6.5.5.3.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 30+10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.6.5.5.4 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.6.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.4.1-1, A.6.5.5.4.1-2, A.6.5.5.4.1-3, and A.6.5.5.4.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.4.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.6.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.6.5.5.4.1-1: Supported test configurations for FR1 PCell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 2                    | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth                                  |
| 3                    | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth                                  |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.6.5.5.4.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter   |   | Unit | Value                     | Comment |
|---|---|------|---------------------------|---------|
|   |   |      | Test 1                    |         |
| Active PCell  |   |      | Cell 1                    |         |
| RF Channel Number   |   |      | 1                         |         |
| Duplex mode   | Config 1  |      | FDD                       |         |
|   | Config 2, 3   |      | TDD                       |         |
| TDD Configuration   | Config 1  |      | Not Applicable            |         |
|   | Config 2  |      | TDDConf.1.1               |         |
|   | Config 3  |      | TDDConf..21               |         |
| RMSI CORESET Reference Channel                                    | Config 1  |      | CR.1.1 FDD                | A.3.1.2 |
|   | Config 2  |      | CR.1.1 TDD                |         |
|   | Config 3  |      | CR.2.1 TDD                |         |
| SSB Configuration   | Config 1  |      | SSB.3 FR1                 | A.3.10  |
|   | Config 2  |      | SSB.3 FR1                 |         |
|   | Config 3  |      | SSB.4 FR1                 |         |
| Dedicated CORESET Reference Channel                               | Config 1  |      | CCR.1.1 FDD               | A.3.1.3 |
|   | Config 2  |      | CCR.1.1 TDD               |         |
|   | Config 3  |      | CCR.2.1 TDD               |         |
| SMTC Configuration  | Config 1, 2   |      | SMTC.1                    | A.3.11  |
|   | Config 3  |      | SMTC.1                    |         |
| PDSCH/PDCCH subcarrier spacing                                    | Config 1, 2   |      | 15 KHz                    |         |
|   | Config 3  |      | 30 KHz                    |         |
| PRACH Configuration   | Config 1, 2   |      | FR1 PRACH configuration 4 | A.3.8.2 |
|   | Config 3  |      | FR1 PRACH configuration 4 | A.3.8.2 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$   |   |      | 0                         |         |
| OCNG parameters   |   |      | OP.1                      | A.3.2.1 |
| CP length   |   |      | Normal                    |         |
| Correlation Matrix and Antenna Configuration                      |   |      | 2x2 Low                   |         |
| Beam failure detection transmission parameters                    | DCI format  |      | 1-0                       |         |
|   | Number of Control OFDM symbols                                      |      | 2                         |         |
|   | Aggregation level   | CCE  | 8                         |         |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                         |         |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0                         |         |
|   | DMRS precoder granularity   |      | REG bundle size           |         |
|   | REG bundle size   |      | 6                         |         |
| DRX   |   |      | DRX.7                     | A.3.3.7 |
| Gap pattern ID  |   |      | N.A.                      |         |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ |   |      | 1                         |         |

|   |             |             |                |  |
|---|-------------|-------------|----------------|--|
| rlmInSyncOutOfSyncThreshold                                   |             |             | absent         | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2 | dBm/SCS kHz | -98            | Threshold used for $Q_{in\_LR\_SSB}$                                   |
|   | Config 3    |             | -95            |  |
| powerControlOffsetSS  |             |             | db0            | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount                                   |             |             | n1             | see clause 5.17 of TS 38.321 [7]                                       |
| beamFailureDetectionTimer                                     |             |             | pbfd4          | see clause 5.17 of TS 38.321 [7]                                       |
| CSI-RS configuration for $q_0$ and $q_1$                      | Config 1    |             | CSI-RS.1.2 FDD | A.3.14.1   |
|   | Config 2    |             | CSI-RS.1.2 TDD |  |
|   | Config 3    |             | CSI-RS.2.2 TDD |  |
| CSI-RS configuration for CSI reporting                        | Config 1    |             | CSI-RS.1.1 FDD | A.3.14.1   |
|   | Config 2    |             | CSI-RS.1.1 TDD |  |
|   | Config 3    |             | CSI-RS.2.1 TDD |  |
| TRS configuration   | Config 1    |             | TRS.1.1 FDD    |  |
|   | Config 2    |             | TRS.1.1 TDD    |  |
|   | Config 3    |             | TRS.1.2 TDD    |  |
| CSI-RS-Index assigned as RLM RS                               | Config 1    |             | CSI-RS.1.2 FDD |  |
|   | Config 2    |             | CSI-RS.1.2 TDD |  |
|   | Config 3    |             | CSI-RS.2.2 TDD |  |
| T310 Timer  |             | ms          | 1000           |  |
| N310  |             |             | 2              |  |
| T1  |             | s           | 1              | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |             | s           | 8.37           |  |
| T3  |             | s           | 6.44           |  |
| T4  |             | s           | 0              |  |
| T5  |             | s           | 1.97           |  |
| D1  |             | s           | 1.93           |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |             |             |                |  |

**Table A.6.5.5.4.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

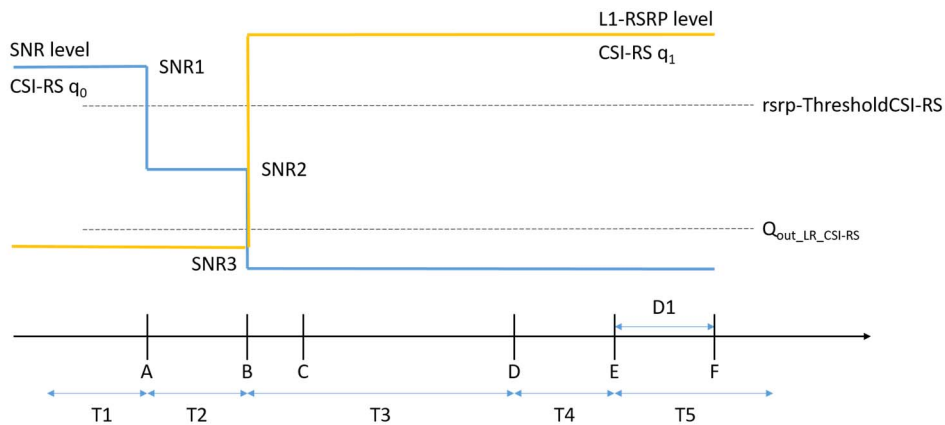
| Parameter   |          | Unit           | Test 1            |      |     |     |     |
|---|----------|----------------|-------------------|------|-----|-----|-----|
|   |          |                | T1                | T2   | T3  | T4  | T5  |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB             | 0                 |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          |                |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |          |                |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |          |                |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |          |                |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |          |                |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          |                |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |          |                |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |          |                |                   |      |     |     |     |
| SNR_CSI-RS of set $q_0$   | Config 1 | dB             | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2 |                | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3 |                | 5                 | -3   | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$   | Config 1 | dB             | -10               | -10  | 10  | 10  | 10  |
|   | Config 2 |                | -10               | -10  | 10  | 10  | 10  |
|   | Config 3 |                | -10               | -10  | 10  | 10  | 10  |
| CSI-RS_RP of set $q_1$  | Config 1 | dB/SC<br>S kHz | -110              | -110 | -88 | -88 | -88 |
|   | Config 2 |                | -110              | -110 | -88 | -88 | -88 |
|   | Config 3 |                | -107              | -107 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1 | dBm/15<br>KHz  | -98               |      |     |     |     |
|   | Config 2 |                |                   |      |     |     |     |
|   | Config 3 |                |                   |      |     |     |     |
| Propagation condition   |          |                | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |          |                |                   |      |     |     |     |

**Table A.6.5.5.4.1-4: Void**

**Table A.6.5.5.4.1-5: Void**

**Table A.6.5.5.4.1-6: Void**





**Figure A.6.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

#### A.6.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 1920 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.6.5.5.5 Beam Failure Detection and Link Recovery Test for FR1 SCell configured with CSI-RS-based BFD and SSB-based LR in non-DRX mode

#### A.6.5.5.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.5.1-1, A.6.5.5.5.1-2, and below. There are two cells, cell 1 is the PCell and cell 2 is the SCell, in the test. UE is not provided by *schedulingRequestID-BFR-SCell-r16*, i.e., no configuration for PUCCH transmission resources, and UE shall perform the random access procedure to recover the beam failure. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.5.1-1 shows the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate beam failure. Figure A.6.5.5.5.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

**Table A.6.5.5.1-1: Supported test configurations for FR1 PCell and SCell**

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

**Table A.6.5.5.1-2: General test parameters for FR1 SCell for beam failure detection and link recovery testing in non-DRX mode**

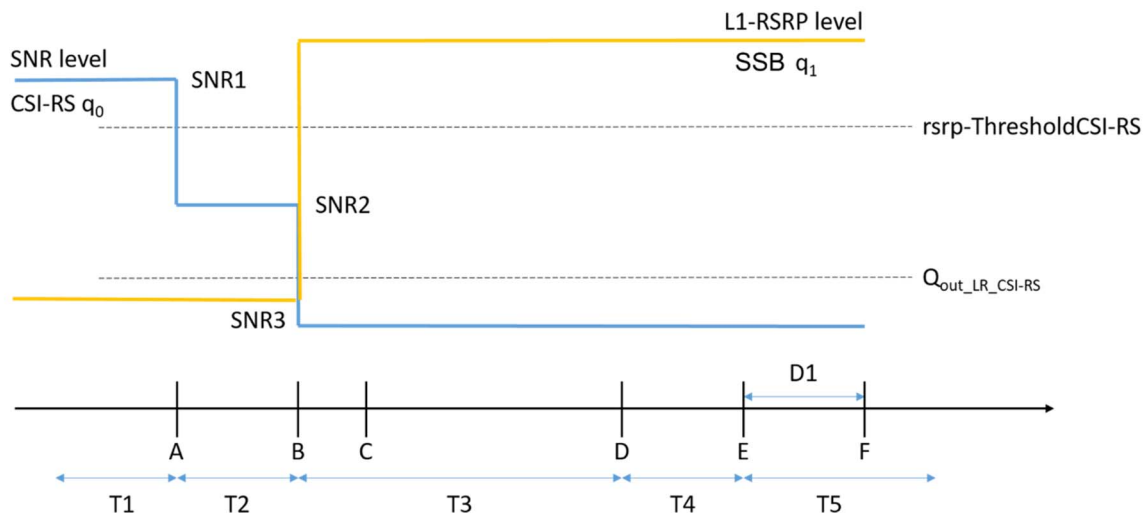
| Parameter  |   | Unit | Value<br>Test 1            | Comment |
|--|---|------|----------------------------|---------|
| Active PCell   |   |      | Cell 1                     |         |
| RF Channel Number for PCell  |   |      | 1                          |         |
| Active SCell   |   |      | Cell 2                     |         |
| RF Channel Number for SCell  |   |      | 2                          |         |
| Duplex mode  | Config 1  |      | FDD                        |         |
|  | Config 2, 3   |      | TDD                        |         |
| BW channel   | Config 1  | MHz  | 10: NRB <sub>c</sub> = 52  |         |
|  | Config 2  |      | 10: NRB <sub>c</sub> = 52  |         |
|  | Config 3  |      | 40: NRB <sub>c</sub> = 106 |         |
| TDD Configuration  | Config 1  |      | Not Applicable             |         |
|  | Config 2  |      | TDDConf.1.1                |         |
|  | Config 3  |      | TDDConf.2.1                |         |
| CORESET Reference Channel  | Config 1  |      | CR.1.1 FDD                 | A.3.1.2 |
|  | Config 2  |      | CR.1.1 TDD                 |         |
|  | Config 3  |      | CR.2.1 TDD                 |         |
| SSB Configuration  | Config 1  |      | SSB.1 FR1                  | A.3.10  |
|  | Config 2  |      | SSB.1 FR1                  |         |
|  | Config 3  |      | SSB.2 FR1                  |         |
| SMTC Configuration   | Config 1, 2   |      | SMTC.1                     | A.3.11  |
|  | Config 3  |      | SMTC.1                     |         |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2   | kHz  | 15                         |         |
|  | Config 3  |      | 30                         |         |
| PRACH Configuration  | Config 1, 2   |      | Table A.3.8.2.2-1          |         |
|  | Config 3  |      | Table A.3.8.2.2-1          |         |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell |   |      | 0                          |         |
| OCNG parameters  |   |      | OP.1                       | A.3.2.1 |
| CP length  |   |      | Normal                     |         |
| Correlation Matrix and Antenna Configuration                                       |   |      | 2x2 Low                    |         |
| Beam failure detection transmission parameters                                     | DCI format  |      | 1-0                        |         |
|  | Number of Control OFDM symbols                                      |      | 2                          |         |
|  | Aggregation level   | CCE  | 8                          |         |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0                          |         |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0                          |         |

|   |                           |                |                 |   |
|---|---------------------------|----------------|-----------------|---|
|   | DMRS precoder granularity |                | REG bundle size |   |
|   | REG bundle size           |                | 6               |   |
| DRX   |                           |                | OFF             |   |
| Gap pattern ID  |                           |                | N.A.            |   |
| schedulingRequestID-BFR-SCell-r16                             |                           |                | absent          | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell          |                           |                | 0               |   |
| rimInSyncOutOfSyncThreshold                                   |                           |                | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1).                |
| rsrp-ThresholdBFR   | Config 1, 2               | dBm/SCS<br>kHz | -98             | Threshold used for $Q_{in\_LR\_SSB}$  |
|   | Config 3                  |                | -95             |   |
| powerControlOffsetSS  |                           |                | db0             | Used for deriving rsrp-ThresholdCSI-RS  |
| beamFailureInstanceMaxCount                                   |                           |                | n1              | see clause 5.17 of TS 38.321 [7]  |
| beamFailureDetectionTimer                                     |                           |                | pbfd4           | see clause 5.17 of TS 38.321 [7]  |
| CSI-RS configuration for $q_0$ in activated SCell             | Config 1                  |                | CSI-RS.1.2 FDD  | A.3.14  |
|   | Config 2                  |                | CSI-RS.1.2 TDD  |   |
|   | Config 3                  |                | CSI-RS.2.2 TDD  |   |
| CSI-RS configuration for CSI reporting                        | Config 1                  |                | CSI-RS.1.1 FDD  | A.3.14  |
|   | Config 2                  |                | CSI-RS.1.1 TDD  |   |
|   | Config 3                  |                | CSI-RS.2.1 TDD  |   |
| TRS configuration   | Config 1                  |                | TRS.1.1 FDD     |   |
|   | Config 2                  |                | TRS.1.1 TDD     |   |
|   | Config 3                  |                | TRS.1.2 TDD     |   |
| CSI-RS-Index assigned as RLM RS in PCell                      | Config 1                  |                | CSI-RS.1.2 FDD  | A.3.14  |
|   | Config 2                  |                | CSI-RS.1.2 TDD  |   |
|   | Config 3                  |                | CSI-RS.2.2 TDD  |   |
| T310 Timer  |                           | ms             | 1000            |   |
| N310  |                           |                | 2               |   |
| T1  |                           | s              | 0.2             | During this time the the UE shall be fully synchronized to cell 1                     |
| T2  |                           | s              | 0.18            |   |
| T3  |                           | s              | 0.14            |   |
| T4  |                           | s              | 0               |   |
| T5  |                           | s              | 0.17            |   |
| D1  |                           | s              | 0.13            |   |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |                           |                |                 |   |

**Table A.6.5.5.1-3: Cell specific test parameters for FR1 SCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Unit | Cell1<br>T1 to T5 | Test 1 Cell2 |    |    |    |    |
|-----------|------|-------------------|--------------|----|----|----|----|
|           |      |                   | T1           | T2 | T3 | T4 | T5 |

|   |          |             |                         |                   |      |     |     |     |
|---|----------|-------------|-------------------------|-------------------|------|-----|-----|-----|
| EPRE ratio of PDCCH DMRS to SSS   |          | dB          | 0                       |                   |      |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |          | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PSS to SSS  |          | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB          |                         |                   |      |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB          |                         |                   |      |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |          | dB          |                         |                   |      |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB          |                         |                   |      |     |     |     |
| SNR_CSI-RS of set $q_0$   | Config 1 | dB          | 5                       | 5                 | -3   | -12 | -12 | -12 |
|   | Config 2 |             | 5                       | 5                 | -3   | -12 | -12 | -12 |
|   | Config 3 |             | 5                       | 5                 | -3   | -12 | -12 | -12 |
| SNR_SSB of set $q_1$  | Config 1 | dB          | -10                     | -10               | -10  | 10  | 10  | 10  |
|   | Config 2 |             | -10                     | -10               | -10  | 10  | 10  | 10  |
|   | Config 3 |             | -10                     | -10               | -10  | 10  | 10  | 10  |
| SSB_RP of set $q_1$   | Config 1 | dBm/SCS kHz | -108                    | -108              | -108 | -88 | -88 | -88 |
|   | Config 2 |             | -108                    | -108              | -108 | -88 | -88 | -88 |
|   | Config 3 |             | -105                    | -105              | -105 | -85 | -85 | -85 |
| $N_{oc}$  | Config 1 | dBm/15kHz   | -98                     | -98               |      |     |     |     |
|   | Config 2 |             | -98                     | -98               |      |     |     |     |
|   | Config 3 |             | -98                     | -98               |      |     |     |     |
| Propagation condition   |          |             | TDL-C<br>300ns<br>100Hz | TDL-C 300ns 100Hz |      |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |          |             |                         |                   |      |     |     |     |



**Figure A.6.5.5.1-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing in for SCell non-DRX mode**

#### A.6.5.5.5.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 120+10$  ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set  $q_1$  for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.6.5.5.6 Beam Failure Detection and Link Recovery Test for FR1 SCell configured with CSI-RS-based BFD and SSB-based LR in DRX mode

##### A.6.5.5.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.6.1-1, A.6.5.5.6.1-2, A.6.5.5.6.1-3, and A.6.5.5.6.1-4 below. There are two cells, cell 1 is the PCell and cell 2 is the SCell, in the test. UE is not provided by *schedulingRequestID-BFR-SCell-r16*, i.e., no configuration for PUCCH transmission resources, and UE shall perform the random access procedure to recover the beam failure. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.6.1-1 shows the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate beam failure. Figure A.6.5.5.6.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and

cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in SCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.6.5.5.6.1-1: Supported test configurations for FR1 PCell and SCell**

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

**Table A.6.5.5.6.1-2: General test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter  |   | Unit | Value             | Comment |
|--|---|------|-------------------|---------|
|  |   |      | Test 1            |         |
| Active PCell   |   |      | Cell 1            |         |
| RF Channel Number for PCell  |   |      | 1                 |         |
| Active SCell   |   |      | Cell 2            |         |
| RF Channel Number for SCell  |   |      | 2                 |         |
| Duplex mode  | Config 1  |      | FDD               |         |
|  | Config 2, 3   |      | TDD               |         |
| BW channel   | Config 1  | MHz  | 10: NRB,c = 52    |         |
|  | Config 2  |      | 10: NRB,c = 52    |         |
|  | Config 3  |      | 40: NRB,c = 106   |         |
| TDD Configuration  | Config 1  |      | Not Applicable    |         |
|  | Config 2  |      | TDDConf.1.1       |         |
|  | Config 3  |      | TDDConf..21       |         |
| CORESET Reference Channel  | Config 1  |      | CR.1.1 FDD        | A.3.1.2 |
|  | Config 2  |      | CR.1.1 TDD        |         |
|  | Config 3  |      | CR.2.1 TDD        |         |
| SSB Configuration  | Config 1  |      | SSB.1 FR1         | A.3.10  |
|  | Config 2  |      | SSB.1 FR1         |         |
|  | Config 3  |      | SSB.2 FR1         |         |
| SMTTC Configuration  | Config 1, 2   |      | SMTTC.1           | A.3.11  |
|  | Config 3  |      | SMTTC.1           |         |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2   | kHz  | 15                |         |
|  | Config 3  |      | 30                |         |
| PRACH Configuration  | Config 1, 2   |      | Table A.3.8.2.2-1 |         |
|  | Config 3  |      | Table A.3.8.2.2-1 |         |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell |   |      | 0                 |         |
| OCNG parameters  |   |      | OP.1              | A.3.2.1 |
| CP length  |   |      | Normal            |         |
| Correlation Matrix and Antenna Configuration                                       |   |      | 2x2 Low           |         |
| Beam failure detection transmission parameters                                     | DCI format  |      | 1-0               |         |
|  | Number of Control OFDM symbols                                    |      | 2                 |         |
|  | Aggregation level   | CCE  | 8                 |         |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB   | 0                 |         |

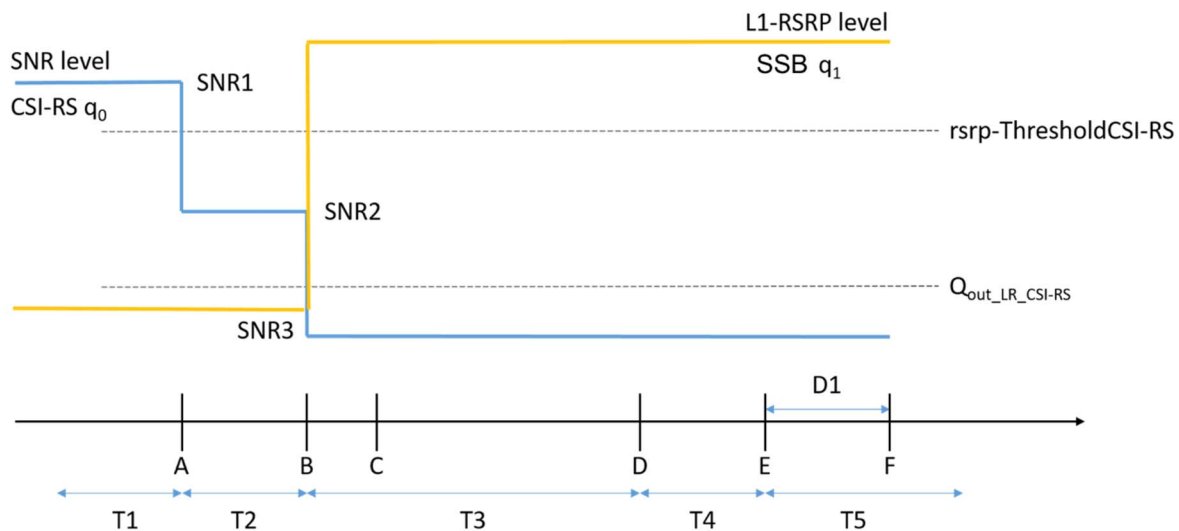
|   |   |             |                 |   |
|---|---|-------------|-----------------|---|
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB          | 0               |   |
|   | DMRS precoder granularity   |             | REG bundle size |   |
|   | REG bundle size   |             | 6               |   |
| DRX   |   |             | DRX.7           | A.3.3.7   |
| Gap pattern ID  |   |             | N.A.            |   |
| schedulingRequestID-BFR-SCell-r16                             |   |             | absent          | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell          |   |             | 0               |   |
| rlmInSyncOutOfSyncThreshold                                   |   |             | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1).                |
| rsrp-ThresholdBFR   | Config 1, 2   | dBm/SCS kHz | -98             | Threshold used for $Q_{in\_LR\_SSB}$  |
|   | Config 3  |             | -95             |   |
| powerControlOffsetSS  |   |             | db0             | Used for deriving rsrp-ThresholdCSI-RS  |
| beamFailureInstanceMaxCount                                   |   |             | n1              | see clause 5.17 of TS 38.321 [7]  |
| beamFailureDetectionTimer                                     |   |             | pbfd4           | see clause 5.17 of TS 38.321 [7]  |
| CSI-RS configuration for qoin activated SCell                 | Config 1  |             | CSI-RS.1.2 FDD  | A.3.14.1  |
|   | Config 2  |             | CSI-RS.1.2 TDD  |   |
|   | Config 3  |             | CSI-RS.2.2 TDD  |   |
| CSI-RS configuration for CSI reporting                        | Config 1  |             | CSI-RS.1.1 FDD  | A.3.14.1  |
|   | Config 2  |             | CSI-RS.1.1 TDD  |   |
|   | Config 3  |             | CSI-RS.2.1 TDD  |   |
| TRS configuration   | Config 1  |             | TRS.1.1 FDD     |   |
|   | Config 2  |             | TRS.1.1 TDD     |   |
|   | Config 3  |             | TRS.1.2 TDD     |   |
| CSI-RS-Index assigned as RLM RS in PCell                      | Config 1  |             | CSI-RS.1.2 FDD  |   |
|   | Config 2  |             | CSI-RS.1.2 TDD  |   |
|   | Config 3  |             | CSI-RS.2.2 TDD  |   |
| T310 Timer  |   | ms          | 1000            |   |
| N310  |   |             | 2               |   |
| T1  |   | s           | 1               | During this time the the UE shall be fully synchronized to cell 1                     |
| T2  |   | s           | 8.37            |   |
| T3  |   | s           | 6.44            |   |
| T4  |   | s           | 0               |   |
| T5  |   | s           | 1.97            |   |
| D1  |   | s           | 1.93            |   |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |             |                 |   |

**Table A.6.5.5.6.1-3: Cell specific test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | Unit | Cell 1<br>T1 to T5 | Test 1 Cell2 |    |    |    |    |
|-----------|------|--------------------|--------------|----|----|----|----|
|           |      |                    | T1           | T2 | T3 | T4 | T5 |

|   |          |             |                         |      |                   |     |     |     |
|---|----------|-------------|-------------------------|------|-------------------|-----|-----|-----|
| EPRE ratio of PDCCH DMRS to SSS   |          | dB          | 0                       |      | 0                 |     |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB          |                         |      |                   |     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |          | dB          |                         |      |                   |     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB          |                         |      |                   |     |     |     |
| EPRE ratio of PSS to SSS  |          | dB          |                         |      |                   |     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB          |                         |      |                   |     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB          |                         |      |                   |     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |          | dB          |                         |      |                   |     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB          |                         |      |                   |     |     |     |
| SNR_CSI-RS of set $q_0$   | Config 1 | dB          | 5                       | 5    | -3                | -12 | -12 | -12 |
|   | Config 2 | dB          | 5                       | 5    | -3                | -12 | -12 | -12 |
|   | Config 3 | dB          | 5                       | 5    | -3                | -12 | -12 | -12 |
| SNR_SSB of set $q_1$  | Config 1 | dB          | -10                     | -10  | -10               | 10  | 10  | 10  |
|   | Config 2 | dB          | -10                     | -10  | -10               | 10  | 10  | 10  |
|   | Config 3 | dB          | -10                     | -10  | -10               | 10  | 10  | 10  |
| SSB_RP of set $q_1$   | Config 1 | dBm/SCS kHz | -110                    | -110 | -110              | -88 | -88 | -88 |
|   | Config 2 | SCS kHz     | -110                    | -110 | -110              | -88 | -88 | -88 |
|   | Config 3 |             | -107                    | -107 | -107              | -85 | -85 | -85 |
| $N_{oc}$  | Config 1 | dBm/15 kHz  | -98                     |      | -98               |     |     |     |
|   | Config 2 | kHz         | -98                     |      | -98               |     |     |     |
|   | Config 3 |             | -98                     |      | -98               |     |     |     |
| Propagation condition   |          |             | TDL-C<br>300ns<br>100Hz |      | TDL-C 300ns 100Hz |     |     |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> |          |             |                         |      |                   |     |     |     |





**Figure A.6.5.5.6.1-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in DRX mode**

#### A.6.5.5.6.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 120 + 10$  ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set  $q_1$  for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.6.5.6 Active BWP switch

#### A.6.5.6.1 DCI-based and Timer-based Active BWP Switch

##### A.6.5.6.1.1 NR FR1- NR FR1 DL active BWP switch of SCell with non-DRX in SA

###### A.6.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.6.5.6.1.1.1-1 below. The test scenario comprises of one PCell (Cell 1) and one SCell (Cell 2) as given in Table A.6.5.6.1.1.1-2. NR Cell-specific parameters are specified in Table A.6.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).  
UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PCell.
- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell's DL slot ( $i+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell no later than the first UL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-2 no later than the first DL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on SCell (Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell's slot ( $j+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-1 no later than the first DL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

**Table A.6.5.6.1.1.1-1: DL BWP switch supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD - FDD duplex mode  |
| 2       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD - TDD duplex mode  |
| 3       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, TDD - FDD duplex mode  |
| 4       | NR 15 kHz SSB SCS, $\geq 10$ MHz bandwidth, FDD - TDD duplex mode  |
| 5       | NR 30 kHz SSB SCS, $\geq 40$ MHz bandwidth, TDD - TDD duplex mode  |
| Note 1: | The UE is only required to be tested in one of the supported test configurations   |
| Note 2: | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs $\geq$ the bandwidth ( $BW_{\text{channel}}$ ) defined in each test configuration |

**Table A.6.5.6.1.1.1-2: General test parameters for DL BWP switch in SA**

| Parameter   | Unit          | Value  | Comment   |
|---|---------------|--------|---|
| NR RF Channel Number                                    |               | 1, 2   | Two NR radio channels are used for this test                        |
| Active PCell  |               | Cell 1 | PCell on RF channel number 1.                                       |
| Active SCell  |               | Cell 2 | SCell on RF channel number 2.                                       |
| CP length   |               | Normal |   |
| DRX   |               | OFF    | For both PCell and SCell  |
| <i>bwp-InactivityTimer</i>                              | ms            | 200    |   |
| Cell-individual offset for cells on RF channel number 1 | dB            | 0      | Individual offset for cells on PCC.                                 |
| Cell-individual offset for cells on RF channel number 2 | dB            | 0      | Individual offset for cells on SCC.                                 |
| Cell2 timing offset to cell1                            | $\mu\text{s}$ | 3      | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1  | s             | 0.2    |   |
| T2  | s             | 0.2    |   |
| T3  | s             | 0.2    |   |

**Table A.6.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter                                    |                | Unit | Cell 1                     | Cell2                      |
|--|----------------|------|----------------------------|----------------------------|
| Frequency Range                              |                |      | FR1                        | FR1                        |
| Duplex mode                                  | Config 1       |      | FDD                        | FDD                        |
|  | Config 2,5     |      | TDD                        | TDD                        |
|  | Config 3       |      | TDD                        | FDD                        |
|  | Config 4       |      | FDD                        | TDD                        |
| TDD configuration                            | Config 1       |      | Not Applicable             | Not Applicable             |
|  | Config 2       |      | TDDConf.1.1                | TDDConf.1.1                |
|  | Config 3       |      | TDDConf.1.1                | Not Applicable             |
|  | Config 4       |      | Not Applicable             | TDDConf.1.1                |
|  | Config 5       |      | TDDConf.2.1                | TDDConf.2.1                |
| BW <sub>channel</sub>                        | Config 1,2,3,4 |      | Note 7                     | Note 7                     |
|  | Config 5       |      | Note 7                     | Note 7                     |
| BW <sub>occupied</sub>                       | Config 1,2,3,4 | RB   | 52 <sup>Note 5</sup>       | 52 <sup>Note 5</sup>       |
|  | Config 5       |      | 106 <sup>Note 6</sup>      | 106 <sup>Note 6</sup>      |
| Active BWP ID                                |                |      | 0                          | 1, 2                       |
| Initial DL BWP Configuration                 |                |      | DLBWP.0.2 <sup>Note4</sup> |                            |
| Initial UL BWP Configuration                 |                |      | ULBWP.0.2 <sup>Note4</sup> | N.A.                       |
| Active DL BWP-0 Configuration                |                |      | DLBWP.0.2 <sup>Note4</sup> | N.A.                       |
| Active DL BWP-1 Configuration                |                |      | N.A.                       | DLBWP.1.1 <sup>Note4</sup> |
| Active DL BWP-2 Configuration                |                |      | N.A.                       | DLBWP.1.3 <sup>Note4</sup> |
| Active UL BWP-0 Configuration                |                |      | ULBWP.0.2 <sup>Note4</sup> | N.A.                       |
| Active UL BWP-1 Configuration                |                |      | N.A.                       | N.A.                       |
| Active UL BWP-2 Configuration                |                |      | N.A.                       | N.A.                       |
| PDSCH Reference measurement channel          | Config 1       |      | SR.1.1 FDD                 | SR.1.1 FDD                 |
|  | Config 2       |      | SR.1.1 TDD                 | SR.1.1 TDD                 |
|  | Config 3       |      | SR.1.1 TDD                 | SR.1.1 FDD                 |
|  | Config 4       |      | SR.1.1 FDD                 | SR.1.1 TDD                 |
|  | Config 5       |      | SR.2.1 TDD                 | SR.2.1 TDD                 |
| RMSI CORESET parameters                      | Config 1       |      | CR.1.1 FDD                 | CR.1.1 FDD                 |
|  | Config 2       |      | CR.1.1 TDD                 | CR.1.1 TDD                 |
|  | Config 3       |      | CR.1.1 TDD                 | CR.1.1 FDD                 |
|  | Config 4       |      | CR.1.1 FDD                 | CR.1.1 TDD                 |
|  | Config 5       |      | CR.2.1 TDD                 | CR.2.1 TDD                 |
| Dedicated CORESET parameters                 | Config 1       |      | CCR.1.2 FDD                | CCR.1.2 FDD                |
|  | Config 2       |      | CCR.1.2 TDD                | CCR.1.2 TDD                |
|  | Config 3       |      | CCR.1.2 TDD                | CCR.1.2 FDD                |
|  | Config 4       |      | CCR.1.2 FDD                | CCR.1.2 TDD                |
|  | Config 5       |      | CCR.2.4 TDD                | CCR.2.4 TDD                |
| TRS Configuration                            | Config 1       |      | TRS.1.1 FDD                | TRS.1.1 FDD                |
|  | Config 2       |      | TRS.1.1 TDD                | TRS.1.1 TDD                |
|  | Config 3       |      | TRS.1.1 TDD                | TRS.1.1 FDD                |
|  | Config 4       |      | TRS.1.1 FDD                | TRS.1.1 TDD                |
|  | Config 5       |      | TRS.1.2 TDD                | TRS.1.2 TDD                |
| OCNG Patterns                                | Config 1,2,3,4 |      | OP.1 <sup>Note 5</sup>     |                            |
|  | Config 5       |      | OP.1 <sup>Note 6</sup>     |                            |
| SSB Configuration                            | Config 1,2,3,4 |      | SSB.1 FR1                  |                            |
|  | Config 5       |      | SSB.2 FR1                  |                            |
| SMTC Configuration                           |                |      | SMTC.1                     |                            |
| Correlation Matrix and Antenna Configuration |                |      | 1x2 Low                    |                            |
| EPRE ratio of PSS to SSS                     |                | dB   | 0                          |                            |
| EPRE ratio of PBCH DMRS to SSS               |                |      | 0                          |                            |
| EPRE ratio of PBCH to PBCH DMRS              |                |      |                            |                            |
| EPRE ratio of PDCCH DMRS to SSS              |                |      |                            |                            |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |      |                            |                            |
| EPRE ratio of PDSCH DMRS to SSS              |                |      |                            |                            |
| EPRE ratio of PDSCH to PDSCH                 |                |      |                            |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |      |                            |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |      |                            |                            |

|  |                |                  |        |        |
|--|----------------|------------------|--------|--------|
| $N_{oc}$ <sup>Note 2</sup>   | Config 1,2,3,4 | dBm/SCS          | -104   | -104   |
|  | Config 5       |                  | -101   | -101   |
| $N_{oc}$ <sup>Note 2</sup>   |                | dBm/15KHz        | -104   | -104   |
| SS-RSRP <sup>Note 3</sup>  | Config 1,2,3,4 | dBm/SCS          | -87    | -87    |
|  | Config 5       |                  | -84    | -84    |
| $\hat{E}_s/I_{ot}$   |                | dB               | 17     | 17     |
| $\hat{E}_s/N_{oc}$   |                | dB               | 17     | 17     |
| $I_o$ <sup>Note 3</sup>  | Config 1,2,3,4 | dBm/<br>9.36MHz  | -58.96 | -58.96 |
|  | Config 5       | dBm/<br>38.16MHz | -52.86 | -52.86 |
| Propagation Condition  |                |                  | AWGN   | AWGN   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled within <math>BW_{occupied}</math>.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> <p>Note 5: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 10 MHz, 52 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>Note 6: All UL/DL transmission shall be confined within <math>BW_{occupied}</math> (i.e. 40 MHz, 106 RBs) from <math>F_{C,low}</math>, and <math>I_o</math> is independent of the <math>BW_{channel}</math> configured.</p> <p>Note 7: <math>N_{RB,c}</math> is derived from Table 5.3.2-1 in TS38.101-1[2] with configured <math>BW_{channel}</math>.</p> |                |                  |        |        |

#### A.6.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+k_1$ ).

During T3, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ( $j+T_{BWPswitchDelay}+k_1$ ).

Where,  $k_1$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of PCell interruption during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+k_1$ ), ( $j+T_{BWPswitchDelay}+k_1$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### A.6.5.6.1.2 NR FR1 DL active BWP switch with non-DRX in SA

#### A.6.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6.

The supported test configurations are shown in Table A.6.5.6.1.2.1-1. The test scenario comprises of one cell (Cell 1) as given in Table A.6.5.6.1.2.1-2. Cell-specific parameters of the cell are specified in Table A.6.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

The cell has constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 no later than the first UL slot that occurs after the beginning of slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on Cell1's BWP-2 starting from the first DL slot that occurs after the beginning of slot ( $i+T_{BWPswitchDelay}$ ).

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell1.

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on Cell1's BWP-1 starting from the first DL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}$ ).

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

**Table A.6.5.6.1.2.1-1: DL BWP switch supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2       | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3       | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note 1: | The UE is only required to be tested in one of the supported test configurations.                    |
| Note 2: | A UE which fulfils the requirements in test case A.6.5.6.1.1 can skip the test cases in A.6.5.6.1.2. |

**Table A.6.5.6.1.2.1-2: General test parameters for DL BWP switch in SA**

| <b>Parameter</b>           | <b>Unit</b> | <b>Value</b> | <b>Comment</b>                             |
|----------------------------|-------------|--------------|--|
| NR RF Channel Number       |             | 1            | One NR radio channel is used for this test |
| Active Cell                |             | Cell 1       | Cell1 on RF channel number 1.              |
| CP length                  |             | Normal       |  |
| DRX                        |             | OFF          |  |
| <i>bwp-InactivityTimer</i> | ms          | 200          |  |
| T1                         | s           | 0.2          |  |
| T2                         | s           | 0.2          |  |
| T3                         | s           | 0.2          |  |



**Table A.6.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter                                    |              | Unit        | Cell 1                          |
|--|--------------|-------------|---------------------------------|
| Frequency Range                              |              |             | FR1                             |
| Duplex mode                                  | Config 1     |             | FDD                             |
|  | Config 2,3   |             | TDD                             |
| TDD configuration                            | Config 1     |             | Not Applicable                  |
|  | Config 2     |             | TDDConf.1.1                     |
|  | Config 3     |             | TDDConf.2.1                     |
| BW <sub>channel</sub>                        | Config 1     |             | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 2     |             | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 3     |             | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID                                |              |             | 1, 2                            |
| Initial DL BWP Configuration                 | Config 1,2,3 |             | DLBWP.0.2 <sup>Note 4</sup>     |
| Active DL BWP-1 Configuration                | Config 1,2,3 |             | DLBWP.1.1 <sup>Note 4</sup>     |
| Active DL BWP-2 Configuration                | Config 1,2,3 |             | DLBWP.1.3 <sup>Note 4</sup>     |
| Initial UL BWP Configuration                 | Config 1,2,3 |             | ULBWP.0.2 <sup>Note 4</sup>     |
| Active UL BWP-1 Configuration                | Config 1,2,3 |             | ULBWP.1.1 <sup>Note 4</sup>     |
| Active UL BWP-2 Configuration                | Config 1     |             | N/A                             |
|  | Config 2,3   |             | ULBWP.1.3 <sup>Note 4</sup>     |
| PDSCH Reference measurement channel          | Config 1     |             | SR.1.1 FDD                      |
|  | Config 2     |             | SR.1.1 TDD                      |
|  | Config 3     |             | SR.2.1 TDD                      |
| RMSI CORESET parameters                      | Config 1     |             | CR.1.1 FDD                      |
|  | Config 2     |             | CR.1.1 TDD                      |
|  | Config 3     |             | CR.2.1 TDD                      |
| Dedicated CORESET parameters                 | Config 1     |             | CCR.1.2 FDD                     |
|  | Config 2     |             | CCR.1.2 TDD                     |
|  | Config 3     |             | CCR.2.4 TDD                     |
| OCNG Patterns                                |              |             | OP.1                            |
| SSB Configuration                            | Config 1,2   |             | SSB.1 FR1                       |
|  | Config 3     |             | SSB.2 FR1                       |
| SMTC Configuration                           |              |             | SMTC.1                          |
| Correlation Matrix and Antenna Configuration |              |             | 1x2 Low                         |
| TRS Configuration                            | Config 1,4   |             | TRS.1.1 FDD                     |
|  | Config 2,5   |             | TRS.1.1 TDD                     |
|  | Config 3,6   |             | TRS.1.2 TDD                     |
| EPRE ratio of PSS to SSS                     |              | dB          | 0                               |
| EPRE ratio of PBCH DMRS to SSS               |              |             |                                 |
| EPRE ratio of PBCH to PBCH DMRS              |              |             |                                 |
| EPRE ratio of PDCCH DMRS to SSS              |              |             |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS            |              |             |                                 |
| EPRE ratio of PDSCH DMRS to SSS              |              |             |                                 |
| EPRE ratio of PDSCH to PDSCH                 |              |             |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |              |             |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |              |             |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>            | Config 1,2   | dBm/SCS     | -104                            |
|  | Config 3     |             | -101                            |
| N <sub>oc</sub> <sup>Note 2</sup>            |              | dBm/15kHz   | -104                            |
| SS-RSRP <sup>Note 3</sup>                    | Config 1,2   | dBm/SCS     | -87                             |
|  | Config 3     |             | -84                             |
| $\hat{E}_s/I_{ot}$                           |              | dB          | 17                              |
| $\hat{E}_s/N_{oc}$                           |              | dB          | 17                              |
| Io <sup>Note 3</sup>                         | Config 1,2   | dBm/9.36MHz | -58.96                          |

|                       |  |                  |        |
|-----------------------|--|------------------|--------|
|                       | Config 3   | dBm/<br>38.16MHz | -52.86 |
| Propagation Condition |  |                  | AWGN   |
| Note 1:               | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                  |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |
| Note 3:               | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                  |        |
| Note 4:               | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |                  |        |

#### A.6.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed Cell1 active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### A.6.5.6.2 RRC-based Active BWP Switch

#### A.6.5.6.2.1 NR FR1 DL active BWP switch of Cell with non-DRX in SA

##### A.6.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.

The supported test configurations are shown in Table A.6.5.6.2.1.1-1. The test scenario comprises of one Cell (Cell 1) as given in Table A.6.5.6.2.1.1-2. Cell-specific parameters of Cell are specified in Table A.6.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in Cell 1.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$  as defined in clause 8.6.3 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k1$  on BWP-1 of final condition. The UE shall be continuously scheduled on PCell's BWP-1 of final condition starting from the first DL slot right after slot  $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ .

$T_{\text{RRCprocessingDelay}}$  and  $T_{\text{BWPswitchDelayRRC}}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

**Table A.6.5.6.2.1.1-1: DL BWP switch supported test configurations in SA scenario**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.6.5.6.2.1.1-2: General test parameters for DL BWP switch in SA scenario**

| Parameter            | Unit | Value  | Comment                                    |
|----------------------|------|--------|--|
| NR RF Channel Number |      | 1      | One NR radio channel is used for this test |
| Active Cell          |      | Cell 1 | Cell on RF channel number 1.               |
| CP length            |      | Normal |  |
| DRX                  |      | OFF    |  |
| T1                   | s    | 0.2    |  |

**Table A.6.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in SA scenario**

| Parameter   |                               | Unit           | Cell 1                          |
|---|-------------------------------|----------------|---------------------------------|
| Frequency Range                                     |                               |                | FR1                             |
| Duplex mode   | Config 1                      |                | FDD                             |
|   | Config 2,3                    |                | TDD                             |
| TDD configuration                                   | Config 1                      |                | Not Applicable                  |
|   | Config 2                      |                | TDDConf.1.1                     |
|   | Config 3                      |                | TDDConf.2.1                     |
| BW <sub>channel</sub>                               | Config 1                      |                | 10 MHz: N <sub>RB,c</sub> = 52  |
|   | Config 2                      |                | 10 MHz: N <sub>RB,c</sub> = 52  |
|   | Config 3                      |                | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID                                       |                               |                | 1                               |
| Initial DL BWP Configuration                        |                               | Config 1,2, 3  | DLBWP.0.2                       |
| Initial UL BWP Configuration                        |                               | Config 1,2, 3  | ULBWP.0.2                       |
| Initial Condition                                   | Active DL BWP-1 Configuration | Config 1, 2, 3 | DLBWP.1.3                       |
|   | Active UL BWP-1 Configuration | Config 1, 2, 3 | ULBWP.1.3                       |
| Final Condition                                     | Active DL BWP-1 Configuration | Config 1, 2, 3 | DLBWP.1.1                       |
|   | Active UL BWP-1 Configuration | Config 1, 2, 3 | ULBWP.1.1                       |
| PDSCH Reference measurement channel                 | Config 1                      |                | SR.1.1 FDD                      |
|   | Config 2                      |                | SR.1.1 TDD                      |
|   | Config 3                      |                | SR2.1 TDD                       |
| RMSI CORESET parameters                             | Config 1                      |                | CR.1.1 FDD                      |
|   | Config 2                      |                | CR.1.1 TDD                      |
|   | Config 3                      |                | CR2.1 TDD                       |
| Dedicated CORESET parameters                        | Config 1                      |                | CCR.1.2 FDD                     |
|   | Config 2                      |                | CCR.1.2 TDD                     |
|   | Config 3                      |                | CCR.2.4 TDD                     |
| OCNG Patterns                                       |                               |                | OP.1                            |
| SSB Configuration                                   | Config 1,2                    |                | SSB.1 FR1                       |
|   | Config 3                      |                | SSB.2 FR1                       |
| SMTc Configuration                                  |                               |                | SMTc.1                          |
| TRS Configuration                                   | Config 1                      |                | TRS.1.1 FDD                     |
|   | Config 2                      |                | TRS.1.1 TDD                     |
|   | Config 3                      |                | TRS.1.2 TDD                     |
| Antenna Configuration                               |                               |                | 1x2 Low                         |
| Propagation Condition                               |                               |                | AWGN                            |
| EPRE ratio of PSS to SSS                            |                               | dB             | 0                               |
| EPRE ratio of PBCH DMRS to SSS                      |                               |                |                                 |
| EPRE ratio of PBCH to PBCH DMRS                     |                               |                |                                 |
| EPRE ratio of PDCCH DMRS to SSS                     |                               |                |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                               |                |                                 |
| EPRE ratio of PDSCH DMRS to SSS                     |                               |                |                                 |
| EPRE ratio of PDSCH to PDSCH                        |                               |                |                                 |
| EPRE ratio of OCNG DMRS to SSS <sup>(Note 1)</sup>  |                               |                |                                 |
| EPRE ratio of OCNG to OCNG DMRS <sup>(Note 1)</sup> |                               |                |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>                   | Config 1,2                    |                |                                 |
|   | Config 3                      | -101           |                                 |
| SS-RSRP <sup>Note 3</sup>                           | Config 1,2                    | dBm/SCS        | -87                             |
|   | Config 3                      |                | -84                             |

|  |            |                  |        |
|--|------------|------------------|--------|
| $\bar{E}_s/I_{ot}$   |            | dB               | 17     |
| $\bar{E}_s/N_{oc}$   |            | dB               | 17     |
| $I_{o}^{Note3}$  | Config 1,2 | dBm/<br>9.36MHz  | -58.96 |
|  | Config 3   | dBm/<br>38.16MHz | -52.86 |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |            |                  |        |

#### A.6.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the beginning of slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$  and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length} + k1$ .

Where,  $k1$  is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

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

#### A.6.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

##### A.6.5.6.3.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA

###### A.6.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify requirements on the DL BWP switch delay on multiple CCs and interruption requirement for NR victim cell, both defined in clause 8.6.

The supported test configurations are shown in Table A.6.5.6.3.1.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and two NR SCells (Cell 2 and Cell 3) as given in Table A.6.5.6.3.1.1-2. NR Cell-specific parameters are specified in Table A.6.5.6.3.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE will have ACK/NACK sending. Before the test starts,

- UE is connected to PCell (Cell 1) on radio channel 1 (PCC), and SCell (Cell 2) on radio channel 2 (SCC) and SCell (Cell 3) on radio channel 3(SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PCell and SCell (Cell 2), BWP-1 and BWP-2, in Cell 1 and Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for SCell (Cell 3). BWP-0 includes the bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell and SCell (Cell 2).

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in SCell (Cell 3).
- UE is configured with a *bwp-InactivityTimer* timer value for PCell and SCell (Cell 2).

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for both PCell and SCell (Cell 2) DL BWP switch, sent from the test equipment to the UE, is received at the UE side in both PCell's and SCell's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2 at both PCell and SCell (Cell 2).

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of PCell's and SCell (Cell 2)'s DL slot ( $i + T_{MultipleBWPswitchDelay}$ ) as defined in clause 8.6.2A.1 and starts to report valid ACK/NACK for the both PCell and SCell (Cell 2) no later than the first UL slot that occurs after the beginning of slot ( $i + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on both PCell's and SCell (Cell 2)'s BWP-2 no later than the first DL slot that occurs after the beginning of slot ( $i + T_{MultipleBWPswitchDelay}$ ).

The starting time of SCell (Cell 3) interruption due to BWP switch on PCell and SCell (Cell 2) shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell (Cell 1) and SCell (Cell 2).

During T3,

The time period T3 starts from the slot #*j*, where *j* is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1 on both PCell and SCell (Cell 2).

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of PCell's and SCell (Cell 2)'s slot ( $j + T_{MultipleBWPswitchDelay}$ ) as defined in clause 8.6.2A.1 and starts to report valid ACK/NACK for the PCell and SCell (Cell 2) no later than the first UL slot that occurs after the beginning of slot ( $j + T_{MultipleBWPswitchDelay} + kI$ ). The UE shall be continuously scheduled on PCell's and SCell (Cell 2)'s BWP-1 no later than the first DL slot that occurs after the beginning of slot ( $j + T_{MultipleBWPswitchDelay}$ ).

The starting time of SCell (Cell 3) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell and SCells by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to SCell (Cell 3) is carried out in the correct time span by monitoring ACK/NACK sent in SCell (Cell 3) during BWP switch of PCell, respectively.

**Table A.6.5.6.3.1.1-1: DL BWP switch supported test configurations**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD -FDD duplex mode  |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode |
| 3  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – FDD duplex mode |
| 4  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode |
| 5  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD - TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |



Table A.6.5.6.3.1.1-2: General test parameters for DL BWP switch in SA

| Parameter   | Unit    | Value          | Comment   |
|---|---------|----------------|---|
| NR RF Channel Number                                    |         | 1, 2           | Two NR radio channels are used for this test                        |
| Active PCell  |         | Cell 1         | PCell on RF channel number 1.                                       |
| Active SCell  |         | Cell 2; Cell 3 | SCell on RF channel number 2 and number 3.                          |
| CP length   |         | Normal         |   |
| DRX   |         | OFF            | For both PCell and SCCells (Cell 2 and Cell 3)                      |
| <i>bwp-InactivityTimer</i>                              | ms      | 200            |   |
| Cell-individual offset for cells on RF channel number 1 | dB      | 0              | Individual offset for cells on PCC.                                 |
| Cell-individual offset for cells on RF channel number 2 | dB      | 0              | Individual offset for Cell 1 on SCC.                                |
| Cell-individual offset for cells on RF channel number 3 | dB      | 0              | Individual offset for Cell 2 on SCC.                                |
| Cell2 and Cell 3 timing offset to cell1                 | $\mu$ s | 3              | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1  | s       | [0.2]          |   |
| T2  | s       | [0.2]          |   |
| T3  | s       | [0.2]          |   |

**Table A.6.5.6.3.1.1-3: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter                                    |                | Unit            | Cell 1 and Cell 2               | Cell 3                          |
|--|----------------|-----------------|---------------------------------|---------------------------------|
| Frequency Range                              |                |                 | FR1                             | FR1                             |
| Duplex mode                                  | Config 1       |                 | FDD                             | FDD                             |
|  | Config 2,5     |                 | TDD                             | TDD                             |
|  | Config 3       |                 | TDD                             | FDD                             |
|  | Config 4       |                 | FDD                             | TDD                             |
| TDD configuration                            | Config 1       |                 | Not Applicable                  | Not Applicable                  |
|  | Config 2       |                 | TDDConf.1.1                     | TDDConf.1.1                     |
|  | Config 3       |                 | TDDConf.1.1                     | Not Applicable                  |
|  | Config 4       |                 | Not Applicable                  | TDDConf.1.1                     |
|  | Config 5       |                 | TDDConf.2.1                     | TDDConf.2.1                     |
| BW <sub>channel</sub>                        | Config 1,2,3,4 |                 | 10 MHz: N <sub>RB,c</sub> = 52  | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 5       |                 | 40 MHz: N <sub>RB,c</sub> = 106 | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID                                |                |                 | 1, 2                            | 0                               |
| Initial DL BWP Configuration                 |                |                 | DLBWP.0.2 <sup>Note4</sup>      |                                 |
| Initial UL BWP Configuration                 |                |                 | ULBWP.0.2 <sup>Note4</sup>      |                                 |
| Active DL BWP-0 Configuration                |                |                 | N.A.                            | DLBWP.0.2 <sup>Note4</sup>      |
| Active DL BWP-1 Configuration                |                |                 | DLBWP.1.1 <sup>Note4</sup>      | N.A.                            |
| Active DL BWP-2 Configuration                |                |                 | DLBWP.1.3 <sup>Note4</sup>      | N.A.                            |
| Active UL BWP-0 Configuration                |                |                 | N.A.                            | ULBWP.0.2 <sup>Note4</sup>      |
| Active UL BWP-1 Configuration                |                |                 | ULBWP.1.1 <sup>Note4</sup>      | N.A.                            |
| Active UL BWP-2 Configuration                |                |                 | ULBWP.1.3 <sup>Note4</sup>      | N.A.                            |
| PDSCH Reference measurement channel          | Config 1       |                 | SR.1.1 FDD                      | SR.1.1 FDD                      |
|  | Config 2       |                 | SR.1.1 TDD                      | SR.1.1 TDD                      |
|  | Config 3       |                 | SR.1.1 TDD                      | SR.1.1 FDD                      |
|  | Config 4       |                 | SR.1.1 FDD                      | SR.1.1 TDD                      |
|  | Config 5       |                 | SR.2.1 TDD                      | SR.2.1 TDD                      |
| RMSI CORESET parameters                      | Config 1       |                 | CR.1.1 FDD                      | CR.1.1 FDD                      |
|  | Config 2       |                 | CR.1.1 TDD                      | CR.1.1 TDD                      |
|  | Config 3       |                 | CR.1.1 TDD                      | CR.1.1 FDD                      |
|  | Config 4       |                 | CR.1.1 FDD                      | CR.1.1 TDD                      |
|  | Config 5       |                 | CR.2.1 TDD                      | CR.2.1 TDD                      |
| Dedicated CORESET parameters                 | Config 1       |                 | CCR.1.1 FDD                     | CCR.1.1 FDD                     |
|  | Config 2       |                 | CCR.1.1 TDD                     | CCR.1.1 TDD                     |
|  | Config 3       |                 | CCR.1.1 TDD                     | CCR.1.1 FDD                     |
|  | Config 4       |                 | CCR.1.1 FDD                     | CCR.1.1 TDD                     |
|  | Config 5       |                 | CCR.2.1 TDD                     | CCR.2.1 TDD                     |
| OCNG Patterns                                |                |                 | OP.1                            |                                 |
| SSB Configuration                            | Config 1,2,3,4 |                 | SSB.1 FR1                       |                                 |
|  | Config 5       |                 | SSB.2 FR1                       |                                 |
| SMTC Configuration                           |                |                 | SMTC.1                          |                                 |
| Correlation Matrix and Antenna Configuration |                |                 | 1x2 Low                         |                                 |
| EPRE ratio of PSS to SSS                     |                | dB              | 0                               | 0                               |
| EPRE ratio of PBCH DMRS to SSS               |                |                 |                                 |                                 |
| EPRE ratio of PBCH to PBCH DMRS              |                |                 |                                 |                                 |
| EPRE ratio of PDCCH DMRS to SSS              |                |                 |                                 |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |                 |                                 |                                 |
| EPRE ratio of PDSCH DMRS to SSS              |                |                 |                                 |                                 |
| EPRE ratio of PDSCH to PDSCH                 |                |                 |                                 |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |                 |                                 |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |                 |                                 |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>            | Config 1,2,3,4 | dBm/SCS         | -104                            | -104                            |
|  | Config 5       |                 |                                 |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>            |                | dBm/15KH<br>z   | -104                            | -104                            |
| SS-RSRP <sup>Note 3</sup>                    | Config 1,2,3,4 | dBm/SCS         | -87                             | -87                             |
|  | Config 5       |                 |                                 |                                 |
| $\hat{E}_s/I_{ot}$                           |                | dB              | 17                              | 17                              |
| $\hat{E}_s/N_{oc}$                           |                | dB              | 17                              | 17                              |
| I <sub>o</sub> <sup>Note3</sup>              | Config 1,2,3,4 | dBm/<br>9.36MHz | -58.96                          | -58.96                          |

|                       |  |                  |        |        |
|-----------------------|--|------------------|--------|--------|
|                       | Config 5   | dBm/<br>38.16MHz | -52.86 | -52.86 |
| Propagation Condition |  |                  | AWGN   | AWGN   |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |        |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |        |        |
| Note 3:               | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                  |        |        |
| Note 4:               | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |                  |        |        |

#### A.6.5.6.3.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for both PCell and SCell (Cell 2) from the first UL slot that occurs after the beginning of DL slot  $(i + T_{MultipleBWPswitchDelay} + kI)$ .

During T3, the UE shall start to send the ACK/NACK for both PCell and SCell (Cell 2) from the first UL slot that occurs after the beginning of DL slot  $(j + T_{MultipleBWPswitchDelay} + kI)$ .

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{MultipleBWPswitchDelay}$  defined in 8.6.2A.1.

All of the above test requirements shall be fulfilled in order for the observed Cell1 and Cell2 active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of SCell (Cell 3) interruption during PCell and SCell (Cell 2) active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell (Cell 3) shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell and SCell (Cell 2) active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot  $(i + T_{MultipleBWPswitchDelay} + kI)$ ,  $(j + T_{MultipleBWPswitchDelay} + kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.6.5.6.4 SCell dormancy switch

##### A.6.5.6.4.1 NR FR1 PCell SCell dormancy switch of single FR1 SCell outside active time

###### A.6.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the SCell dormancy switch delay requirements defined in clause 8.6 when the UE is triggered to switch between dormancy to non-dormancy and non-dormancy to dormancy outside the DRX active time. Further the test purpose is to verify the interruption rate on other serving cells when the UE performing CSI and RRM measurements on dormant SCell(s) as defined in clause 8.2.2.2.12 and also to verify the interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

In the test scenario UE is connected to one PCell (Cell 1) in FR1 and one SCell in FR1. In the test the SCell is switched from non-dormancy to dormancy, and vice versa, at a point in time before start of *onDuration*. The UE is configured to monitor PDCCH for DCI format 2\_6 at *ps-Offset* before the start of *onDuration*. Two tests are specified, where a UE that only supports triggering within the first three OFDM symbols of a slot shall undergo Test1 only, and a UE that supports

triggering also in remaining OFDM symbols of a slot shall undergo both Test1 and Test2. In the tested scenario, *ps-Offset* is selected to correspond to the dormancy switching time specified in clause 8.6.

The supported test configurations are shown in Table A.6.5.6.4.1.1-1. The general test configuration is given in Table A.6.5.6.4.1.1-2. NR Cell-specific parameters are specified in Table A.6.5.6.4.1.1-3.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is indicated in *dormantBWP-Id* that the active DL BWP is BWP-2 in the SCell.
- UE is configured with DRX.
- UE is configured to monitor DCI format 2\_6, and to be active during *onDuration* even when no DCI format 2\_6 is detected (*ps-WakeUp*).

All cells have constant signal levels throughout the test.

The test consists of 4 successive time periods, with durations of T1, T2, T3 and T4, respectively.

During T1,

Time period T1 starts when a DCI format 2\_6 command intended for dormant BWP switch in a SCell from non-dormancy to dormancy, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted  $i$  (at *ps-Offset* before *onDuration*). Upon reception of the PDCCH indicating entering dormant BWP in PCell (i.e. through cross-carrier scheduling), UE shall switch the DL BWP-1 to DL BWP-2 in SCell, i.e., switching from non-dormant BWP to dormant BWP and the UE shall complete the switching before the start of *onDuration*.

The UE shall be able to receive PDCCH on PCell no later than the first DL slot that occurs after the beginning of PCell's DL slot ( $i + T_{\text{dormantBWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK on the PCell no later than the first UL slot that occurs after the beginning of slot ( $i+N$ ) as defined in clause 10.3 in TS38.213. The UE shall be continuously scheduled on PCell's BWP-0 no later than the first DL slot that occurs after the beginning of slot ( $i + T_{\text{dormantBWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to dormancy switching on SCell shall occur within the dormant BWP switch delay, i.e. before start of *onDuration*.

The UE shall not transmit signals on SCell after the beginning of PCell's DL slot ( $i + T_{\text{dormantBWPswitchDelay}}$ ) as defined in clause 8.6. The UE shall not be scheduled on SCells BWP-1 no later than the first DL slot that occurs after the beginning of slot ( $i + T_{\text{dormantBWPswitchDelay}}$ ).

Time period T2 starts when T1 is completed. During T2, the test equipment continues to schedule the UE continuously in PCell. The UE shall carry out CSI and RRM measurements on the dormant SCells. The UE shall report ACK/NACK in PCell in response to scheduled PDSCH, with the maximum loss of transmitted ACK/NACKs fulfilling the requirement in clause 8.2.2.2.12. The test equipment verifies that the loss of ACK/NACKs is no larger than 1.5%.

Time period T3 starts when T2 is completed. During T3, the test equipment does not schedule the UE, by which the inactivity timer expires and the UE stops monitoring PDCCH except for signalling using DCI format 2\_6 at wake-up signalling occasions.

During T4,

Time period T4 starts when a DCI format 2\_6 command for leaving dormant BWP in SCell, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted  $j$  (at *ps-Offset* before *onDuration*). Upon

reception of the PDCCH indicating leaving dormant BWP in PCell (i.e. through cross-carrier scheduling), UE shall switch the DL BWP-2 to DL BWP-1 in SCell, i.e., switching from dormant BWP to non-dormant BWP.

The UE shall be able to receive PDSCH on PCell and SCell no later than the first DL slot that occurs after the beginning of PCell's DL slot ( $j + T_{\text{dormantBWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK on the PCell (for both PCell and SCell) no later than the first UL slot that occurs after the beginning of slot ( $j+N$ ) as defined in clause 10.3 in TS 38.213. The UE shall be continuously scheduled on PCell's BWP-0 no later than the first DL slot that occurs after the beginning of slot ( $j + T_{\text{dormantBWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to dormancy switching on SCell shall occur within the dormant BWP switch delay.

The UE shall be ready to transmit signals on SCell no later than the first DL slot that occurs after the beginning of PCell's DL slot ( $j + T_{\text{dormantBWPswitchDelay}}$ ) as defined in clause 8.6. The UE shall be ready to continuously scheduled on SCell's BWP-1 no later than the first DL slot that occurs after the beginning of slot ( $j + T_{\text{dormantBWPswitchDelay}}$ ).

The test equipment verifies the DL dormant BWP switch time in SCell by counting the slots from the time when the dormant BWP switch command is received till an ACK/NACK on PCell is received.

The test equipment verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during dormant BWP switch of SCell (i.e. before start of *onDuration*), respectively.

**Table A.6.5.6.4.1.1-1: SCell dormancy switch supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD -FDD duplex mode  |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode |
| 3      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – FDD duplex mode |
| 4      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode |
| 5      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD - TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.6.5.6.4.1.1-2: General test parameters for SCell dormancy switch in SA**

| Parameter  | Unit | Value  |        | Comment   |
|--|------|--------|--------|---|
|  |      | Test 1 | Test 2 |   |
| NR RF Channel Number   |      | 1, 2   |        | Two NR radio channels are used for this test                        |
| Active PCell   |      | Cell 1 |        | PCell on RF channel number 1.                                       |
| Active SCell   |      | Cell 2 |        | SCell on RF channel number 2.                                       |
| CP length  |      | Normal |        |   |
| DRX  |      | ON     |        | For both PCell and SCell  |
| Cell-individual offset for cells on RF channel number 1                    | dB   | 0      |        | Individual offset for cells on PCC.                                 |
| Cell-individual offset for cells on RF channel number 2                    | dB   | 0      |        | Individual offset for cells on SCC.                                 |
| Cell2 timing offset to cell1   | μs   | 3      |        | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| OFDM symbol range in slot for transmission of DCI with dormancy indication |      | 0 – 2  | 3 – 11 |   |
| T1   | s    | 0.2    |        |   |
| T2   | s    | 0.2    |        |   |

**Table A.6.5.6.4.1.1-3: NR Cell specific test parameters for SCell dormancy switch in SA**

| Parameter                                    |                | Unit          | Cell 1                          | Cell2                           |
|--|----------------|---------------|---------------------------------|---------------------------------|
| Frequency Range                              |                |               | FR1                             | FR1                             |
| Duplex mode                                  | Config 1       |               | FDD                             | FDD                             |
|  | Config 2,5     |               | TDD                             | TDD                             |
|  | Config 3       |               | TDD                             | FDD                             |
|  | Config 4       |               | FDD                             | TDD                             |
| TDD configuration                            | Config 1       |               | Not Applicable                  | Not Applicable                  |
|  | Config 2       |               | TDDConf.1.1                     | TDDConf.1.1                     |
|  | Config 3       |               | TDDConf.1.1                     | Not Applicable                  |
|  | Config 4       |               | Not Applicable                  | TDDConf.1.1                     |
|  | Config 5       |               | TDDConf.2.1                     | TDDConf.2.1                     |
| BW <sub>channel</sub>                        | Config 1,2,3,4 |               | 10 MHz: N <sub>RB,c</sub> = 52  | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 5       |               | 40 MHz: N <sub>RB,c</sub> = 106 | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID                                |                |               | 0                               | 1                               |
| Initial DL BWP Configuration                 |                |               | DLBWP.0.2 <sup>Note4</sup>      |                                 |
| Initial UL BWP Configuration                 |                |               | ULBWP.0.2 <sup>Note4</sup>      |                                 |
| Active DL BWP-0 Configuration                |                |               | DLBWP.0.2 <sup>Note4</sup>      | N.A.                            |
| Active DL BWP-1 Configuration                |                |               | N.A.                            | DLBWP.1.1 <sup>Note4</sup>      |
| Active DL BWP-2 Configuration                |                |               | N.A.                            | DLBWP.1.3 <sup>Note4</sup>      |
| Active UL BWP-0 Configuration                |                |               | ULBWP.0.2 <sup>Note4</sup>      | N.A.                            |
| Active UL BWP-1 Configuration                |                |               | N.A.                            | ULBWP.1.1 <sup>Note4</sup>      |
| Active UL BWP-2 Configuration                |                |               | N.A.                            | ULBWP.1.3 <sup>Note4</sup>      |
| PDSCH Reference measurement channel          | Config 1       |               | SR.1.1 FDD                      | SR.1.1 FDD                      |
|  | Config 2       |               | SR.1.1 TDD                      | SR.1.1 TDD                      |
|  | Config 3       |               | SR.1.1 TDD                      | SR.1.1 FDD                      |
|  | Config 4       |               | SR.1.1 FDD                      | SR.1.1 TDD                      |
|  | Config 5       |               | SR.2.1 TDD                      | SR.2.1 TDD                      |
| RMSI CORESET parameters                      | Config 1       |               | CR.1.1 FDD                      | CR.1.1 FDD                      |
|  | Config 2       |               | CR.1.1 TDD                      | CR.1.1 TDD                      |
|  | Config 3       |               | CR.1.1 TDD                      | CR.1.1 FDD                      |
|  | Config 4       |               | CR.1.1 FDD                      | CR.1.1 TDD                      |
|  | Config 5       |               | CR.2.1 TDD                      | CR.2.1 TDD                      |
| Dedicated CORESET parameters, Test 1         | Config 1       |               | CCR.1.1 FDD                     | CCR.1.1 FDD                     |
|  | Config 2       |               | CCR.1.1 TDD                     | CCR.1.1 TDD                     |
|  | Config 3       |               | CCR.1.1 TDD                     | CCR.1.1 FDD                     |
|  | Config 4       |               | CCR.1.1 FDD                     | CCR.1.1 TDD                     |
|  | Config 5       |               | CCR.2.1 TDD                     | CCR.2.1 TDD                     |
| Dedicated CORESET parameters, Test 2         | Config 1       |               | CCR.1.5 FDD                     | CCR.1.1 FDD                     |
|  | Config 2       |               | CCR.1.5 TDD                     | CCR.1.1 TDD                     |
|  | Config 3       |               | CCR.1.5 TDD                     | CCR.1.1 FDD                     |
|  | Config 4       |               | CCR.1.5 FDD                     | CCR.1.1 TDD                     |
|  | Config 5       |               | CCR.2.3 TDD                     | CCR.2.1 TDD                     |
| OCNG Patterns                                |                |               | OP.1                            |                                 |
| SSB Configuration                            | Config 1,2,3,4 |               | SSB.1 FR1                       |                                 |
|  | Config 5       |               | SSB.2 FR1                       |                                 |
| SMTC Configuration                           |                |               | SMTC.1                          |                                 |
| Correlation Matrix and Antenna Configuration |                |               | 1x2 Low                         |                                 |
| EPRE ratio of PSS to SSS                     |                | dB            | 0                               | 0                               |
| EPRE ratio of PBCH DMRS to SSS               |                |               |                                 |                                 |
| EPRE ratio of PBCH to PBCH DMRS              |                |               |                                 |                                 |
| EPRE ratio of PDCCH DMRS to SSS              |                |               |                                 |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS            |                |               |                                 |                                 |
| EPRE ratio of PDSCH DMRS to SSS              |                |               |                                 |                                 |
| EPRE ratio of PDSCH to PDSCH                 |                |               |                                 |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                |               |                                 |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                |               |                                 |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>            | Config 1,2,3,4 | dBm/SCS       | -104                            | -104                            |
|  | Config 5       |               | -101                            | -101                            |
| N <sub>oc</sub> <sup>Note 2</sup>            |                | dBm/15KH<br>z | -104                            | -104                            |
| SS-RSRP <sup>Note 3</sup>                    | Config 1,2,3,4 | dBm/SCS       | -87                             | -87                             |
|  | Config 5       |               | -84                             | -84                             |



|  |                |                  |        |        |
|--|----------------|------------------|--------|--------|
| $\dot{E}_s/I_{ot}$   |                | dB               | 17     | 17     |
| $\dot{E}_s/N_{oc}$   |                | dB               | 17     | 17     |
| $I_{o}^{Note3}$  | Config 1,2,3,4 | dBm/<br>9.36MHz  | -58.96 | -58.96 |
|  | Config 5       | dBm/<br>38.16MHz | -52.86 | -52.86 |
| Propagation Condition  |                |                  | AWGN   | AWGN   |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |                |                  |        |        |

#### A.6.5.6.4.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ( $i+N$ ) (i.e. from the start of *onDuration*).

During time period T2, the UE shall transmit ACK/NACKs in response to scheduling in PCell and the rate of missed ACK/NACKs shall be no more than 1.5%.

During T4, the UE shall start to send the ACK/NACK for PCell and SCell from the first UL slot that occurs after the beginning of DL slot ( $j+N$ ) (i.e. from the start of *onDuration*).

Where,  $N$  is the timing that UE provide HARQ-ACK information in response to a detection of a DCI format 2\_6 indicating SCell dormancy as specified in [3].

All of the above test requirements shall be fulfilled in order for the observed SCell dormant BWP switch delay to be counted as correct.

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

During T1 and T4, the start time of PCell interruption during SCell dormant BWP switch shall not happen outside the dormant BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for dormant BWP switch in clause 8.6.

NOTE: During T1, T4 if there are no uplink resources for reporting the ACK/NACK in the first DL slot that occurs after the beginning of DL slot ( $i+N$ ), ( $j+N$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.6.5.6.4.2 NR FR1 PCell SCell dormancy switch of two FR1 SCells inside active time

##### A.6.5.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify fulfillment of SCell dormancy switching delay requirements in clause 8.6.2A, requirements on interruptions due to SCell dormancy switching in clause 8.2.2.2.12.1, and requirements on interruptions due to CSI and RRM measurements on dormant SCells in clauses 8.2.2.2.12.2 and 8.2.2.2.12.3, respectively. In the tested scenario, the UE is connected to PCell and two SCells in FR1, and the SCells are switched from non-dormancy to dormancy, and back, during active time. Depending on UE capability on whether DCI for dormancy switching can be received also later than within the initial three OFDM symbols of a slot, the UE may have to undergo one or two sets of tests. A UE that only supports triggering during within the first three OFDM symbols of a slot shall only undergo Test1 and Test2, whereas a UE that supports triggering also in remaining OFDM symbols of a slot shall undergo Test1 through Test4.

The supported test configurations are provided in Table A.6.5.6.4.2.1-1 below. General test parameters are provided in Table A.6.5.6.4.2.1-2, and cell-specific parameters are provided in Table A.6.5.6.4.2.1-3 below.

The tests consist of three consecutive time periods T1, T2, and T3, respectively.

Three carriers are used in the test, each within FR1 and each with one cell. Cell 1 (PCell) is on RF channel 1 (PCC), Cell 2 (SCell1) is on RF channel 2 (SCC1), and Cell 3 (SCell2) is on RF channel 3 (SCC2). All three cells have constant signal levels throughout the test. The UE is continuously scheduled in PCell throughout the test.

Before the test starts,

UE is connected to Cell 1 (PCell), Cell 2 (SCell1) and Cell 3 (SCell2).

UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for Cell 1. BWP-0 includes the bandwidth of the initial DL BWP and SSB.

UE is configured with one non-dormant and one dormant UE-specific downlink bandwidth part, BWP-0 and BWP-1, respectively, for Cell 2 and Cell 3. BWP-0 includes the bandwidth of the initial DL BWP and SSB.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 1 is BWP-0.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 2 is BWP-0.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 3 is BWP-0.

UE is continuously scheduled in PCell, SCell1 and SCell2.

T1 starts at the point in time at which the UE receives a DCI with dormancy indication on PDCCH in PCell at the antenna connector, in a slot # denoted  $m$ , pertaining to dormancy indication for switching SCell1 and SCell2 from non-dormancy to dormancy. The UE shall complete switching of the SCells to dormancy by the end of slot  $m + \text{ceil}(T_{\text{MultipleBWPsSwitchDelay}}/\text{NR slot length}) + 1$  in Test1 and Test2, and slot  $m + \text{ceil}(T_{\text{MultipleBWPsSwitchDelay}}/\text{NR slot length}) + 2$  in Test3 and Test4, as specified in clause 8.6.2A. Any PCell interruptions due to the switching between non-dormant and dormant BWPs shall fulfill requirements in clause 8.2.2.2.12.1. The test equipment verifies that interruptions due to switching from non-dormancy to dormancy are within the requirements by analysing HARQ feedback transmitted in PCell for PCell.

During T2, the UE is carrying out CSI and RRM measurements on dormant SCell1 and SCell2. Any PCell interruptions due to CSI and RRM measurements shall fulfill requirements in clauses 8.2.2.2.12.2 and 8.2.2.2.12.3, respectively. The test equipment verifies that the interruptions are within the allowed percentages by counting ACK/NACKs in PCell. At the end of T2, the test equipment transmits a DCI with dormancy indication on PDCCH in PCell carrying a dormancy indication for switching SCell1 and SCell2 from dormancy to non-dormancy.

T3 starts at the point in time at which the UE receives a DCI with dormancy indication on PDCCH in PCell at the antenna connector, in a slot # denoted  $n$ , pertaining to dormancy indication for switching SCell1 and SCell2 from dormancy to non-dormancy. The UE shall complete switching of the SCells to non-dormancy by the end of slot  $n + \text{ceil}(T_{\text{MultipleBWPsSwitchDelay}}/\text{NR slot length}) + 1$  in Test1 and Test2, and slot  $n + \text{ceil}(T_{\text{MultipleBWPsSwitchDelay}}/\text{NR slot length}) + 2$  in Test3 and test4, as specified in clause 8.6.2A. Any PCell interruptions due to the switching between dormant and non-dormant BWPs shall fulfill requirements in clause 8.2.2.2.12.1. The test equipment verifies that interruptions due to switching from dormancy to non-dormancy are within the requirements by analysing HARQ feedback transmitted in PCell for PCell. The test equipment verifies the switching delay by analysing HARQ feedback transmitted in PCell for SCells.

**Table A.6.5.6.4.2.1-1: Supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                              |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

Table A.6.5.6.4.2.1-2: General test parameters

| Parameter  | Unit | Value   |       |        |       | Comment  |
|--|------|---------|-------|--------|-------|--|
|  |      | Test1   | Test2 | Test3  | Test4 |  |
| NR RF Channel Number   |      | 1, 2, 3 |       |        |       | Three NR radio channels are used for this test   |
| Active PCell   |      | Cell 1  |       |        |       | Primary cell on NR RF channel number 1 in FR1  |
| SCell1   |      | Cell 2  |       |        |       | SCell1 on NR RF channel number 2 in FR1  |
| SCell2   |      | Cell 3  |       |        |       | SCell2 on NR RF channel number 3 in FR1  |
| CP length  |      | Normal  |       |        |       |  |
| DRX  |      | OFF     |       |        |       | Continuous monitoring of primary cell  |
| CSI reporting periodicity, Non-dormant BWP                                 | ms   | 2       |       |        |       | CSI reporting periodicity for periodic reporting of CQI for PCell and non-dormant SCells   |
| CSI reporting periodicity, Dormant BWP                                     | ms   | 40      |       |        |       | CSI reporting periodicity for periodic reporting of CQI for dormant SCells   |
| Timing offset between Cell 1 and Cell 2                                    | ns   | 0       |       |        |       |  |
| Timing offset between Cell 1 and Cell 3                                    | ns   | 0       |       |        |       |  |
| Triggering DCI format  |      | 1_1     | 0_1   | 1_1    | 0_1   | Triggering DCI format for triggering during active time  |
| OFDM symbol range in slot for transmission of DCI with dormancy indication |      | 0 – 2   |       | 3 – 11 |       | Test1 and Test3 are based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 and Test4 are based on that the triggering DCI is received later than within the first three OFDM symbols of a slot. |
| T1   | s    | 0.2     |       |        |       |  |
| T2   | s    | 5       |       |        |       |  |
| T3   | s    | 0.2     |       |        |       |  |

**Table A.6.5.6.4.2.1-3: NR Cell specific test parameters**

| Parameter   |            | Unit         | Cell 1                      | Cell 2         | Cell 3         |
|---|------------|--------------|-----------------------------|----------------|----------------|
| Frequency range   |            |              | FR1                         |                |                |
| NR RF channel   |            |              | 1                           | 2              | 3              |
| Duplex mode   | Config 1   |              | FDD                         |                |                |
|   | Config 2,3 |              | TDD                         |                |                |
| TDD configuration                                       | Config 2   |              | TDDConf.1.1                 |                |                |
|   | Config 3   |              | TDDConf.2.1                 |                |                |
| BW <sub>channel</sub>                                   | Config 1,2 | MHz          | 10: N <sub>RB,c</sub> = 52  |                |                |
|   | Config 3   |              | 40: N <sub>RB,c</sub> = 106 |                |                |
| Downlink initial BWP configuration                      |            |              | DLBWP.0.1                   | DLBWP.0.1      | DLBWP.0.1      |
| Uplink initial BWP configuration                        |            |              | ULBWP.0.1                   | ---            | ---            |
| Downlink active non-dormant BWP-0 configuration         |            |              | DLBWP.1.1                   | DLBWP.1.1      | DLBWP.1.1      |
| Downlink active dormant BWP-1 configuration             |            |              | ---                         | DLBWP.1.1      | DLBWP.1.1      |
| Uplink active BWP-0 configuration                       |            |              | ULBWP.1.1                   | ---            | ---            |
| TCI state   |            |              | TCI.State.0                 | TCI.State.0    | TCI.State.0    |
| CSI-RS configuration for CSI reporting, Non-dormant BWP | Config 1   |              | CSI-RS.1.1 FDD              | CSI-RS.1.1 FDD | CSI-RS.1.1 FDD |
|   | Config 2   |              | CSI-RS.1.1 TDD              | CSI-RS.1.1 TDD | CSI-RS.1.1 TDD |
|   | Config 3   |              | CSI-RS.2.1 TDD              | CSI-RS.2.1 TDD | CSI-RS.2.1 TDD |
| CSI-RS configuration for CSI reporting, Dormant BWP     | Config 1   |              | ---                         | CSI-RS.1.6 FDD | CSI-RS.1.6 FDD |
|   | Config 2   |              |                             | CSI-RS.1.5 TDD | CSI-RS.1.5 TDD |
|   | Config 3   |              |                             | CSI-RS.2.6 TDD | CSI-RS.2.6 TDD |
| TRS Configuration                                       | Config 1   |              | TRS.1.1 FDD                 | TRS.1.1 FDD    | TRS.1.1 FDD    |
|   | Config 2   |              | TRS.1.1 TDD                 | TRS.1.1 TDD    | TRS.1.1 TDD    |
|   | Config 3   |              | TRS.1.2 TDD                 | TRS.1.2 TDD    | TRS.1.2 TDD    |
| PDSCH Reference measurement channel                     | Config 1   |              | SR.1.1 FDD                  | SR.1.1 FDD     | SR.1.1 FDD     |
|   | Config 2   |              | SR.1.1 TDD                  | SR.1.1 TDD     | SR.1.1 TDD     |
|   | Config 3   |              | SR.2.1 TDD                  | SR.2.1 TDD     | SR.2.1 TDD     |
| Dedicated CORESET parameters, Test 1,2                  | Config 1   |              | CCR.1.1 FDD                 | CCR.1.1 FDD    | CCR.1.1 FDD    |
|   | Config 2   |              | CCR.1.1 TDD                 | CCR.1.1 TDD    | CCR.1.1 TDD    |
|   | Config 3   |              | CCR.2.1 TDD                 | CCR.2.1 TDD    | CCR.2.1 TDD    |
| Dedicated CORESET parameters, Test 3,4                  | Config 1   |              | CCR.1.5 FDD                 | CCR.1.1 FDD    | CCR.1.1 FDD    |
|   | Config 2   |              | CCR.1.5 TDD                 | CCR.1.1 TDD    | CCR.1.1 TDD    |
|   | Config 3   |              | CCR.2.3 TDD                 | CCR.2.1 TDD    | CCR.2.1 TDD    |
| RMSI CORESET parameters                                 | Config 1   |              | CR.1.1 FDD                  | ---            | ---            |
|   | Config 2   |              | CR.1.1 TDD                  |                |                |
|   | Config 3   |              | CR.2.1 TDD                  |                |                |
| OCNG Pattern  |            |              | OP.1                        | OP.1           | OP.1           |
| SSB Configuration                                       | Config 1,2 |              | SSB.1 FR1                   | SSB.1 FR1      | SSB.1 FR1      |
|   | Config 3   |              | SSB.2 FR1                   | SSB.2 FR1      | SSB.2 FR1      |
| SMTc configuration                                      |            |              | SMTc.1                      | SMTc.1         | SMTc.1         |
| EPRE ratio of PSS to SSS                                |            | dB           | 0                           |                |                |
| EPRE ratio of PBCH DMRS to SSS                          |            |              |                             |                |                |
| EPRE ratio of PBCH to PBCH DMRS                         |            |              |                             |                |                |
| EPRE ratio of PDCCH DMRS to SSS                         |            |              |                             |                |                |
| EPRE ratio of PDCCH to PDCCH DMRS                       |            |              |                             |                |                |
| EPRE ratio of PDSCH DMRS to SSS                         |            |              |                             |                |                |
| EPRE ratio of PDSCH to PDSCH                            |            |              |                             |                |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>         |            |              |                             |                |                |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>        |            |              |                             |                |                |
| N <sub>oc</sub> <sup>Note2</sup>                        | Config 1,2 | dBm/15kHz    | -104                        | -104           | -104           |
|   | Config 3   |              | -101                        | -101           | -101           |
| Ē <sub>s</sub> /I <sub>ot</sub>                         |            | dB           | 17                          | 17             | 17             |
| Ē <sub>s</sub> /N <sub>oc</sub>                         |            | dB           | 17                          | 17             | 17             |
| SS-RSRP <sup>Note3</sup>                                | Config 1,2 | dBm/SCS      | -87                         | -87            | -87            |
|   | Config 3   |              | -84                         | -84            | -84            |
| I <sub>o</sub> <sup>Note3</sup>                         | Config 1,2 | dBm/9.36 MHz | -59.0                       | -59.0          | -59.0          |
|   | Config 3   |              | -52.9                       | -52.9          | -52.9          |
| Propagation condition                                   |            |              | AWGN                        | AWGN           | AWGN           |

|  |  |         |         |         |
|--|--|---------|---------|---------|
| Correlation Matrix and Antenna Configuration |  | 1x2 Low | 1x2 Low | 1x2 Low |
| Note 1:                                      | OCNG shall be used such that the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |         |         |         |
| Note 2:                                      | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |         |         |         |
| Note 3:                                      | SS-RSRP, SCH_RP, and $I_0$ levels have been derived from other parameters for information purpose. They are not settable parameters themselves.  |         |         |         |

#### A.6.5.6.4.2.2 Test Requirements

During T1, any interruption on PCell due to dormancy switching of SCells shall be within the requirement specified in clause 8.2.2.2.12.1.

During T2, interruptions on PCell due to CSI and RRM measurements on dormant SCells shall be within the interruption rate requirements specified in clauses 8.2.2.2.12.2 and 8.2.2.2.12.3, respectively.

During T3, any interruption on PCell due to dormancy switching of SCells shall be within the requirement specified in clause 8.2.2.2.12.1. Monitoring of PDCCH for SCell in SCell shall be resumed within the dormancy switching time specified in clause 8.6.2A.

For an event to be considered to be correct, all requirements above have to be fulfilled.

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

### A.6.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

#### A.6.5.6.5.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA

##### A.6.5.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify requirements on the RRC-based DL BWP switch delay on multiple CCs defined in clause 8.6.

The supported test configurations are shown in Table A.6.5.6.5.1.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2) as given in Table A.6.5.6.5.1.1-2. NR Cell-specific parameters are specified in Table A.6.5.6.5.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (SCell) on radio channel 2 (SCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for PCell and SCell (Cell 2).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PCell and SCell (Cell 2).

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration for both PCell and SCell (Cell 2), sent from the test equipment to the UE, is completely received at the UE side in PCell's and SCell's slot # denoted  $i$ . The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition for both PCell and SCell (Cell 2).

The UE shall be able to receive PDSCH on PCell and SCell (Cell 2) from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$  as defined in clause 8.6.3A.1 and starts to

report valid ACK/NACK for the PCell and SCell (Cell 2) from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length} + k1$  on BWP-1 of final condition. The UE shall be continuously scheduled on PCell's and SCell (Cell 2)'s BWP-1 of final condition starting from the first DL slot right after slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ .

$T_{RRCprocessingDelay}$ ,  $T_{BWPswitchDelayRRC}$  and  $D_{RRC}$  are defined in clause 8.6.3A.1,  $N=2$  in this test case.

The test equipment verifies the DL BWP switch time in PCell and SCell by counting the slots from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

**Table A.6.5.6.5.1.1-1: DL BWP switch supported test configurations**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode |
| 3  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – FDD duplex mode |
| 4  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode |
| 5  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.6.5.6.5.1.1-2: General test parameters for DL BWP switch in SA**

| Parameter   | Unit | Value  | Comment   |
|---|------|--------|---|
| NR RF Channel Number                                    |      | 1, 2   | Two NR radio channels are used for this test                        |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                                       |
| Active SCell  |      | Cell 2 | SCell on RF channel number 2.                                       |
| CP length   |      | Normal |   |
| DRX   |      | OFF    | For both PCell and SCell (Cell 2)                                   |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cell on PCC.                                  |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cell on SCC.                                  |
| Cell 2 timing offset to Cell 1                          | μs   | 3      | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1  | s    | [0.2]  |   |

**Table A.6.5.6.5.1.1-3: NR Cell specific test parameters for DL BWP switch in SA**



| Parameter                                    |                               | Unit    | Cell 1                          | Cell 2                          |
|--|-------------------------------|---------|---------------------------------|---------------------------------|
| Frequency Range                              |                               |         | FR1                             |                                 |
| Duplex mode                                  | Config 1                      |         | FDD                             | FDD                             |
|  | Config 2,5                    |         | TDD                             | TDD                             |
|  | Config 3                      |         | TDD                             | FDD                             |
|  | Config 4                      |         | FDD                             | TDD                             |
| TDD configuration                            | Config 1                      |         | Not Applicable                  | Not Applicable                  |
|  | Config 2                      |         | TDDConf.1.1                     | TDDConf.1.1                     |
|  | Config 3                      |         | TDDConf.1.1                     | Not Applicable                  |
|  | Config 4                      |         | Not Applicable                  | TDDConf.1.1                     |
|  | Config 5                      |         | TDDConf.2.1                     | TDDConf.2.1                     |
| BW <sub>channel</sub>                        | Config 1,2,3,4                |         | 10 MHz: N <sub>RB,c</sub> = 52  | 10 MHz: N <sub>RB,c</sub> = 52  |
|  | Config 5                      |         | 40 MHz: N <sub>RB,c</sub> = 106 | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID                                |                               |         | 1                               |                                 |
| Initial DL BWP Configuration                 |                               |         | DLBWP.0.2 <sup>Note4</sup>      |                                 |
| Initial UL BWP Configuration                 |                               |         | ULBWP.0.2 <sup>Note4</sup>      |                                 |
| Initial Condition                            | Active DL BWP-1 Configuration |         | DLBWP.1.3 <sup>Note4</sup>      |                                 |
|  | Active UL BWP-1 Configuration |         | ULBWP.1.3 <sup>Note4</sup>      |                                 |
| Final Condition                              | Active DL BWP-1 Configuration |         | DLBWP.1.1 <sup>Note4</sup>      |                                 |
|  | Active UL BWP-1 Configuration |         | ULBWP.1.1 <sup>Note4</sup>      |                                 |
| PDSCH Reference measurement channel          | Config 1                      |         | SR.1.1 FDD                      | SR.1.1 FDD                      |
|  | Config 2                      |         | SR.1.1 TDD                      | SR.1.1 TDD                      |
|  | Config 3                      |         | SR.1.1 TDD                      | SR.1.1 FDD                      |
|  | Config 4                      |         | SR.1.1 FDD                      | SR.1.1 TDD                      |
|  | Config 5                      |         | SR.2.1 TDD                      | SR.2.1 TDD                      |
| RMSI CORESET parameters                      | Config 1                      |         | CR.1.1 FDD                      | CR.1.1 FDD                      |
|  | Config 2                      |         | CR.1.1 TDD                      | CR.1.1 TDD                      |
|  | Config 3                      |         | CR.1.1 TDD                      | CR.1.1 FDD                      |
|  | Config 4                      |         | CR.1.1 FDD                      | CR.1.1 TDD                      |
|  | Config 5                      |         | CR.2.1 TDD                      | CR.2.1 TDD                      |
| Dedicated CORESET parameters                 | Config 1                      |         | CCR.1.1 FDD                     | CCR.1.1 FDD                     |
|  | Config 2                      |         | CCR.1.1 TDD                     | CCR.1.1 TDD                     |
|  | Config 3                      |         | CCR.1.1 TDD                     | CCR.1.1 FDD                     |
|  | Config 4                      |         | CCR.1.1 FDD                     | CCR.1.1 TDD                     |
|  | Config 5                      |         | CCR.2.1 TDD                     | CCR.2.1 TDD                     |
| OCNG Patterns                                |                               |         | OP.1                            |                                 |
| SSB Configuration                            | Config 1,2,3,4                |         | SSB.1 FR1                       |                                 |
|  | Config 5                      |         | SSB.2 FR1                       |                                 |
| SMTC Configuration                           |                               |         | SMTC.1                          |                                 |
|  | Config 1                      |         | TRS.1.1 FDD                     | TRS.1.1 FDD                     |
|  | Config 2                      |         | TRS.1.1 TDD                     | TRS.1.1 TDD                     |
|  | Config 3                      |         | TRS.1.1 TDD                     | TRS.1.1 FDD                     |
|  | Config 4                      |         | TRS.1.1 FDD                     | TRS.1.1 TDD                     |
|  | Config 5                      |         | TRS.1.2 TDD                     | TRS.1.2 TDD                     |
| Correlation Matrix and Antenna Configuration |                               |         | 1x2 Low                         |                                 |
| Propagation Condition                        |                               |         | AWGN                            |                                 |
| EPRE ratio of PSS to SSS                     |                               | dB      | 0                               |                                 |
| EPRE ratio of PBCH DMRS to SSS               |                               |         |                                 |                                 |
| EPRE ratio of PBCH to PBCH DMRS              |                               |         |                                 |                                 |
| EPRE ratio of PDCCH DMRS to SSS              |                               |         |                                 |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS            |                               |         |                                 |                                 |
| EPRE ratio of PDSCH DMRS to SSS              |                               |         |                                 |                                 |
| EPRE ratio of PDSCH to PDSCH                 |                               |         |                                 |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)       |                               |         |                                 |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)     |                               |         |                                 |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>            | Config 1,2,3,4                | dBm/SCS | -104                            |                                 |
|  | Config 5                      |         | -101                            |                                 |
| SS-RSRP <sup>Note 3</sup>                    | Config 1,2,3,4                | dBm/SCS | -87                             |                                 |
|  | Config 5                      |         | -84                             |                                 |
| $\bar{E}_s/I_{ot}$                           |                               | dB      | 17                              |                                 |
| $\bar{E}_s/N_{oc}$                           |                               | dB      | 17                              |                                 |

|  |                |                  |        |
|--|----------------|------------------|--------|
| I <sub>o</sub> <sup>Note3</sup>  | Config 1,2,3,4 | dBm/<br>9.36MHz  | -58.96 |
|  | Config 5       | dBm/<br>38.16MHz | -52.86 |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |                |                  |        |

#### A.6.5.6.5.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for both PCell and SCell (Cell 2) from the first DL slot that occurs right after the beginning of slot  $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length})$  and starts to report valid ACK/NACK for both PCell and SCell (Cell 2) from the first UL slot that occurs after the beginning of DL slot  $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length} + k1)$ .

Where,  $k1$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability  $bwp-SwitchingDelay$  [2], UE shall finish BWP switch on PCell and SCell (Cell 2) within the time duration  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}$  defined in 8.6.3A.1.

All of the above test requirements shall be fulfilled in order for the observed PCell and SCell (Cell 2) active BWP switch delay to be counted as correct.

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

NOTE: During T1 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot  $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length} + k1)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### A.6.5.7 DL interruptions at switching between two uplink carriers

#### A.6.5.7.1 DL interruptions at switching between two uplink carriers in FDD-TDD CA

##### A.6.5.7.1.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers defined in clause 8.2.2.2.10. The test case is applicable for an uplink band pair of an inter-band FDD-TDD CA configuration when the capability  $uplinkTxSwitchingPeriod$  is present.

There are two cells: FR1 FDD PCell (Cell 1), FR1 TDD SCell (Cell 2). The test parameters for the two cells are given in Table A.6.5.7.1.1-1, Table A.6.5.7.1.1-2 and Table A.6.5.7.1.1-3 below.

For NR FDD carrier (Cell 1), aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting 6dB on the following symbol in the slot overlapping with the special slot of the NR TDD carrier (Cell 2):

- symbol#12 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
- otherwise,
  - symbol #8 if UE capability  $uplinkTxSwitchingPeriod$  is 210us or
  - symbol #9 if UE capability  $uplinkTxSwitchingPeriod$  is 140us or

- symbol #10 if UE capability *uplinkTxSwitchingPeriod* is 35us.

For NR TDD carrier (Cell 2), aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting [6dB] on the following symbol in the special slot:

- symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption-r16*;
- otherwise,
  - symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or
  - symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or
  - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

This test verifies that the UE correctly report the L1-RSRP reporting. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *uplinkTxSwitching* is indicated to UE.

**Table A.6.5.7.1.1-1: Supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.6.5.7.1.1-2: General test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter                                  | Unit | Test configuration | Value  | Comment  |
|--|------|--------------------|--|--|
| RF Channel Number                          |      | Config 1           | 1, 2   | Two radio channels are used for this test.                           |
| Active cell                                |      | Config 1           | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell                 | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length                                  |      | Config 1           | Normal   |  |
| DRX  |      | Config 1           | OFF  |  |
| Measurement gap pattern Id                 |      | Config 1           | OFF  |  |
| Filter coefficient                         |      | Config 1           | 0  | L3 filtering is not used   |
| CSI-RS configuration for L1-RSRP reporting |      | Config 1           | Cell 1: CSI-RS.1.5<br>FDD<br>Cell 2: CSI-RS.2.5<br>TDD |  |
| T1   | s    | Config 1           | 5  |  |

**Table A.6.5.7.1.1-3: Cell specific test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter  |          | Unit         | Cell1   | Cell2   |
|--|----------|--------------|---|---|
| Frequency Range  |          |              | FR1   | FR1   |
| Duplex mode  | Config 1 |              | FDD   | TDD   |
| TDD configuration  | Config 1 |              | N/A   | TDDConf.2.1 except that:<br>S='11DL:1GP:2UL';<br>nrofDownlinkSymbols:11<br>nrofUplinkSymbols: 2                                       |
| BW <sub>channel</sub>                                      | Config 1 |              | 10 MHz: N <sub>RB,c</sub> = 52  | 40 MHz: N <sub>RB,c</sub> = 106   |
| Initial BWP Configuration                                  | Config 1 |              | DLBWP.0.1   | DLBWP.0.1   |
| DL dedicated BWP configuration                             | Config 1 |              | DLBWP.1.1   | DLBWP.1.1   |
| UL dedicated BWP configuration                             | Config 1 |              | ULBWP.1.1   | ULBWP.1.1   |
| SRS configuration  | Config 1 |              | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:<br>resourceMappingstartPosition: 0<br>resourceMappingnrofSymbols: n2 | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:<br>resourceMappingstartPosition: 0<br>resourceMappingnrofSymbols: n2 |
| PDSCH Reference measurement channel                        | Config 1 |              | SR.1.1 FDD  | SR.2.1 TDD  |
| RMSI CORESET parameters                                    | Config 1 |              | CR.1.1 FDD  | CR.2.1 TDD  |
| Dedicated CORESET parameters                               | Config 1 |              | CCR.1.1 FDD   | CCR.2.1 TDD   |
| OCNG Patterns  |          |              | OP.1  | OP.1  |
| SMTC Configuration   |          |              | SMTC.1  | SMTC.1  |
| SSB Configuration  | Config 1 |              | SSB.1 FR1   | SSB.2 FR1   |
| Correlation Matrix and Antenna Configuration               |          |              | 1x2 Low   | 2x2 Low   |
| EPRE ratio of PSS to SSS                                   |          | dB           | 0   | 0   |
| EPRE ratio of PBCH DMRS to SSS                             |          |              |   |   |
| EPRE ratio of PBCH to PBCH DMRS                            |          |              |   |   |
| EPRE ratio of PDCCH DMRS to SSS                            |          |              |   |   |
| EPRE ratio of PDCCH to PDCCH DMRS                          |          |              |   |   |
| EPRE ratio of PDSCH DMRS to SSS                            |          |              |   |   |
| EPRE ratio of PDSCH to PDSCH                               |          |              |   |   |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                     |          |              |   |   |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                   |          |              |   |   |
| N <sub>oc</sub> <sup>Note 2</sup>                          |          | dBm/15 kHz   | -104  | -104  |
| SS-RSRP <sup>Note 3</sup>                                  |          | dBm/SSB SCS  | -87   | -84   |
| CSI-RS RSRP <sup>Note 6</sup>                              |          | dBm/SCS      | -81   | -78   |
| $\tilde{E}_s/I_{ot}$                                       |          | dB           | 17  | 17  |
| $\tilde{E}_s/N_{oc}$                                       |          | dB           | 17  | 17  |
| N <sub>oc</sub> <sup>Note 2</sup>                          | Config 1 | dBm/SCS      | -104  | -101  |
| I <sub>o</sub> <sup>Note 3</sup> on symbols without CSI-RS | Config 1 | dBm/9.36 MHz | -58.96  | -   |
|  |          | dBm/38.16MHz | -   | -52.86  |
| I <sub>o</sub> <sup>Note 6</sup> on symbols with CSI-RS    | Config 1 | dBm/9.36 MHz | -56.58  | -   |
|  |          | dBm/38.16MHz | -   | -50.5   |
| Time offset to Cell1 <sup>Note 5</sup>                     |          | µs           | -   | 0   |
| Propagation Condition                                      |          |              | AWGN  | AWGN  |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Void   |
| Note 5: | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.                                       |
| Note 6: | CSI-RS RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |

### A.6.5.7.1.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.1.

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

### A.6.5.7.2 DL interruptions at switching between two uplink carriers in TDD-TDD CA

#### A.6.5.7.2.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers defined in clause 8.2.2.2.10. The test case is applicable for an uplink band pair of an inter-band TDD-TDD CA configuration when the capability *uplinkTxSwitchingPeriod* is present.

There are two cells: FR1 TDD PCell (Cell 1), FR1 TDD SCell (Cell 2). The test parameters for the two cells are given in Table A.6.5.7.2.1-1, Table A.6.5.7.2.1-2 and Table A.6.5.7.2.1-3 below.

For NR TDD PCell (Cell 1), aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting 6dB on the following symbol in the special slot:

- symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption-r16*;
- otherwise,
  - symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or
  - symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or
  - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

For NR TDD SCell (Cell 2), aperiodic CSI-RS for L1-RSRP reporting is configured with power boosting 6dB [6dB] on the following symbol on the 2<sup>nd</sup> special slot of every 8 slots:

- symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption-r16*;
- otherwise,
  - symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or
  - symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or
  - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

This test verifies that the UE correctly report the L1-RSRP reporting. The test case is only applicable to UE which supports *simultaneousRxTxInterBandCA*.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *uplinkTxSwitching* is indicated to UE.

**Table A.6.5.7.2.1-1: Supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.6.5.7.2.1-2: General test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter                                  | Unit | Test configuration | Value  | Comment  |
|--|------|--------------------|--|--|
| RF Channel Number                          |      | Config 1           | 1, 2   | Two radio channels are used for this test.                           |
| Active cell                                |      | Config 1           | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell                 | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length                                  |      | Config 1           | Normal   |  |
| DRX  |      | Config 1           | OFF  |  |
| Measurement gap pattern Id                 |      | Config 1           | OFF  |  |
| Filter coefficient                         |      | Config 1           | 0  | L3 filtering is not used   |
| CSI-RS configuration for L1-RSRP reporting |      | Config 1           | Cell 1: CSI-RS.2.5<br>TDD<br>Cell 2: CSI-RS.2.5<br>TDD |  |
| T1   | s    | Config 1           | 5  |  |

**Table A.6.5.7.2.1-3: Cell specific test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**



| Parameter  |          | Unit        | Cell1   | Cell2   |        |
|--|----------|-------------|---|---|--------|
| Frequency Range  |          |             | FR1   | FR1   |        |
| Duplex mode  | Config 1 |             | TDD   | TDD   |        |
| TDD configuration  | Config 1 |             | TDDConf.2.1 except that<br>S='11DL:1GP:2UL';<br>nrofDownlinkSymbols:11<br>nrofUplinkSymbols: 2  | TDDConf.2.2   |        |
| BW <sub>channel</sub>  | Config 1 |             | 40 MHz: N <sub>RB,c</sub> = 106   | 40 MHz: N <sub>RB,c</sub> = 106   |        |
| Initial BWP Configuration  | Config 1 |             | DLBWP.0.1   | DLBWP.0.1   |        |
| DL dedicated BWP configuration   | Config 1 |             | DLBWP.1.1   | DLBWP.1.1   |        |
| UL dedicated BWP configuration   | Config 1 |             | ULBWP.1.1   | ULBWP.1.1   |        |
| SRS configuration  | Config 1 |             | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:<br>resourceMappingstartPosition: 0<br>resourceMappingnrofSymbols: n2 | SRS configuration in Table A.4.4.1.1.1-3 is applied except that:<br>resourceMappingstartPosition: 0<br>resourceMappingnrofSymbols: n2 |        |
| PDSCH Reference measurement channel  | Config 1 |             | SR.2.1 TDD  | SR.2.1 TDD  |        |
| RMSI CORESET parameters  | Config 1 |             | CR.2.1 TDD  | CR.2.1 TDD  |        |
| Dedicated CORESET parameters   | Config 1 |             | CCR.2.1 TDD   | CCR.2.1 TDD   |        |
| OCNG Patterns  |          |             | OP.1  | OP.1  |        |
| SMTc Configuration   |          |             | SMTc.1  | SMTc.1  |        |
| SSB Configuration  | Config 1 |             | SSB.2 FR1   | SSB.2 FR1   |        |
| Correlation Matrix and Antenna Configuration   |          |             | 1x2 Low   | 2x2 Low   |        |
| EPRE ratio of PSS to SSS   |          | dB          | 0   | 0   |        |
| EPRE ratio of PBCH DMRS to SSS   |          |             |   |   |        |
| EPRE ratio of PBCH to PBCH DMRS  |          |             |   |   |        |
| EPRE ratio of PDCCH DMRS to SSS  |          |             |   |   |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |          |             |   |   |        |
| EPRE ratio of PDSCH DMRS to SSS  |          |             |   |   |        |
| EPRE ratio of PDSCH to PDSCH   |          |             |   |   |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |          |             |   |   |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |          |             |   |   |        |
| N <sub>oc</sub> Note 2   |          | dBm/15 kHz  | -104  | -104  |        |
| SS-RSRP Note 3   |          | dBm/SSB SCS | -84   | -84   |        |
| CSI-RS RSRP Note6  |          | dBm/SCS     | -78   | -78   |        |
| $\bar{E}_s/I_{ot}$   |          | dB          | 17  | 17  |        |
| $\bar{E}_s/N_{oc}$   |          | dB          | 17  | 17  |        |
| N <sub>oc</sub> Note 2   |          | Config 1    | dBm/SCS   | -101  | -101   |
| I <sub>o</sub> Note3 on symbols without CSI-RS   |          | Config 1    | dBm/38.16MHz  | -52.86  | -52.86 |
| I <sub>o</sub> Note6 on symbols with CSI-RS  |          | Config 1    | dBm/38.16MHz  | -50.5   | -50.5  |
| Time offset to Cell1 Note 5  |          | $\mu$ s     | -   | 0   |        |
| Propagation Condition  |          |             | AWGN  | AWGN  |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.</p> <p>Note 6: CSI-RS RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |          |             |   |   |        |

### A.6.5.7.2.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.2.2.10.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.1.

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

## A.6.5.8 UE specific CBW change

### A.6.5.8.1 UE specific CBW change on PCell in FR1 in non-DRX

#### A.6.5.8.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13.

The supported test configurations are shown in Table A.6.5.8.1.1-1. The test scenario comprises of one Cell (Cell 1), which is PCell as given in Table A.6.5.8.1.1-2. Cell-specific parameters are specified in Table A.6.5.8.1.1-3.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE sends ACK/NACK during the test.

Before the test starts:

- UE is connected to Cell 1 (PCell) on radio channel 1.
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PCell.
- UE has been configured with UE specific CBW (CBW-1).
- UE is indicated in *SCS-SpecificCarrier* [2] that the UE specific CBW is CBW-1 as the initial condition in Cell 1 (PCell).

Cell1 (PCell) has constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* containing *SCS-SpecificCarrier* with updated UE specific CBW, sent from the test equipment to the UE, is completely received at the UE side in PCell's slot # denoted *i*. The UE shall reconfigure its UE specific CBW with the updated CBW-2 for the final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$  as defined in clause 8.13 and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1$  on the PCell's BWP-1 on CBW-2 for the final condition. The UE shall be continuously scheduled on the PCell's BWP-1 on CBW-2 for the final condition starting from the first DL slot right after slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ .

$T_{RRCprocessingDelay}$  and  $T_{CBWchangeDelayRRC}$  are defined in clause 8.13.

The test equipment verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the RRC Reconfiguration message including updated UE specific CBW configuration is sent until the moment a valid ACK/NACK is received.

**Table A.6.5.8.1.1-1: Supported test configurations for UE specific CBW change in SA scenario**

| Configuration  | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.6.5.8.1.1-2: General test parameters for UE specific CBW change in SA scenario**

| Parameter            | Unit | Value  | Comment                                    |
|----------------------|------|--------|--|
| NR RF Channel Number |      | 1      | One NR radio channel is used for this test |
| Active Cell          |      | Cell 1 | Cell on RF channel number 1.               |
| CP length            |      | Normal |  |
| DRX                  |      | OFF    |  |
| T1                   | s    | 0.2    |  |

**Table A.6.5.8.1.1-3: NR Cell specific test parameters for UE specific CBW change in SA scenario**

| Parameter   |  | Unit           | Cell 1                          |
|---|--|----------------|---------------------------------|
| Frequency Range                                     |  |                | FR1                             |
| Duplex mode   | Config 1                                       |                | FDD                             |
|   | Config 2,3                                     |                | TDD                             |
| TDD configuration                                   | Config 1                                       |                | Not Applicable                  |
|   | Config 2                                       |                | TDDConf.1.1                     |
|   | Config 3                                       |                | TDDConf.2.1                     |
| BW <sub>channel</sub>                               | Config 1                                       |                | 10 MHz: N <sub>RB,c</sub> = 52  |
|   | Config 2                                       |                | 10 MHz: N <sub>RB,c</sub> = 52  |
|   | Config 3                                       |                | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active DL BWP ID                                    | Config 1,2, 3                                  |                | 1                               |
| Initial DL BWP Configuration (BWP-1)                | Config 1,2, 3                                  |                | DLBWP.0.2                       |
| Initial UL BWP Configuration                        | Config 1,2, 3                                  |                | ULBWP.0.2                       |
| Initial Condition                                   | Active DL<br>DLCBW-<br>1<br>Configure<br>ation | Config 1, 2, 3 | DLCBW.1.1                       |
|   | Active UL<br>CBW-1<br>Configura<br>tion        | Config 1, 2, 3 | ULCBW.1.1                       |
| Final Condition                                     | Active DL<br>DLCBW-<br>1<br>Configure<br>ation | Config 1, 2, 3 | DLCBW.1.2                       |
|   | Active UL<br>CBW-1<br>Configura<br>tion        | Config 1, 2, 3 | ULCBW.1.2                       |
| PDSCH Reference<br>measurement channel              | Config 1                                       |                | SR.1.1 FDD                      |
|   | Config 2                                       |                | SR.1.1 TDD                      |
|   | Config 3                                       |                | SR2.1 TDD                       |
| RMSI CORESET parameters                             | Config 1                                       |                | CR.1.1 FDD                      |
|   | Config 2                                       |                | CR.1.1 TDD                      |
|   | Config 3                                       |                | CR2.1 TDD                       |
| Dedicated CORESET<br>parameters                     | Config 1                                       |                | CCR.1.1 FDD                     |
|   | Config 2                                       |                | CCR.1.1 TDD                     |
|   | Config 3                                       |                | CCR.2.1 TDD                     |
| OCNG Patterns                                       |  |                | OP.1                            |
| SSB Configuration                                   | Config 1,2                                     |                | SSB.1 FR1                       |
|   | Config 3                                       |                | SSB.2 FR1                       |
| SMTC Configuration                                  |  |                | SMTC.1                          |
| TRS Configuration                                   | Config 1                                       |                | TRS.1.1 FDD                     |
|   | Config 2                                       |                | TRS.1.1 TDD                     |
|   | Config 3                                       |                | TRS.1.2 TDD                     |
| Antenna Configuration                               |  |                | 1x2 Low                         |
| Propagation Condition                               |  |                | AWGN                            |
| EPRE ratio of PSS to SSS                            |  | dB             | 0                               |
| EPRE ratio of PBCH DMRS to SSS                      |  |                |                                 |
| EPRE ratio of PBCH to PBCH DMRS                     |  |                |                                 |
| EPRE ratio of PDCCH DMRS to SSS                     |  |                |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS                   |  |                |                                 |
| EPRE ratio of PDSCH DMRS to SSS                     |  |                |                                 |
| EPRE ratio of PDSCH to PDSCH                        |  |                |                                 |
| EPRE ratio of OCNG DMRS to SSS <sup>(Note 1)</sup>  |  |                |                                 |
| EPRE ratio of OCNG to OCNG DMRS <sup>(Note 1)</sup> |  |                |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>                   | Config 1,2                                     | dBm/SCS        | -104                            |
|   | Config 3                                       |                | -101                            |
| SS-RSRP <sup>Note 3</sup>                           | Config 1,2                                     | dBm/SCS        | -87                             |
|   | Config 3                                       |                | -84                             |
| $\hat{E}_s/I_{ot}$                                  |  | dB             | 17                              |
| $\hat{E}_s/N_{oc}$                                  |  | dB             | 17                              |

|  |            |                  |        |
|--|------------|------------------|--------|
| I <sub>o</sub> <sup>Note3</sup>  | Config 1,2 | dBm/<br>9.36MHz  | -58.96 |
|  | Config 3   | dBm/<br>38.16MHz | -52.86 |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [3].</p> |            |                  |        |

### A.6.5.8.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for the PCell from the first DL slot that occurs right after the beginning of slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$  and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1$ .

Where,  $k1$  is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed UE specific CBW change delay on the PCell to be counted as correct.

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

## A.6.5.9 Pathloss reference signal switching delay

### A.6.5.9.1 MAC-CE based pathloss reference signal switch delay

#### A.6.5.9.1.1 Test Purpose and Environment

The purpose of this test is to verify the MAC-CE based pathloss reference signal switch delay requirement defined in clause 8.14.

The supported test configurations are shown in Table A.6.5.9.1.1-1. The test scenario comprises of one cell (Cell 1) as given in Table A.6.5.9.1.1-2. Cell-specific parameters of the cell are specified in Table A.6.5.9.1.1-3 below.

The test consists of 3 successive time periods, with duration of T1, T2 and T3, respectively.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 on radio channel 1.
- UE shall be fully synchronized to SSB #0.

During T1,

- The UE shall track SSB #1 so that SSB #1 as a pathloss reference signal is known to the UE.

Time period T2 starts when the UE is configured of the power headroom reporting functionality by upper layers by the test equipment and the UE shall transmit a PHR during T2.

During T2,

- UE is configured with a *phr-ProhibitTimer* timer value for Cell 1.
- UE is configured with a *phr-Tx-PowerFactorChange* value for Cell 1.

During T3,

Time period T3 starts when a PDSCH carrying MAC-CE activation for pathloss reference signal switch, sent from the test equipment to the UE to switch the pathloss reference signal from SSB 0 to SSB 1, is received at the

UE side in Cell1's slot # denoted  $i$ . The UE shall switch its pathloss reference signal to the target one and send PHR.

The UE shall be able to apply the target pathloss reference signal of the serving cell on which pathloss reference signal switch occurs no later than the slot  $i + T_{HARQ} + \left\lceil \frac{3\text{ms} + 5 * T_{target\_PL-RS} + 2\text{ms}}{NR\ slot\ length} \right\rceil$  as defined in clause 8.14. The UE shall be able to apply old pathloss reference signals until the slot  $i + T_{HARQ} + 3N_{slot}^{subframe,\mu}$  as defined in clause 8.14.

The test equipment verifies the pathloss RS switch time by counting the slots from the time when the pathloss RS switch command is transmitted till a PHR is received during T3.

**Table A.6.5.9.1.1-1: MAC-CE based pathloss reference signal switch supported test configurations**

| Config  | Description  |
|---|--|
| 1   | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2   | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3   | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |  |

**Table A.6.5.9.1.1-2: General test parameters for MAC-CE based pathloss reference signal switch in SA**

| Parameter                                    | Unit           | Value                     | Comment                  |
|--|----------------|---------------------------|--------------------------|
| Active PCell                                 |                | Cell 1                    |                          |
| RF Channel Number                            |                | 1                         |                          |
| Duplex mode                                  | Config 1       | FDD                       |                          |
|  | Config 2, 3    | TDD                       |                          |
| DL initial BWP configuration                 | Config 1, 2, 3 | DLBWP.0.1                 |                          |
| DL dedicated BWP configuration               | Config 1, 2, 3 | DLBWP.1.1                 |                          |
| UL initial BWP configuration                 | Config 1, 2, 3 | ULBWP.0.1                 |                          |
| UL dedicated BWP configuration               | Config 1, 2, 3 | ULBWP.1.1                 |                          |
| TDD Configuration                            | Config 1       | Not Applicable            |                          |
|  | Config 2       | TDDConf.1.1               |                          |
|  | Config 3       | TDDConf.2.1               |                          |
| CORESET Reference Channel                    | Config 1       | CR.1.1 FDD                |                          |
|  | Config 2       | CR.1.1 TDD                |                          |
|  | Config 3       | CR.2.1 TDD                |                          |
| SSB Configuration                            | Config 1       | SSB.1 FR1                 |                          |
|  | Config 2       | SSB.1 FR1                 |                          |
|  | Config 3       | SSB.2 FR1                 |                          |
| SMTTC Configuration                          | Config 1, 2    | SMTTC.1                   |                          |
|  | Config 3       | SMTTC.1                   |                          |
| PDSCH/PDCCH subcarrier spacing               | Config 1, 2    | 15 kHz                    |                          |
|  | Config 3       | 30 kHz                    |                          |
| SSB index assigned as pathloss RS            |                | 0 in T1, 0 in T2, 1 in T3 |                          |
| OCNG parameters                              |                | OP.1                      |                          |
| CP length                                    |                | Normal                    |                          |
| Correlation Matrix and Antenna Configuration |                | 1x2 Low                   |                          |
| DRX  |                | OFF                       |                          |
| Gap pattern ID                               |                | gp0                       |                          |
| <i>phr-ProhibitTimer</i>                     | sub frame      | 0                         |                          |
| <i>phr-Tx-PowerFactorChange</i>              | dB             | 5                         |                          |
| <i>phr-PeriodicTimer</i>                     | sub frame      | infinity                  |                          |
| Filter coefficient                           |                | 0                         | L3 filtering is not used |
| T1   | s              | [2]                       |                          |
| T2   | s              | [2]                       |                          |
| T3   | s              | 0.2                       |                          |



**Table A.6.5.9.1.1-3: NR Cell specific test parameters for MAC-CE based pathloss reference signal switch in SA**

| Parameter   |                      | Unit           | Test 1    |                |    |
|---|----------------------|----------------|-----------|----------------|----|
|   |                      |                | T1        | T2             | T3 |
| EPRE ratio of PDCCH DMRS to SSS   |                      | dB             | 4         |                |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |                      | dB             | 0         |                |    |
| EPRE ratio of PBCH DMRS to SSS  |                      | dB             | 0         |                |    |
| EPRE ratio of PBCH to PBCH DMRS   |                      | dB             |           |                |    |
| EPRE ratio of PSS to SSS  |                      | dB             |           |                |    |
| EPRE ratio of PDSCH DMRS to SSS   |                      | dB             |           |                |    |
| EPRE ratio of PDSCH to PDSCH DMRS   |                      | dB             |           |                |    |
| EPRE ratio of OCNG DMRS to SSS  |                      | dB             |           |                |    |
| EPRE ratio of OCNG to OCNG DMRS   |                      | dB             |           |                |    |
| SSB with index 0  |                      |                |           |                |    |
|   | $\hat{E}_s / I_{ot}$ | dB             | [7]       |                |    |
|   | $N_{oc}$             | Config 1, 2, 3 | dBm/15kHz | [-101]         |    |
|   | $\hat{E}_s / N_{oc}$ |                | dB        | [7]            |    |
|   | SS-RSRP              | Config 1, 2    | dBm/SCS   | [-94]          |    |
|   | Note 4               | Config 3       |           | [-91]          |    |
| SSB with index 1  |                      |                | [-3]      |                |    |
|   | $\hat{E}_s / I_{ot}$ |                | dB        | [-3]           |    |
|   | $N_{oc}$             | Config 1, 2, 3 | dBm/15kHz | [-101]         |    |
|   | $\hat{E}_s / N_{oc}$ |                | dB        | [-3]           |    |
|   | SS-RSRP              | Config 1, 2    | dBm/SCS   | [-104]         |    |
|   | Note 4               | Config 3       |           | [-101]         |    |
| I <sub>o</sub> Note 5   |                      | Config 1, 2    | dBm       | -65.3/9.36MHz  |    |
|   |                      | Config 3       |           | -59.2/38.16MHz |    |
| Propagation condition   |                      |                |           | AWGN           |    |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> <p>Note 5: SS-RSRP, Es/lot and I<sub>o</sub> levels have been derived from other parameters for information purpose. They are not settable parameters.</p> |                      |                |           |                |    |

### A.6.5.9.1.2 Test Requirements

During T3, the UE shall start to send the PHR for PCell no later than the slot  $i + T_{HARQ} + \left\lceil \frac{3ms + 5 * T_{target\_PL-RS} + 2ms}{NR\ slot\ length} \right\rceil$ .

During T3, the UE shall start to send the PHR for PCell no earlier than the slot  $i + T_{HARQ} + 3N_{slot}^{subframe,\mu}$ .

Where,  $T_{HARQ}$  is the timing between pathloss reference MAC-CE activation command and acknowledgement as specified in [7],  $T_{target\_PL-RS}$  is the periodicity of the target pathloss reference signal which is SSB in this test.

During T3, UE shall send L1-RSRP report with measurement results for both SSB0 and SSB1.

All of the above test requirements shall be fulfilled in order for the observed pathloss RS switch delay to be counted as correct.

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

Note: The UE shall be given proper uplink transmission grant during T2 and T3.

## A.6.6 Measurement procedure

### A.6.6.1 Intra-frequency Measurements

#### A.6.6.1.1 SA event triggered reporting tests without gap under non-DRX

##### A.6.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2.5.1 and 9.2.5.2.

##### A.6.6.1.1.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Table A.6.6.1.1.1-1 and A.6.6.1.1.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

**Table A.6.6.1.1.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.6.1.1.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FR1**

| Parameter                                       | Unit | Test configuration | Value                | Comment   |
|---|------|--------------------|----------------------|---|
| Active cell                                     |      | 1, 2, 3            | Cell 1               |   |
| Neighbour cell                                  |      | 1, 2, 3            | Cell 2               | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3            | 1: Cell 1 and Cell 2 |   |
| SSB configuration                               |      | 1                  | SSB.1 FR1            |   |
|   |      | 2                  | SSB.1 FR1            |   |
|   |      | 3                  | SSB.2 FR1            |   |
| SMTC configuration                              |      | 1                  | SMTC.2               |   |
|   |      | 2                  | SMTC.1               |   |
|   |      | 3                  | SMTC.1               |   |
| A3-Offset                                       | dB   | 1, 2, 3            | -4.5                 |   |
| CP length                                       |      | 1, 2, 3            | Normal               |   |
| Hysteresis                                      | dB   | 1, 2, 3            | 0                    |   |
| Time To Trigger                                 | s    | 1, 2, 3            | 0                    |   |
| Filter coefficient                              |      | 1, 2, 3            | 0                    | L3 filtering is not used  |
| DRX   |      | 1, 2, 3            |                      | OFF   |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                 | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3 $\mu$ s            | Synchronous cells   |
|   |      | 3                  | 3 $\mu$ s            | Synchronous cells   |
| T1  | s    | 1, 2, 3            | 5                    |   |
| T2  | s    | 1, 2, 3            | 5                    |   |

Table A.6.6.1.1.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FR1

| Parameter   | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |        |
|---|---------------|--------------------|------------------------|--------|------------------------|--------|
|   |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |               | 1                  | TN/A                   |        | TN/A                   |        |
|   |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1            |        |
|   |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration   |               | 1                  | SR.1.1 FDD             |        | N/A                    |        |
|   |               | 2                  | SR.1.1 TDD             |        |                        |        |
|   |               | 3                  | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration  |               | 1                  | CR.1.1 FDD             |        | N/A                    |        |
|   |               | 2                  | CR.1.1 TDD             |        | N/A                    |        |
|   |               | 3                  | CR.2.1 TDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |               | 1                  | CCR.1.1 FDD            |        | N/A                    |        |
|   |               | 2                  | CCR.1.1 TDD            |        | N/A                    |        |
|   |               | 3                  | CCR.2.1 TDD            |        | N/A                    |        |
| OCNG Patterns   |               | 1, 2, 3            | OP.1                   |        | OP.1                   |        |
| TRS Configuration   |               | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
|   |               | 2                  | TRS.1.1 TDD            |        | N/A                    |        |
|   |               | 3                  | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration   |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |               | 1, 2, 3            | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS  |               | 1, 2, 3            | SSB                    |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/SCS       | 1                  | -98                    |        |                        |        |
|   |               | 2                  | -98                    |        |                        |        |
|   |               | 3                  | -95                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 kHz    | 1                  | -98                    |        |                        |        |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB            | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1                  | 4                      | 4      | -Infinity              | 4      |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 2                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 3                  | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | --58.50                | -56.16 |
| Propagation Condition   |               | 1, 2, 3            | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

### A.6.6.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.6.6.1.2 SA event triggered reporting tests without gap under DRX

#### A.6.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2.5.1 and 9.2.5.2.

#### A.6.6.1.2.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.2.2-1, A.6.6.1.2.2-2 and A.6.6.1.2.2-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.1.2.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.6.1.2.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX**

| Parameter                                       | Unit | Test configuration | Value                |        | Comment   |
|---|------|--------------------|----------------------|--------|---|
|   |      |                    | Test 1               | Test 2 |   |
| Active cell                                     |      | 1, 2, 3            | Cell 1               |        |   |
| Neighbour cell                                  |      | 1, 2, 3            | Cell 2               |        | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3            | 1: Cell 1 and Cell 2 |        |   |
| SSB configuration                               |      | 1                  | SSB.1 FR1            |        |   |
|   |      | 2                  | SSB.1 FR1            |        |   |
|   |      | 3                  | SSB.2 FR1            |        |   |
| SMTC configuration                              |      | 1                  | SMTC.2               |        |   |
|   |      | 2                  | SMTC.1               |        |   |
|   |      | 3                  | SMTC.1               |        |   |
| A3-Offset                                       | dB   | 1, 2, 3            | -4.5                 |        |   |
| CP length                                       |      | 1, 2, 3            | Normal               |        |   |
| Hysteresis                                      | dB   | 1, 2, 3            | 0                    |        |   |
| Time To Trigger                                 | s    | 1, 2, 3            | 0                    |        |   |
| Filter coefficient                              |      | 1, 2, 3            | 0                    |        | L3 filtering is not used  |
| DRX   |      | 1, 2, 3            | DRX.1                | DRX.7  |   |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                 |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3 $\mu$ s            |        | Synchronous cells   |
|   |      | 3                  | 3 $\mu$ s            |        | Synchronous cells   |
| T1  | s    | 1, 2, 3            | 5                    |        |   |
| T2  | s    | 1, 2, 3            | 5                    | 10     |   |

**Table A.6.6.1.2.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX**

| Parameter   | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |        |
|---|---------------|--------------------|------------------------|--------|------------------------|--------|
|   |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |               | 1                  | TN/A                   |        | TN/A                   |        |
|   |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1            |        |
|   |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration   |               | 1                  | SR.1.1 FDD             |        | N/A                    |        |
|   |               | 2                  | SR.1.1 TDD             |        |                        |        |
|   |               | 3                  | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration  |               | 1                  | CR.1.1 FDD             |        | N/A                    |        |
|   |               | 2                  | CR.1.1 TDD             |        | N/A                    |        |
|   |               | 3                  | CR.2.1 TDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |               | 1                  | CCR.1.1 FDD            |        | N/A                    |        |
|   |               | 2                  | CCR.1.1 TDD            |        | N/A                    |        |
|   |               | 3                  | CCR.2.1 TDD            |        | N/A                    |        |
| OCNG Patterns   |               | 1, 2, 3            | OP.1                   |        | OP.1                   |        |
| TRS configuration   |               | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
|   |               | 2                  | TRS.1.1 TDD            |        | N/A                    |        |
|   |               | 3                  | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration   |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |               | 1, 2, 3            | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS  |               | 1, 2, 3            | SSB                    |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/SCS       | 1                  | -98                    |        |                        |        |
|   |               | 2                  | -98                    |        |                        |        |
|   |               | 3                  | -95                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 kHz    | 1                  | -98                    |        |                        |        |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB            | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1                  | 4                      | 4      | -Infinity              | 4      |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 2                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 3                  | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | --58.50                | -56.16 |
| Propagation Condition   |               | 1, 2, 3            | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

### A.6.6.1.2.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

## A.6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX

### A.6.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

### A.6.6.1.3.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.3.1-1 and A.6.6.1.3.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

**Table A.6.6.1.3.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.6.1.3.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1**

| Parameter                                       | Unit | Test configuration | Value                      | Comment   |
|---|------|--------------------|----------------------------|---|
| Active cell                                     |      | 1, 2, 3            | Cell 1                     |   |
| Neighbour cell                                  |      | 1, 2, 3            | Cell 2                     | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3            | 1: Cell 1 and Cell 2       |   |
| Measurement gap type                            |      | 1, 2, 3            | Per-UE gaps                |   |
| Measurement gap repetition periodicity          | ms   | 1, 2, 3            | 40                         |   |
| Measurement gap length                          | ms   | 1, 2, 3            | 6                          |   |
| Measurement gap offset                          | ms   | 1, 2, 3            | 39                         |   |
| SSB configuration                               |      | 1                  | SSB.1 FR1                  |   |
|   |      | 2                  | SSB.1 FR1                  |   |
|   |      | 3                  | SSB.2 FR1                  |   |
| SMTTC configuration                             |      | 1                  | SMTTC.2                    |   |
|   |      | 2                  | SMTTC.1                    |   |
|   |      | 3                  | SMTTC.1                    |   |
| CSI-RS parameters                               |      | 1                  | CSI-RS.1.2 FDD resource #0 |   |
|   |      | 2                  | CSI-RS.1.2 TDD resource #0 |   |
|   |      | 3                  | CSI-RS.2.2 TDD resource #0 |   |
| A3-Offset                                       | dB   | 1, 2, 3            | -4.5                       |   |
| CP length                                       |      | 1, 2, 3            | Normal                     |   |
| Hysteresis                                      | dB   | 1, 2, 3            | 0                          |   |
| Time To Trigger                                 | s    | 1, 2, 3            | 0                          |   |
| Filter coefficient                              |      | 1, 2, 3            | 0                          | L3 filtering is not used  |
| DRX   | ms   | 1, 2, 3            |                            | OFF   |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                       | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3 $\mu$ s                  | Synchronous cells   |
|   |      | 3                  | 3 $\mu$ s                  | Synchronous cells   |
| T1  | s    | 1, 2, 3            | 5                          |   |
| T2  | s    | 1, 2, 3            | 5                          |   |



**Table A.6.6.1.3.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1**

| Parameter   | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |        |
|---|---------------|--------------------|------------------------|--------|------------------------|--------|
|   |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |               | 1                  | TN/A                   |        | TN/A                   |        |
|   |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1            |        |
|   |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration   |               | 1                  | SR.1.1 FDD             |        | N/A                    |        |
|   |               | 2                  | SR.1.1 TDD             |        |                        |        |
|   |               | 3                  | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration  |               | 1                  | CR.1.1 FDD             |        | N/A                    |        |
|   |               | 2                  | CR.1.1 TDD             |        |                        |        |
|   |               | 3                  | CR.2.1 TDD             |        |                        |        |
| Dedicated CORESET RMC configuration   |               | 1                  | CCR.1.2 FDD            |        | N/A                    |        |
|   |               | 2                  | CCR.1.2 TDD            |        |                        |        |
|   |               | 3                  | CCR.2.1 TDD            |        |                        |        |
| OCNG Patterns   |               | 1, 2, 3            | OP.1                   |        | OP.1                   |        |
| TRS configuration   |               | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
|   |               | 2                  | TRS.1.1 TDD            |        | N/A                    |        |
|   |               | 3                  | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration   |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |               | 1, 2, 3            | DLBWP.1.2              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |               | 1, 2, 3            | ULBWP.1.2              |        | ULBWP.1.1              |        |
| RLM-RS  |               | 1, 2, 3            | CSI-RS                 |        | SSB                    |        |
| $N_{oc}$ <small>Note 2</small>  | dBm/SCS       | 1                  | -98                    |        |                        |        |
|   |               | 2                  | -98                    |        |                        |        |
|   |               | 3                  | -95                    |        |                        |        |
| $N_{oc}$ <small>Note 2</small>  | dBm/15 kHz    | 1                  | -98                    |        |                        |        |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB            | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1                  | 4                      | 4      | -Infinity              | 4      |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| SS-RSRP <small>Note 3</small>   | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 2                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 3                  | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | --58.50                | -56.16 |
| Propagation Condition   |               | 1, 2, 3            | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

### A.6.6.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX

#### A.6.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.6.6.1.4.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.4.2-1, A.6.6.1.4.2-2 and A.6.6.1.4.2-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.1.4.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.6.1.4.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX**

| Parameter                                       | Unit | Test configuration | Value                      |        | Comment  |
|---|------|--------------------|----------------------------|--------|--|
|   |      |                    | Test 1                     | Test 2 |  |
| Active cell                                     |      | 1, 2, 3            | Cell 1                     |        |  |
| Neighbour cell                                  |      | 1, 2, 3            | Cell 2                     |        | Cell to be identified.   |
| RF Channel Number                               |      | 1, 2, 3            | 1: Cell 1 and Cell 2       |        |  |
| Measurement gap type                            |      | 1, 2, 3            | Per-UE gaps                |        |  |
| Measurement gap repetition periodicity          | ms   | 1, 2, 3            | 40                         |        |  |
| Measurement gap length                          | ms   | 1, 2, 3            | 6                          |        |  |
| Measurement gap offset                          | ms   | 1, 2, 3            | 39                         |        |  |
| SSB configuration                               |      | 1                  | SSB.1 FR1                  |        |  |
|   |      | 2                  | SSB.1 FR1                  |        |  |
|   |      | 3                  | SSB.2 FR1                  |        |  |
| SMTTC configuration                             |      | 1                  | SMTTC.2                    |        |  |
|   |      | 2                  | SMTTC.1                    |        |  |
|   |      | 3                  | SMTTC.1                    |        |  |
| CSI-RS parameters                               |      | 1                  | CSI-RS.1.2 FDD resource #0 |        |  |
|   |      | 2                  | CSI-RS.1.2 TDD resource #0 |        |  |
|   |      | 3                  | CSI-RS.2.2 TDD resource #0 |        |  |
| A3-Offset                                       | dB   | 1, 2, 3            | -4.5                       |        |  |
| CP length                                       |      | 1, 2, 3            | Normal                     |        |  |
| Hysteresis                                      | dB   | 1, 2, 3            | 0                          |        |  |
| Time To Trigger                                 | s    | 1, 2, 3            | 0                          |        |  |
| Filter coefficient                              |      | 1, 2, 3            | 0                          |        | L3 filtering is not used   |
| DRX   |      | 1, 2, 3            | DRX.1                      | DRX.7  |  |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                       |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1.. |
|   |      | 2                  | 3 $\mu$ s                  |        | Synchronous cells  |
|   |      | 3                  | 3 $\mu$ s                  |        | Synchronous cells  |
| T1  | s    | 1, 2, 3            | 5                          |        |  |
| T2  | s    | 1, 2, 3            | 5                          | 10     |  |

**Table A.6.6.1.4.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX**

| Parameter  | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |        |
|--|---------------|--------------------|------------------------|--------|------------------------|--------|
|  |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration  |               | 1                  | TN/A                   |        | TN/A                   |        |
|  |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1            |        |
|  |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD             |        | N/A                    |        |
|  |               | 2                  | SR.1.1 TDD             |        |                        |        |
|  |               | 3                  | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD             |        | N/A                    |        |
|  |               | 2                  | CR.1.1 TDD             |        | N/A                    |        |
|  |               | 3                  | CR.2.1 TDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.2 FDD            |        | N/A                    |        |
|  |               | 2                  | CCR.1.2 TDD            |        | N/A                    |        |
|  |               | 3                  | CCR.2.1 TDD            |        | N/A                    |        |
| OCNG Patterns  |               | 1, 2, 3            | OP.1                   |        | OP.1                   |        |
| TRS configuration  |               | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
|  |               | 2                  | TRS.1.1 TDD            |        | N/A                    |        |
|  |               | 3                  | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration  |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration  |               | 1, 2, 3            | DLBWP.1.2              |        | DLBWP.1.1              |        |
| Active UL BWP configuration  |               | 1, 2, 3            | ULBWP.1.2              |        | ULBWP.1.1              |        |
| RLM-RS   |               | 1, 2, 3            | CSI-RS                 |        | SSB                    |        |
| $N_{oc}$ Note 2  | dBm/SCS       | 1                  | -98                    |        |                        |        |
|  |               | 2                  | -98                    |        |                        |        |
|  |               | 3                  | -95                    |        |                        |        |
| $N_{oc}$ Note 2  | dBm/15 kHz    | 1                  | -98                    |        |                        |        |
|  |               | 2                  |                        |        |                        |        |
|  |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$   | dB            | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
|  |               | 2                  |                        |        |                        |        |
|  |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$   | dB            | 1                  | 4                      | 4      | -Infinity              | 4      |
|  |               | 2                  |                        |        |                        |        |
|  |               | 3                  |                        |        |                        |        |
| SS-RSRP Note 3   | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity              | -94    |
|  |               | 2                  | -94                    | -94    | -Infinity              | -94    |
|  |               | 3                  | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|  | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | -64.60                 | -62.25 |
|  | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | --58.50                | -56.16 |
| Propagation Condition  |               | 1, 2, 3            | AWGN                   |        |                        |        |
| <p>Note 1: Table A.6.6.1.4.2-1The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Table A.6.6.1.4.2-1Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: Table A.6.6.1.4.2-1SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

**Table A.6.6.1.4.2-4: Void****Table A.6.6.1.4.2-5: Void****A.6.6.1.4.3 Test Requirements**

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

**A.6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading****A.6.6.1.5.1 Test purpose and Environment**

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

**A.6.6.1.5.2 Test parameters**

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.5.2-1 and A.6.6.1.5.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

**Table A.6.6.1.5.2-1: Supported test configurations**

| Configuration | Description                                       |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

**Table A.6.6.1.5.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading**

| Parameter                                       | Unit | Test configuration | Value                | Comment   |
|---|------|--------------------|----------------------|---|
| Active cell                                     |      | 1                  | Cell 1               |   |
| Neighbour cell                                  |      | 1                  | Cell 2               | Cell to be identified.  |
| RF Channel Number                               |      | 1                  | 1: Cell 1 and Cell 2 |   |
| SSB configuration                               |      | 1                  | SSB.1 FR1            |   |
| SMTC configuration                              |      | 1                  | SMTC.2               |   |
| A3-Offset                                       | dB   | 1                  | -4.5                 |   |
| CP length                                       |      | 1                  | Normal               |   |
| Hysteresis                                      | dB   | 1                  | 0                    |   |
| Time To Trigger                                 | s    | 1                  | 0                    |   |
| Filter coefficient                              |      | 1                  | 0                    | L3 filtering is not used  |
| DRX   | ms   | 1                  |                      | OFF   |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                 | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1  | s    | 1                  | 5                    |   |
| T2  | s    | 1                  | 5                    |   |

**Table A.6.6.1.5.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading**

| Parameter   | Unit         | Test configuration | Cell 1                 |        | Cell 2                 |        |
|---|--------------|--------------------|------------------------|--------|------------------------|--------|
|   |              |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |              | 1                  | N/A                    |        | N/A                    |        |
| PDSCH RMC configuration   |              | 1                  | SR.1.1 FDD             |        | N/A                    |        |
| RMSI CORESET RMC configuration  |              | 1                  | CR.1.1 FDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |              | 1                  | CCR.1.1 FDD            |        | N/A                    |        |
| OCNG Patterns   |              | 1                  | OP.1                   |        | OP.1                   |        |
| TRS configuration   |              | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
| Initial BWP configuration   |              | 1                  | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |              | 1                  | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |              | 1                  | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS  |              | 1                  | SSB                    |        | SSB                    |        |
| $N_{oc}$ Note 2   | dBm/SCS      | 1                  | -98                    |        |                        |        |
| $N_{oc}$ Note 2   | dBm/15 kHz   | 1                  | -98                    |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB           | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
| $\hat{E}_s/N_{oc}$  | dB           | 1                  | 4                      | 4      | -Infinity              | 4      |
| SS-RSRP Note 3  | dBm/SCS kHz  | 1                  | -94                    | -94    | -Infinity              | -94    |
| Io  | dBm/9.36 MHz | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
| Propagation Condition   |              | 1                  | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |                    |                        |        |                        |        |

### A.6.6.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading

#### A.6.6.1.6.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

### A.6.6.1.6.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.6.2-1 and A.6.6.1.6.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

**Table A.6.6.1.6.2-1: Supported test configurations**

| Configuration | Description                                       |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

**Table A.6.6.1.6.2-2: General test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading**

| Parameter                                       | Unit | Test configuration | Value                      | Comment  |
|---|------|--------------------|----------------------------|--|
| Active cell                                     |      | 1                  | Cell 1                     |  |
| Neighbour cell                                  |      | 1                  | Cell 2                     | Cell to be identified.   |
| RF Channel Number                               |      | 1                  | 1: Cell 1 and Cell 2       |  |
| Measurement gap type                            |      | 1                  | Per-UE gaps                |  |
| Measurement gap repetition periodicity          | ms   | 1                  | 40                         |  |
| Measurement gap length                          | ms   | 1                  | 6                          |  |
| Measurement gap offset                          | ms   | 1                  | 39                         |  |
| SSB configuration                               |      | 1                  | SSB.1 FR1                  |  |
| SMTC configuration                              |      | 1                  | SMTC.2                     |  |
| CSI-RS parameters                               |      | 1                  | CSI-RS.1.2 FDD resource #0 |  |
| A3-Offset                                       | dB   | 1                  | -4.5                       |  |
| CP length                                       |      | 1                  | Normal                     |  |
| Hysteresis                                      | dB   | 1                  | 0                          |  |
| Time To Trigger                                 | s    | 1                  | 0                          |  |
| Filter coefficient                              |      | 1                  | 0                          | L3 filtering is not used   |
| DRX   | ms   | 1                  |                            | OFF  |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                       | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1  | s    | 1                  | 5                          |  |
| T2  | s    | 1                  | 5                          |  |



**Table A.6.6.1.6.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading**

| Parameter   | Unit         | Test configuration | Cell 1                 |        | Cell 2                 |        |
|---|--------------|--------------------|------------------------|--------|------------------------|--------|
|   |              |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |              | 1                  | N/A                    |        | N/A                    |        |
| PDSCH RMC configuration   |              | 1                  | SR.1.1 FDD             |        | N/A                    |        |
| RMSI CORESET RMC configuration  |              | 1                  | CR.1.1 FDD             |        | N/A                    |        |
| Dedicated CORESET RMC configuration   |              | 1                  | CCR.1.2 FDD            |        | N/A                    |        |
| OCNG Patterns   |              | 1                  | OP.1                   |        | OP.1                   |        |
| TRS configuration   |              | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
| Initial BWP configuration   |              | 1                  | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |              | 1                  | DLBWP.1.2              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |              | 1                  | ULBWP.1.2              |        | ULBWP.1.1              |        |
| RLM-RS  |              | 1                  | CSI-RS                 |        | SSB                    |        |
| $N_{oc}$ Note 2   | dBm/SCS      | 1                  | -98                    |        |                        |        |
| $N_{oc}$ Note 2   | dBm/15 kHz   | 1                  | -98                    |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB           | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
| $\hat{E}_s/N_{oc}$  | dB           | 1                  | 4                      | 4      | -Infinity              | 4      |
| SS-RSRP Note 3  | dBm/SCS kHz  | 1                  | -94                    | -94    | -Infinity              | -94    |
| Io  | dBm/9.36 MHz | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
| Propagation Condition   |              | 1                  | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |                    |                        |        |                        |        |

### A.6.6.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.6.6.1.7 SA event triggered reporting tests under DRX for UE configured with highSpeedMeasFlag-r16

#### A.6.6.1.7.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasFlag-r16. This test will partly verify the intra-frequency cell search requirements in clauses 9.2.5.1 and 9.2.5.2.

### A.6.6.1.7.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.7.2-1, A.6.6.1.7.2-2 and A.6.6.1.7.2-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.1.7.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.6.1.7.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter                                       | Unit | Test configuration | Value                | Comment   |
|---|------|--------------------|----------------------|---|
| <i>highSpeedMeasFlag-r16</i>                    |      | 1,2,3              | Present              | To enable high speed measurement enhancements                                       |
| Active cell                                     |      | 1, 2, 3            | Cell 1               |   |
| Neighbour cell                                  |      | 1, 2, 3            | Cell 2               | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3            | 1: Cell 1 and Cell 2 |   |
| SSB configuration                               |      | 1                  | SSB.1 FR1            |   |
|   |      | 2                  | SSB.1 FR1            |   |
|   |      | 3                  | SSB.2 FR1            |   |
| SMTC configuration                              |      | 1                  | SMTC.2               |   |
|   |      | 2                  | SMTC.1               |   |
|   |      | 3                  | SMTC.1               |   |
| A3-Offset                                       | dB   | 1, 2, 3            | -4.5                 |   |
| CP length                                       |      | 1, 2, 3            | Normal               |   |
| Hysteresis                                      | dB   | 1, 2, 3            | 0                    |   |
| Time To Trigger                                 | s    | 1, 2, 3            | 0                    |   |
| Filter coefficient                              |      | 1, 2, 3            | 0                    | L3 filtering is not used  |
| DRX   |      | 1, 2, 3            | DRX.7                | 640ms DRX cycle   |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                 | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3 μs                 | Synchronous cells   |
|   |      | 3                  | 3 μs                 | Synchronous cells   |
| T1  | s    | 1, 2, 3            | 5                    |   |
| T2  | s    | 1, 2, 3            | 6                    |   |

**Table A.6.6.1.7.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter                           | Unit          | Test configuration | Cell 1                 |        | Cell 2                            |        |
|-------------------------------------|---------------|--------------------|------------------------|--------|-----------------------------------|--------|
|                                     |               |                    | T1                     | T2     | T1                                | T2     |
| TDD configuration                   |               | 1                  | TN/A                   |        | TN/A                              |        |
|                                     |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1                       |        |
|                                     |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1                       |        |
| PDSCH RMC configuration             |               | 1                  | SR.1.1 FDD             |        | N/A                               |        |
|                                     |               | 2                  | SR.1.1 TDD             |        |                                   |        |
|                                     |               | 3                  | SR.2.1 TDD             |        |                                   |        |
| RMSI CORESET RMC configuration      |               | 1                  | CR.1.1 FDD             |        | CR.1.1 FDD                        |        |
|                                     |               | 2                  | CR.1.1 TDD             |        | CR.1.1 TDD                        |        |
|                                     |               | 3                  | CR.2.1 TDD             |        | CR.2.1 TDD                        |        |
| Dedicated CORESET RMC configuration |               | 1                  | CCR.1.1 FDD            |        | CCR.1.1 FDD                       |        |
|                                     |               | 2                  | CCR.1.1 TDD            |        | CCR.1.1 TDD                       |        |
|                                     |               | 3                  | CCR.2.1 TDD            |        | CCR.2.1 TDD                       |        |
| OCNG Patterns                       |               | 1, 2, 3            | OP.1                   |        | OP.1                              |        |
| TRS configuration                   |               | 1                  | TRS.1.1 FDD            |        | N/A                               |        |
|                                     |               | 2                  | TRS.1.1 TDD            |        | N/A                               |        |
|                                     |               | 3                  | TRS.1.2 TDD            |        | N/A                               |        |
| Initial BWP configuration           |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1            |        |
| Active DL BWP configuration         |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.1                         |        |
| Active UL BWP configuration         |               | 1, 2, 3            | ULBWP.1.1              |        | ULBWP.1.1                         |        |
| RLM-RS                              |               | 1, 2, 3            | SSB                    |        | SSB                               |        |
| $N_{oc}$ <small>Note 2</small>      | dBm/SCS       | 1                  | -98                    |        |                                   |        |
|                                     |               | 2                  | -98                    |        |                                   |        |
|                                     |               | 3                  | -95                    |        |                                   |        |
| $N_{oc}$ <small>Note 2</small>      | dBm/15 kHz    | 1                  | -98                    |        |                                   |        |
|                                     |               | 2                  |                        |        |                                   |        |
|                                     |               | 3                  |                        |        |                                   |        |
| $\hat{E}_s/I_{ot}$                  | dB            | 1                  | 4                      | -1.46  | -Infinity                         | -1.46  |
|                                     |               | 2                  |                        |        |                                   |        |
|                                     |               | 3                  |                        |        |                                   |        |
| $\hat{E}_s/N_{oc}$                  | dB            | 1                  | 4                      | 4      | -Infinity                         | 4      |
|                                     |               | 2                  |                        |        |                                   |        |
|                                     |               | 3                  |                        |        |                                   |        |
| SS-RSRP <small>Note 3</small>       | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity                         | -94    |
|                                     |               | 2                  | -94                    | -94    | -Infinity                         | -94    |
|                                     |               | 3                  | -91                    | -91    | -Infinity                         | -91    |
| I <sub>o</sub>                      | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | -64.60                            | -62.25 |
|                                     | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | -64.60                            | -62.25 |
|                                     | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | -58.50                            | -56.16 |
| Propagation Condition               |               | 1, 2               | AWGN                   |        | AWGN 1944Hz <small>Note 4</small> |        |
|                                     |               | 3                  | AWGN                   |        | AWGN 3334Hz <small>Note 5</small> |        |

|         |  |
|---------|--|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.   |
| Note 5: | The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.   |

### A.6.6.1.7.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 5120 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.2 Inter-frequency Measurements

### A.6.6.2.1 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

#### A.6.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.1.1-1, A.6.6.2.1.1-2 and A.6.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.6.6.2.1.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2       | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3       | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                              |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.6.6.2.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value             |        | Comment   |
|---|------|--------------------|-------------------|--------|---|
|   |      |                    | Test 1            | Test 2 |   |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) |        | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          |        | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                 | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3       | 9                 | 9      |   |
| SMTC-SSB parameters                             |      | Config 1           | SSB.1 FR1         |        | As specified in clause A.3.10.1   |
|   |      | Config 2           | SSB.1 FR1         |        | As specified in clause A.3.10.1   |
|   |      | Config 3           | SSB.2 FR1         |        | As specified in clause A.3.10.1   |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                |        |   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |        |   |
| CP length                                       |      | Config 1,2,3       | Normal            |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |        |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | OFF               |        | DRX is not used   |
| Time offset between serving and neighbour cells |      | Config 1           | 3ms               |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs               |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                 |        |   |
| T2  | s    | Config 1,2,3       | 1                 | 1      |   |

**Table A.6.6.2.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter                                 |                  | Unit       | Test configuration | Cell 1                      |     | Cell 2    |     |
|---|------------------|------------|--------------------|-----------------------------|-----|-----------|-----|
|   |                  |            |                    | T1                          | T2  | T1        | T2  |
| NR RF Channel Number                      |                  |            | Config 1,2,3       | 1                           |     | 2         |     |
| Duplex mode                               |                  |            | Config 1           | FDD                         |     |           |     |
|   |                  |            | Config 2,3         | TDD                         |     |           |     |
| TDD configuration                         |                  |            | Config 1           | Not Applicable              |     |           |     |
|   |                  |            | Config 2           | TDDConf.1.1                 |     |           |     |
|   |                  |            | Config 3           | TDDConf.2.1                 |     |           |     |
| BW <sub>channel</sub>                     |                  | MHz        | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |     |           |     |
|   |                  |            | Config 3           | 40: N <sub>RB,c</sub> = 106 |     |           |     |
| BWP BW                                    |                  | MHz        | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |     |           |     |
|   |                  |            | Config 3           | 40: N <sub>RB,c</sub> = 106 |     |           |     |
| BWP configuration                         | Initial DL BWP   |            | Config 1, 2, 3     | DLBWP.0.1                   |     | NA        |     |
|   | Initial UL BWP   |            |                    | ULBWP.0.1                   |     | NA        |     |
|   | Dedicated DL BWP |            |                    | DLBWP.1.1                   |     | NA        |     |
|   | Dedicated UL BWP |            |                    | ULBWP.1.1                   |     | NA        |     |
| TRS configuration                         |                  |            | Config 1           | TRS.1.1 FDD                 |     | NA        |     |
|   |                  |            | Config 2           | TRS.1.1 TDD                 |     | NA        |     |
|   |                  |            | Config 3           | TRS.1.2 TDD                 |     | NA        |     |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |            | Config 1,2,3       | OP.1                        |     | OP.1      |     |
| PDSCH Reference measurement channel       |                  |            | Config 1           | SR.1.1 FDD                  |     |           |     |
|   |                  |            | Config 2           | SR.1.1 TDD                  |     |           |     |
|   |                  |            | Config 3           | SR2.1 TDD                   |     |           |     |
| RMSI CORESET Reference Channel            |                  |            | Config 1           | CR.1.1 FDD                  |     |           |     |
|   |                  |            | Config 2           | CR.1.1 TDD                  |     |           |     |
|   |                  |            | Config 3           | CR2.1 TDD                   |     |           |     |
| Dedicated CORESET Reference Channel       |                  |            | Config 1           | CCR.1.1 FDD                 |     |           |     |
|   |                  |            | Config 2           | CCR.1.1 TDD                 |     |           |     |
|   |                  |            | Config 3           | CCR.2.1 TDD                 |     |           |     |
| SSB parameters                            |                  |            | Config 1           | SSB.1 FR1                   |     | SSB.5 FR1 |     |
|   |                  |            | Config 2           | SSB.1 FR1                   |     | SSB.5 FR1 |     |
|   |                  |            | Config 3           | SSB.2 FR1                   |     | SSB.6 FR1 |     |
| SMTC configuration defined in A.3.11      |                  |            | Config 1           | SMTC.2                      |     | SMTC.5    |     |
|   |                  |            | Config 2, 3        | SMTC.1                      |     | SMTC.4    |     |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz        | Config 1,2         | 15                          |     |           |     |
|   |                  |            | Config 3           | 30                          |     |           |     |
| EPRE ratio of PSS to SSS                  |                  |            | Config 1,2,3       | 0                           |     | 0         |     |
| EPRE ratio of PBCH DMRS to SSS            |                  |            |                    |                             |     |           |     |
| EPRE ratio of PBCH to PBCH DMRS           |                  |            |                    |                             |     |           |     |
| EPRE ratio of PDCCH DMRS to SSS           |                  |            |                    |                             |     |           |     |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |            |                    |                             |     |           |     |
| EPRE ratio of PDSCH DMRS to SSS           |                  |            |                    |                             |     |           |     |
| EPRE ratio of PDSCH to PDSCH              |                  |            |                    |                             |     |           |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |            |                    |                             |     |           |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |            |                    |                             |     |           |     |
| N <sub>oc</sub> <sup>Note2</sup>          |                  | dBm/15 kHz |                    |                             | -98 |           | -98 |



|  |                  |                       |        |        |           |        |
|--|------------------|-----------------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/S<br>CS      | Config 1,2            | -98    |        | -98       |        |
|  |                  | Config 3              | -95    |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S<br>CS      | Config 1,2            | -94    | -94    | -Infinity | -91    |
|  |                  | Config 3              | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB               | Config<br>1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB               | Config 1,2,3          | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.<br>36MHz  | Config 1,2            | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38<br>.16MHz | Config 3              | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |                  | Config 1,2,3          | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |                  |                       |        |        |           |        |

#### A.6.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.2.2 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is used

##### A.6.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.2.1-1, A.6.6.2.2.1-2 and A.6.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.2.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.2.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2       | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3       | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.6.6.2.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value             |        |        |        | Comment   |
|---|------|--------------------|-------------------|--------|--------|--------|---|
|   |      |                    | Test 1            | Test 2 | Test 3 | Test 4 |   |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              |        |        |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) |        |        |        | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          |        |        |        | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                 | 4      |        |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3       | 9                 | 9      |        |        |   |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                |        |        |        |   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |        |        |        |   |
| CP length                                       |      | Config 1,2,3       | Normal            |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |        |        |        |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 |        |        |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | DRX .1            | DRX .7 | DRX .1 | DRX .7 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells |      | Config 1           | 3ms               |        |        |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs               |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                 |        |        |        |   |
| T2  | s    | Config 1,2,3       | 1.1               | 11     | 1.1    | 11     |   |

**Table A.6.6.2.2.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter                                 |                  | Unit | Test configuration | Cell 1                      |           | Cell 2 |    |
|---|------------------|------|--------------------|-----------------------------|-----------|--------|----|
|   |                  |      |                    | T1                          | T2        | T1     | T2 |
| NR RF Channel Number                      |                  |      | Config 1,2,3       | 1                           |           | 2      |    |
| Duplex mode                               |                  |      | Config 1           | FDD                         |           |        |    |
|   |                  |      | Config 2,3         | TDD                         |           |        |    |
| TDD configuration                         |                  |      | Config 1           | Not Applicable              |           |        |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |           |        |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |           |        |    |
| BW <sub>channel</sub>                     |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |           |        |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |           |        |    |
| BWP BW                                    |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |           |        |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |           |        |    |
| BWP configuration                         | Initial DL BWP   |      | Config 1, 2, 3     | DLBWP.0.1                   | NA        |        |    |
|   | Initial UL BWP   |      | Config 1, 2, 3     | ULBWP.0.1                   | NA        |        |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   | NA        |        |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   | NA        |        |    |
| TRS configuration                         |                  |      | Config 1           | TRS.1.1 FDD                 | NA        |        |    |
|   |                  |      | Config 2           | TRS.1.1 TDD                 | NA        |        |    |
|   |                  |      | Config 3           | TRS.1.2 TDD                 | NA        |        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |      | Config 1,2,3       | OP.1                        | OP.1      |        |    |
| PDSCH Reference measurement channel       |                  |      | Config 1           | SR.1.1 FDD                  | NA        |        |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  | NA        |        |    |
|   |                  |      | Config 3           | SR2.1 TDD                   | NA        |        |    |
| RMSI CORESET Reference Channel            |                  |      | Config 1           | CR.1.1 FDD                  | NA        |        |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  | NA        |        |    |
|   |                  |      | Config 3           | CR2.1 TDD                   | NA        |        |    |
| Dedicated CORESET Reference Channel       |                  |      | Config 1           | CCR.1.1 FDD                 | NA        |        |    |
|   |                  |      | Config 2           | CCR.1.1 TDD                 | NA        |        |    |
|   |                  |      | Config 3           | CCR.2.1 TDD                 | NA        |        |    |
| SSB parameters                            |                  |      | Config 1           | SSB.1 FR1                   | SSB.5 FR1 |        |    |
|   |                  |      | Config 2           | SSB.1 FR1                   | SSB.5 FR1 |        |    |
|   |                  |      | Config 3           | SSB.2 FR1                   | SSB.6 FR1 |        |    |
| SMTC configuration defined in A.3.11      |                  |      | Config 1           | SMTC.2                      | SMTC.5    |        |    |
|   |                  |      | Config 2, 3        | SMTC.1                      | SMTC.4    |        |    |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz  | Config 1,2         | 15                          |           |        |    |
|   |                  |      | Config 3           | 30                          |           |        |    |
| EPRE ratio of PSS to SSS                  |                  |      | Config 1,2,3       | 0                           | 0         |        |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |      |                    |                             |           |        |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |      |                    |                             |           |        |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |      |                    |                             |           |        |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |      |                    |                             |           |        |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |      |                    |                             |           |        |    |
| EPRE ratio of PDSCH to PDSCH              |                  |      |                    |                             |           |        |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |      |                    |                             |           |        |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |      |                    |                             |           |        |    |

|  |              |                    |        |        |           |        |
|--|--------------|--------------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz   | Config 1,2,3       | -98    |        | -98       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2         | -98    |        | -98       |        |
|  |              | Config 3           | -95    |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2         | -94    | -94    | -Infinity | -91    |
|  |              | Config 3           | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | Config 1,2,3       | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2         | -64.59 | -64.59 | -70.05    | -62.2  |
|  | dBm/38.16MHz | Config 3           | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3       | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |        |        |           |        |

**Table A.6.6.2.2.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.6.6.2.2.1-5: TimeAlignmentTimer-Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.6.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement

reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.6.6.2.3 Void

A.6.6.2.4 Void

A.6.6.2.5 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

A.6.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.5.1-1, A.6.6.2.5.1-2 and A.6.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.5.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.6.6.2.5.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2       | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3       | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.6.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value             |        | Comment   |
|---|------|--------------------|-------------------|--------|---|
|   |      |                    | Test 1            | Test 2 |   |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) |        | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          |        | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                 | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3       | 9                 | 9      |   |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                |        |   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |        |   |
| CP length                                       |      | Config 1,2,3       | Normal            |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |        |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | OFF               |        | DRX is not used   |
| Time offset between serving and neighbour cells |      | Config 1           | 3ms               |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs               |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                 |        |   |
| T2  | s    | Config 1,2,3       | 1.1               | 1      |   |

**Table A.6.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**



| Parameter                                 |                  | Unit | Test configuration | Cell 1                      |    | Cell 2    |    |
|---|------------------|------|--------------------|-----------------------------|----|-----------|----|
|   |                  |      |                    | T1                          | T2 | T1        | T2 |
| NR RF Channel Number                      |                  |      | Config 1,2,3       | 1                           |    | 2         |    |
| Duplex mode                               |                  |      | Config 1           | FDD                         |    |           |    |
|   |                  |      | Config 2,3         | TDD                         |    |           |    |
| TDD configuration                         |                  |      | Config 1           | Not Applicable              |    |           |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |    |           |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |    |           |    |
| BW <sub>channel</sub>                     |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP BW                                    |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP configuration                         | Initial DL BWP   |      | Config 1, 2, 3     | DLBWP.0.1                   | NA |           |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                   | NA |           |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   | NA |           |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   | NA |           |    |
| TRS configuration                         |                  |      | Config 1           | TRS.1.1 FDD                 |    | NA        |    |
|   |                  |      | Config 2           | TRS.1.1 TDD                 |    | NA        |    |
|   |                  |      | Config 3           | TRS.1.2 TDD                 |    | NA        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |      | Config 1,2,3       | OP.1                        |    | OP.1      |    |
| PDSCH Reference measurement channel       |                  |      | Config 1           | SR.1.1 FDD                  |    |           |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |    |           |    |
|   |                  |      | Config 3           | SR2.1 TDD                   |    |           |    |
| RMSI CORESET Reference Channel            |                  |      | Config 1           | CR.1.1 FDD                  |    |           |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |    |           |    |
|   |                  |      | Config 3           | CR2.1 TDD                   |    |           |    |
| Dedicated CORESET Reference Channel       |                  |      | Config 1           | CCR.1.1 FDD                 |    |           |    |
|   |                  |      | Config 2           | CCR.1.1 TDD                 |    |           |    |
|   |                  |      | Config 3           | CCR.2.1 TDD                 |    |           |    |
| SSB parameters                            |                  |      | Config 1           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |      | Config 2           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |      | Config 3           | SSB.2 FR1                   |    | SSB.6 FR1 |    |
| SMTc configuration defined in A.3.11      |                  |      | Config 1           | SMTc.2                      |    | SMTc.5    |    |
|   |                  |      | Config 2, 3        | SMTc.1                      |    | SMTc.4    |    |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz  | Config 1,2         | 15                          |    |           |    |
|   |                  |      | Config 3           | 30                          |    |           |    |
| EPRE ratio of PSS to SSS                  |                  |      | Config 1,2,3       | 0                           |    | 0         |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |      |                    |                             |    |           |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH to PDSCH              |                  |      |                    |                             |    |           |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |      |                    |                             |    |           |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |      |                    |                             |    |           |    |

|  |              |              |        |        |           |        |
|--|--------------|--------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz   |              | -98    |        | -98       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2   | -98    |        | -98       |        |
|  |              | Config 3     | -95    |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2   | -94    | -94    | -Infinity | -91    |
|  |              | Config 3     | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2   | -64.59 | -64.59 | -70.05    | -62.2  |
|  | dBm/38.16MHz | Config 3     | -58.4  | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |              |        |        |           |        |

#### A.6.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

#### A.6.6.2.6 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is used

##### A.6.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.6.1-1, A.6.6.2.6.1-2 and A.6.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.6.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.6.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.2.6.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2       | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3       | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.6.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value             |        |        |        | Comment   |
|---|------|--------------------|-------------------|--------|--------|--------|---|
|   |      |                    | Test 1            | Test 2 | Test 3 | Test 4 |   |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              |        |        |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) |        |        |        | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          |        |        |        | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                 | 4      |        |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3       | 9                 | 9      |        |        |   |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                |        |        |        |   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |        |        |        |   |
| CP length                                       |      | Config 1,2,3       | Normal            |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |        |        |        |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 |        |        |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | DRX .1            | DRX .7 | DRX .1 | DRX .7 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells |      | Config 1           | 3 ms              |        |        |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3 $\mu$ s         |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                 |        |        |        |   |
| T2  | s    | Config 1,2,3       | 1.3               | 13.5   | 1.3    | 13.5   |   |

**Table A.6.6.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

| Parameter                                 |                  | Unit | Test configuration | Cell 1                      |    | Cell 2    |    |
|---|------------------|------|--------------------|-----------------------------|----|-----------|----|
|   |                  |      |                    | T1                          | T2 | T1        | T2 |
| NR RF Channel Number                      |                  |      | Config 1,2,3       | 1                           |    | 2         |    |
| Duplex mode                               |                  |      | Config 1           | FDD                         |    |           |    |
|   |                  |      | Config 2,3         | TDD                         |    |           |    |
| TDD configuration                         |                  |      | Config 1           | Not Applicable              |    |           |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |    |           |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |    |           |    |
| BW <sub>channel</sub>                     |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP BW                                    |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP configuration                         | Initial DL BWP   |      | Config 1, 2, 3     | DLBWP.0.1                   |    | NA        |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                   |    | NA        |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   |    | NA        |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   |    | NA        |    |
| TRS configuration                         |                  |      | Config 1           | TRS.1.1 FDD                 |    | NA        |    |
|   |                  |      | Config 2           | TRS.1.1 TDD                 |    | NA        |    |
|   |                  |      | Config 3           | TRS.1.2 TDD                 |    | NA        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |      | Config 1,2,3       | OP.1                        |    | OP.1      |    |
| PDSCH Reference measurement channel       |                  |      | Config 1           | SR.1.1 FDD                  |    | NA        |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |    |           |    |
|   |                  |      | Config 3           | SR.2.1 TDD                  |    |           |    |
| RMSI CORESET Reference Channel            |                  |      | Config 1           | CR.1.1 FDD                  |    | -         |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |    |           |    |
|   |                  |      | Config 3           | CR.2.1 TDD                  |    |           |    |
| Dedicated CORESET Reference Channel       |                  |      | Config 1           | CCR.1.1 FDD                 |    | -         |    |
|   |                  |      | Config 2           | CCR.1.1 TDD                 |    |           |    |
|   |                  |      | Config 3           | CCR.2.1 TDD                 |    |           |    |
| SSB parameters                            |                  |      | Config 1           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |      | Config 2           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |      | Config 3           | SSB.2 FR1                   |    | SSB.6 FR1 |    |
| SMTC configuration defined in A.3.11      |                  |      | Config 1           | SMTC.2                      |    | SMTC.5    |    |
|   |                  |      | Config 2, 3        | SMTC.1                      |    | SMTC.4    |    |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz  | Config 1,2         | 15                          |    |           |    |
|   |                  |      | Config 3           | 30                          |    |           |    |
| EPRE ratio of PSS to SSS                  |                  |      | Config 1,2,3       | 0                           |    | 0         |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |      |                    |                             |    |           |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH to PDSCH              |                  |      |                    |                             |    |           |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |      |                    |                             |    |           |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |      |                    |                             |    |           |    |

|  |              |              |        |        |           |        |
|--|--------------|--------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz   |              | -98    |        | -98       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2   | -98    |        | -98       |        |
|  |              | Config 3     | -95    |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2   | -94    | -94    | -Infinity | -91    |
|  |              | Config 3     | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2   | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38.16MHz | Config 3     | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |              |        |        |           |        |

#### A.6.6.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.6.6.2.7 Void

A.6.6.2.8 Void

A.6.6.2.9 SA event triggered reporting tests with additional mandatory gap pattern

A.6.6.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event when mandatory gap pattern with 3ms MGL is configured.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.9.1-1, A.6.6.2.9.1-2 and A.6.6.2.9.1-3.

In test 1 measurement gap pattern configuration # 3 as defined in Table A.6.6.2.9.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #2 as defined in Table A.6.6.2.9.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #2, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.6.6.2.9.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2       | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3       | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                              |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.6.6.2.9.1-2: General test parameters for SA inter-frequency event triggered reporting with additional mandatory gap pattern**

| Parameter                                       | Unit | Test configuration | Value             |        | Comment   |
|---|------|--------------------|-------------------|--------|---|
|   |      |                    | Test 1            | Test 2 |   |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              |        | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) |        | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          |        | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                  |      | Config 1,2,3       | 3                 | 2      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3       | 9                 | 9      |   |
| SMTC-SSB parameters                             |      | Config 1           | SSB.1 FR1         |        | As specified in clause A.3.10.1   |
|   |      | Config 2           | SSB.1 FR1         |        | As specified in clause A.3.10.1   |
|   |      | Config 3           | SSB.2 FR1         |        | As specified in clause A.3.10.1   |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                |        |   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |        |   |
| CP length                                       |      | Config 1,2,3       | Normal            |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |        |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | OFF               |        | DRX is not used   |
| Time offset between serving and neighbour cells |      | Config 1           | 3ms               |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs               |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                 |        |   |
| T2  | s    | Config 1,2,3       | 1                 | 1      |   |

**Table A.6.2.9.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting with additional mandatory gap pattern**

| Parameter                                 |                  | Unit       | Test configuration | Cell 1                      |    | Cell 2    |    |
|---|------------------|------------|--------------------|-----------------------------|----|-----------|----|
|   |                  |            |                    | T1                          | T2 | T1        | T2 |
| NR RF Channel Number                      |                  |            | Config 1,2,3       | 1                           |    | 2         |    |
| Duplex mode                               |                  |            | Config 1           | FDD                         |    |           |    |
|   |                  |            | Config 2,3         | TDD                         |    |           |    |
| TDD configuration                         |                  |            | Config 1           | Not Applicable              |    |           |    |
|   |                  |            | Config 2           | TDDConf.1.1                 |    |           |    |
|   |                  |            | Config 3           | TDDConf.2.1                 |    |           |    |
| BW <sub>channel</sub>                     |                  | MHz        | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |            | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP BW                                    |                  | MHz        | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |            | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP configuration                         | Initial DL BWP   |            | Config 1, 2, 3     | DLBWP.0.1                   |    | NA        |    |
|   | Initial UL BWP   |            |                    | ULBWP.0.1                   |    | NA        |    |
|   | Dedicated DL BWP |            |                    | DLBWP.1.1                   |    | NA        |    |
|   | Dedicated UL BWP |            |                    | ULBWP.1.1                   |    | NA        |    |
| TRS configuration                         |                  |            | Config 1           | TRS.1.1 FDD                 |    | NA        |    |
|   |                  |            | Config 2           | TRS.1.1 TDD                 |    | NA        |    |
|   |                  |            | Config 3           | TRS.1.2 TDD                 |    | NA        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |            | Config 1,2,3       | OP.1                        |    | OP.1      |    |
| PDSCH Reference measurement channel       |                  |            | Config 1           | SR.1.1 FDD                  |    |           |    |
|   |                  |            | Config 2           | SR.1.1 TDD                  |    |           |    |
|   |                  |            | Config 3           | SR2.1 TDD                   |    |           |    |
| CORESET Reference Channel                 |                  |            | Config 1           | CR.1.1 FDD                  |    |           |    |
|   |                  |            | Config 2           | CR.1.1 TDD                  |    |           |    |
|   |                  |            | Config 3           | CR2.1 TDD                   |    |           |    |
| SSB parameters                            |                  |            | Config 1           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |            | Config 2           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |            | Config 3           | SSB.2 FR1                   |    | SSB.6 FR1 |    |
| SMTC configuration defined in A.3.11      |                  |            | Config 1           | SMTC.1                      |    | SMTC.4    |    |
|   |                  |            | Config 2, 3        | SMTC.1                      |    | SMTC.4    |    |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz        | Config 1,2         | 15                          |    |           |    |
|   |                  |            | Config 3           | 30                          |    |           |    |
| EPRE ratio of PSS to SSS                  |                  |            | Config 1,2,3       | 0                           |    | 0         |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |            |                    |                             |    |           |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |            |                    |                             |    |           |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |            |                    |                             |    |           |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |            |                    |                             |    |           |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |            |                    |                             |    |           |    |
| EPRE ratio of PDSCH to PDSCH              |                  |            |                    |                             |    |           |    |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |                  |            |                    |                             |    |           |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |            |                    |                             |    |           |    |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/15 kHz       |            |                    | -98                         |    | -98       |    |
|   |                  | Config 1,2 |                    | -98                         |    | -98       |    |



|  |                  |                       |        |        |           |        |
|--|------------------|-----------------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/S<br>CS      | Config 3              | -95    |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S<br>CS      | Config 1,2            | -94    | -94    | -Infinity | -91    |
|  |                  | Config 3              | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB               | Config<br>1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB               | Config 1,2,3          | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.<br>36MHz  | Config 1,2            | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38<br>.16MHz | Config 3              | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |                  | Config 1,2,3          | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |                  |                       |        |        |           |        |

#### A.6.6.2.9.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

#### A.6.6.2.10 SA event triggered reporting tests for FR1 when DRX is used

##### A.6.6.2.10.1 Test Purpose and Environment

The purpose of this test is to verify that the UE which supports interFrequencyMeas-Nogap-r16 makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search without measurement gap requirements in clause 9.3.9.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on RF channel 2. The SSB of cell 2 is completely within UE's active BWP BW. The RBs containing SSB from cell 1 and cell 2 should be different in frequency location within the cell bandwidth. The test parameters are given in Tables A.6.6.2.10.1-1, A.6.6.2.10.1-2 and A.6.6.2.10.1-3.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.2.10.1-1: SA event triggered reporting tests when DRX is used for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |
| Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell           |  |

**Table A.6.6.2.10.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 when DRX is used**

| Parameter                                       | Unit | Test configuration | Value             | Comment   |
|---|------|--------------------|-------------------|---|
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          | NR cell 2 is on NR RF channel number 2.   |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                |   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |   |
| CP length                                       |      | Config 1,2,3       | Normal            |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | DRX.1             | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells |      | Config 1           | 3ms               | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs               | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                 |   |
| T2  | s    | Config 1,2,3       | 1                 |   |

**Table A.6.6.2.10.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 when DRX is used**

| Parameter                                 |                  | Unit | Test configuration | Cell 1                      |    | Cell 2    |    |
|---|------------------|------|--------------------|-----------------------------|----|-----------|----|
|   |                  |      |                    | T1                          | T2 | T1        | T2 |
| NR RF Channel Number                      |                  |      | Config 1,2,3       | 1                           |    | 2         |    |
| Duplex mode                               |                  |      | Config 1           | FDD                         |    |           |    |
|   |                  |      | Config 2,3         | TDD                         |    |           |    |
| TDD configuration                         |                  |      | Config 1           | Not Applicable              |    |           |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |    |           |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |    |           |    |
| BW <sub>channel</sub>                     |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP BW                                    |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |           |    |
| BWP configuration                         | Initial DL BWP   |      | Config 1, 2, 3     | DLBWP.0.1                   |    | NA        |    |
|   | Initial UL BWP   |      | Config 1, 2, 3     | ULBWP.0.1                   |    | NA        |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   |    | NA        |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   |    | NA        |    |
| TRS configuration                         |                  |      | Config 1           | TRS.1.1 FDD                 |    | NA        |    |
|   |                  |      | Config 2           | TRS.1.1 TDD                 |    | NA        |    |
|   |                  |      | Config 3           | TRS.1.2 TDD                 |    | NA        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |      | Config 1,2,3       | OP.1                        |    | OP.1      |    |
| PDSCH Reference measurement channel       |                  |      | Config 1           | SR.1.1 FDD                  |    | NA        |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |    | NA        |    |
|   |                  |      | Config 3           | SR2.1 TDD                   |    | NA        |    |
| CORESET Reference Channel                 |                  |      | Config 1           | CR.1.1 FDD                  |    | NA        |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |    | NA        |    |
|   |                  |      | Config 3           | CR2.1 TDD                   |    | NA        |    |
| SSB parameters                            |                  |      | Config 1           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |      | Config 2           | SSB.1 FR1                   |    | SSB.5 FR1 |    |
|   |                  |      | Config 3           | SSB.2 FR1                   |    | SSB.6 FR1 |    |
| SMTC configuration defined in A.3.11      |                  |      | Config 1           | SMTC.2                      |    | SMTC.5    |    |
|   |                  |      | Config 2, 3        | SMTC.1                      |    | SMTC.4    |    |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz  | Config 1,2         | 15                          |    |           |    |
|   |                  |      | Config 3           | 30                          |    |           |    |
| EPRE ratio of PSS to SSS                  |                  |      | Config 1,2,3       | 0                           |    | 0         |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |      |                    |                             |    |           |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |      |                    |                             |    |           |    |
| EPRE ratio of PDSCH to PDSCH              |                  |      |                    |                             |    |           |    |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |                  |      |                    |                             |    |           |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |      |                    |                             |    |           |    |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/15 kHz       |      | Config 1,2,3       | -98                         |    | -98       |    |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/S CS         |      | Config 1,2         | -98                         |    | -98       |    |
|   |                  |      | Config 3           | -95                         |    | -95       |    |

|                           |  |                    |        |        |           |        |
|---------------------------|--|--------------------|--------|--------|-----------|--------|
| SS-RSRP <sup>Note 3</sup> | dBm/S  | Config 1,2         | -94    | -94    | -Infinity | -91    |
|                           | CS   | Config 3           | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$      | dB   | Config 1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$      | dB   | Config 1,2,3       | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>    | dBm/9.36MHz  | Config 1,2         | -64.59 | -64.59 | -70.05    | -62.2  |
|                           | dBm/38.16MHz   | Config 3           | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition     |  | Config 1,2,3       | AWGN   |        | AWGN      |        |
| Note 1:                   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                    |        |        |           |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |        |        |           |        |
| Note 3:                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                    |        |        |           |        |
| Note 4:                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                    |        |        |           |        |

**Table A.6.6.2.10.1-4: TimeAlignmentTimer-Configuration SA inter-frequency event triggered reporting when DRX is used**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.6.6.2.10.2 Test Requirements

In test config 1, UE is required to report SSB time index. UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test config 2 and 3, UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 900 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.2.11 SA event triggered reporting tests for FR1 without gap when DRX is not used

##### A.6.6.2.11.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.9.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The SSB of Cell 2 is completely within UE's active BWP BW. The RBs containing SSB from cell 1 and cell 2 should be different in frequency location within the cell bandwidth. The test parameters are given in Tables A.6.6.2.11.1-1, A.6.6.2.11.1-2 and A.6.6.2.11.1-3.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.6.6.2.11.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |
| Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell           |  |

**Table A.6.6.2.11.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without gap**

| Parameter                                       | Unit | Test configuration | Value             | Comment   |
|---|------|--------------------|-------------------|---|
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          | NR cell 2 is on NR RF channel number 2.   |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                |   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |   |
| CP length                                       |      | Config 1,2,3       | Normal            |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | OFF               | DRX is not used   |
| Time offset between serving and neighbour cells |      | Config 1           | 3ms               | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs               | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                 |   |
| T2  | s    | Config 1,2,3       | 1                 |   |

**Table A.6.6.2.11.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without gap**

| Parameter                                 |                  | Unit     | Test configuration | Cell 1                      |     | Cell 2    |     |
|---|------------------|----------|--------------------|-----------------------------|-----|-----------|-----|
|   |                  |          |                    | T1                          | T2  | T1        | T2  |
| NR RF Channel Number                      |                  |          | Config 1,2,3       | 1                           |     | 2         |     |
| Duplex mode                               |                  |          | Config 1           | FDD                         |     |           |     |
|   |                  |          | Config 2,3         | TDD                         |     |           |     |
| TDD configuration                         |                  |          | Config 1           | Not Applicable              |     |           |     |
|   |                  |          | Config 2           | TDDConf.1.1                 |     |           |     |
|   |                  |          | Config 3           | TDDConf.2.1                 |     |           |     |
| BW <sub>channel</sub>                     |                  | MHz      | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |     |           |     |
|   |                  |          | Config 3           | 40: N <sub>RB,c</sub> = 106 |     |           |     |
| BWP BW                                    |                  | MHz      | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |     |           |     |
|   |                  |          | Config 3           | 40: N <sub>RB,c</sub> = 106 |     |           |     |
| BWP configuration                         | Initial DL BWP   |          | Config 1, 2, 3     | DLBWP.0.1                   |     | NA        |     |
|   | Initial UL BWP   |          |                    | ULBWP.0.1                   |     | NA        |     |
|   | Dedicated DL BWP |          |                    | DLBWP.1.1                   |     | NA        |     |
|   | Dedicated UL BWP |          |                    | ULBWP.1.1                   |     | NA        |     |
| TRS configuration                         |                  |          | Config 1           | TRS.1.1 FDD                 |     | NA        |     |
|   |                  |          | Config 2           | TRS.1.1 TDD                 |     | NA        |     |
|   |                  |          | Config 3           | TRS.1.2 TDD                 |     | NA        |     |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |          | Config 1,2,3       | OP.1                        |     | OP.1      |     |
| PDSCH Reference measurement channel       |                  |          | Config 1           | SR.1.1 FDD                  |     |           |     |
|   |                  |          | Config 2           | SR.1.1 TDD                  |     |           |     |
|   |                  |          | Config 3           | SR2.1 TDD                   |     |           |     |
| CORESET Reference Channel                 |                  |          | Config 1           | CR.1.1 FDD                  |     |           |     |
|   |                  |          | Config 2           | CR.1.1 TDD                  |     |           |     |
|   |                  |          | Config 3           | CR2.1 TDD                   |     |           |     |
| SSB parameters                            |                  |          | Config 1           | SSB.1 FR1                   |     | SSB.5 FR1 |     |
|   |                  |          | Config 2           | SSB.1 FR1                   |     | SSB.5 FR1 |     |
|   |                  |          | Config 3           | SSB.2 FR1                   |     | SSB.6 FR1 |     |
| SMTC configuration defined in A.3.11      |                  |          | Config 1           | SMTC.2                      |     | SMTC.5    |     |
|   |                  |          | Config 2, 3        | SMTC.1                      |     | SMTC.4    |     |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz      | Config 1,2         | 15                          |     |           |     |
|   |                  |          | Config 3           | 30                          |     |           |     |
| EPRE ratio of PSS to SSS                  |                  |          | Config 1,2,3       | 0                           |     | 0         |     |
| EPRE ratio of PBCH DMRS to SSS            |                  |          |                    |                             |     |           |     |
| EPRE ratio of PBCH to PBCH DMRS           |                  |          |                    |                             |     |           |     |
| EPRE ratio of PDCCH DMRS to SSS           |                  |          |                    |                             |     |           |     |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |          |                    |                             |     |           |     |
| EPRE ratio of PDSCH DMRS to SSS           |                  |          |                    |                             |     |           |     |
| EPRE ratio of PDSCH to PDSCH              |                  |          |                    |                             |     |           |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |          |                    |                             |     |           |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |          |                    |                             |     |           |     |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/15 kHz       |          |                    | -98                         |     | -98       |     |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/S CS         |          | Config 1,2         | -98                         |     | -98       |     |
|   |                  |          | Config 3           | -95                         |     | -95       |     |
| SS-RSRP <sup>Note 3</sup>                 |                  | dBm/S CS | Config 1,2         | -94                         | -94 | -Infinity | -91 |
|   |                  |          | Config 3           | -91                         | -91 | -Infinity | -88 |



|                        |  |                       |        |        |           |        |
|------------------------|--|-----------------------|--------|--------|-----------|--------|
| $\hat{E}_s/I_{ot}$     | dB   | Config<br>1,2,3,4,5,6 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$     | dB   | Config 1,2,3          | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup> | dBm/9.<br>36MHz  | Config 1,2            | -64.59 | -64.59 | -70.05    | -62.26 |
|                        | dBm/38<br>.16MHz   | Config 3              | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |  | Config 1,2,3          | AWGN   |        | AWGN      |        |
| Note 1:                | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                       |        |        |           |        |
| Note 2:                | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                       |        |        |           |        |
| Note 3:                | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                       |        |        |           |        |
| Note 4:                | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                       |        |        |           |        |

### A.6.6.2.11.2 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to read the neighbour cell SSB index in this test.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.3 Inter-RAT Measurements

### A.6.6.3.1 SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1

#### A.6.6.3.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

Supported test configurations are shown in table A.6.6.3.1.1-1. General test parameters are provided in Table A.6.6.3.1.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.1.1-3 and A.6.6.3.1.1-4, respectively.

**Table A.6.6.3.1.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

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

**Table A.6.6.3.1.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter   | Unit | Value   | Comment  |
|---|------|---|--|
| NR RF Channel Number                              |      | 1   | 1 NR carrier frequency is used in the test                           |
| LTE RF Channel Number                             |      | 1   | 1 LTE carrier frequency is used in the test                          |
| Channel Bandwidth                                 | MHz  | As specified in Tables A.6.6.3.1.1-2 and A.6.6.3.1.1-3. |  |
| Active cell                                       |      | Cell 1  | Cell 1 is on RF channel number 1                                     |
| Neighbour cell                                    |      | Cell 2  | Cell 2 is on RF channel number 2                                     |
| Gap Pattern Id                                    |      | 0   | As specified in Clause Table 9.1.2-1. Per-UE gap pattern.            |
| NR measurement quantity                           |      | SS-RSRP   | Measurement quantity for Cell 1                                      |
| Inter-RAT E-UTRAN measurement quantity            |      | RSRP  | Measurement quantity for Cell 2                                      |
| b2-Threshold1                                     | dBm  | Note 1  | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2      |
| b2-Threshold2EUTRA                                | dBm  | -95   | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| Hysteresis  | dB   | 0   |  |
| TimeToTrigger                                     | s    | 0   |  |
| Filter coefficient                                |      | 0   | L3 filtering is not used   |
| DRX   |      | OFF   | OFF  |
| T1  | s    | 5   |  |
| T2  | s    | 5   |  |
| Note 1: Values are defined in Table A.6.6.3.1.1-3 |      |   |  |

**Table A.6.6.3.1.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1**

| Parameter  |                  | Unit         | Configuration    | Cell 1                            |         |
|--|------------------|--------------|------------------|-----------------------------------|---------|
|  |                  |              |                  | T1                                | T2      |
| RF channel number                                |                  |              | 1, 2, 3, 4, 5, 6 | 1                                 |         |
| Duplex mode                                      |                  |              | 1, 2, 3          | FDD                               |         |
|  |                  |              | 4, 5, 6          | TDD                               |         |
| TDD Configuration                                | SCS=15 KHz       |              | 2, 5             | TDDConf.1.1                       |         |
|  | SCS=30 KHz       |              | 3, 6             | TDDConf.2.1                       |         |
| BW <sub>channel</sub>                            |                  | MHz          | 1, 4             | 10: N <sub>RB,c</sub> = 52 (FDD)  |         |
|  |                  |              | 2, 5             | 10: N <sub>RB,c</sub> = 52 (TDD)  |         |
|  |                  |              | 3, 6             | 40: N <sub>RB,c</sub> = 106 (TDD) |         |
| PDSCH reference measurement channel              |                  |              | 1, 4             | SR.1.1 FDD                        |         |
|  |                  |              | 2, 5             | SR.1.1 TDD                        |         |
|  |                  |              | 3, 6             | SR.2.1 TDD                        |         |
| RMSI CORSET reference channel                    |                  |              | 1, 4             | CR.1.1 FDD                        |         |
|  |                  |              | 2, 5             | CR.1.1 TDD                        |         |
|  |                  |              | 3, 6             | CR.2.1 TDD                        |         |
| Dedicated CORSET reference channel               |                  |              | 1, 4             | CCR.1.1 FDD                       |         |
|  |                  |              | 2, 5             | CCR.1.1 TDD                       |         |
|  |                  |              | 3, 6             | CCR.2.1 TDD                       |         |
| BWP configurations                               | Initial DL BWP   |              | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                         |         |
|  | Dedicated DL BWP |              | 1, 2, 3, 4, 5, 6 | DLBWP.1.1                         |         |
|  | Initial UL BWP   |              | 1, 2, 3, 4, 5, 6 | ULBWP.0.1                         |         |
|  | Dedicated UL BWP |              | 1, 2, 3, 4, 5, 6 | ULBWP.1.1                         |         |
| OCNG pattern <sup>Note1</sup>                    |                  |              | 1, 2, 3, 4, 5, 6 | OP.1                              |         |
| SMTTC configuration                              |                  |              | 1, 2, 3, 4, 5, 6 | SMTTC.1                           |         |
| SSB configuration                                |                  |              | 1, 2, 4, 5       | SSB.1 FR1                         |         |
|  |                  |              | 3, 6             | SSB.2 FR1                         |         |
| CSI-RS for tracking                              |                  |              | 1, 4             | TRS.1.1 FDD                       |         |
|  |                  |              | 2, 5             | TRS.1.1 TDD                       |         |
|  |                  |              | 3, 6             | TRS.1.2 TDD                       |         |
| b2-Threshold1                                    |                  | dBm          | 1, 2, 4, 5       | -96                               |         |
|  |                  |              | 3, 6             | -93                               |         |
| EPRE ratio of PSS to SSS                         |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 |         |
| EPRE ratio of PBCH_DMRS to SSS                   |                  |              |                  |                                   |         |
| EPRE ratio of PBCH to PBCH_DMRS                  |                  |              |                  |                                   |         |
| EPRE ratio of PDCCH_DMRS to SSS                  |                  |              |                  |                                   |         |
| EPRE ratio of PDCCH to PDCCH_DMRS                |                  |              |                  |                                   |         |
| EPRE ratio of PDSCH_DMRS to SSS                  |                  |              |                  |                                   |         |
| EPRE ratio of PDSCH to PDSCH_DMRS                |                  |              |                  |                                   |         |
| EPRE ratio of OCNG DMRS to SSS                   |                  |              |                  |                                   |         |
| EPRE ratio of OCNG to OCNG DMRS                  |                  |              |                  |                                   |         |
| N <sub>oc</sub> <sup>Note2</sup>                 |                  |              |                  |                                   |         |
| N <sub>oc</sub> <sup>Note2</sup>                 |                  | dBm/SCS      | 1, 2, 4, 5       | -104                              |         |
|  |                  |              | 3, 6             | -101                              |         |
| E <sub>s</sub> /N <sub>oc</sub>                  |                  | dB           | 1, 2, 3, 4, 5, 6 | 116                               | 70      |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup> |                  | dB           | 1, 2, 3, 4, 5, 6 | 116                               | 70      |
| SS-RSRP <sup>Note3</sup>                         |                  | dBm/SCS      | 1, 2, 4, 5       | --88                              | --104   |
|  |                  |              | 3, 6             | --85                              | --101   |
| SSB_RP <sup>Note3</sup>                          |                  | dBm/SCS      | 1, 2, 4, 5       | --88                              | --104   |
|  |                  |              | 3, 6             | --85                              | --101   |
| I <sub>o</sub> <sup>Note3</sup>                  |                  | dBm/9.36 MHz | 1, 2, 4, 5       | --59.94                           | --73.04 |
|  |                  |              | dBm/38.16 MHz    | 3, 6                              | --53.84 |
| Propagation condition                            |                  |              | 1, 2, 3, 4, 5, 6 | TDL-C 300ns 100Hz                 |         |
| Antenna Configuration and Correlation Matrix     |                  |              | 1, 2, 3, 4, 5, 6 | 1x2 Low                           |         |

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3:  $\hat{E}_s/I_{ot}$ , SS-RSRP, SSB\_RP and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table A.6.6.3.1.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 2 |    |
|-----------|------|---------------|--------|----|
|           |      |               | T1     | T2 |
|           |      |               |        |    |

|   |           |                  |  |
|---|-----------|------------------|--|
| RF channel number   |           | 1, 2, 3, 4, 5, 6 | 1  |
| Duplex mode   |           | 1, 2, 3          | FDD  |
|   |           | 4, 5, 6          | TDD  |
| TDD special subframe configuration <sup>Note1</sup>   |           | 4, 5, 6          | 6  |
| TDD uplink-downlink configuration <sup>Note1</sup>  |           | 4, 5, 6          | 1  |
| BW <sub>channel</sub>   | MHz       | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |
|   |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |
|   |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |
| OCNG Patterns <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |
|   |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |
| PBCH_RA   | dB        | 1, 2, 3, 4, 5, 6 | 0  |
| PBCH_RB   |           |                  |  |
| PSS_RA  |           |                  |  |
| SSS_RA  |           |                  |  |
| PCFICH_RB   |           |                  |  |
| PHICH_RA  |           |                  |  |
| PHICH_RB  |           |                  |  |
| PDCCH_RA  |           |                  |  |
| PDCCH_RB  |           |                  |  |
| PDSCH_RA  |           |                  |  |
| PDSCH_RB  |           |                  |  |
| OCNG_RA <sup>Note3</sup>  |           |                  |  |
| OCNG_RB <sup>Note3</sup>  |           |                  |  |
| N <sub>oc</sub> <sup>Note4</sup>  |           |                  |  |
| $\hat{E}_s/N_{oc}$  | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>   | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  |
| RSRP <sup>Note5</sup>   | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  |
| SCH_RP <sup>Note5</sup>   | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  |
| I <sub>o</sub> <sup>Note5</sup>   | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -76.22+10log (N <sub>RB,c</sub> /50)   |
| Propagation Condition   |           | 1, 2, 3, 4, 5, 6 | ETU70  |
| Antenna Configuration and Correlation Matrix  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |           |                  |  |

### A.6.6.3.1.2 Test Requirements

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

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

### A.6.6.3.2 SA NR - E-UTRAN event-triggered reporting in DRX in FR1

#### A.6.6.3.2.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3. There are two test cases. In test 1 the UE shall be configured with DRX cycle of 40 ms. In test 2 the UE shall be configured with DRX cycle of 640 ms.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore the UE shall be allocated with PUSCH resource at every DRX cycle.

Supported test configurations are shown in table A.6.6.3.2.1-1. General test parameters are provided in Table A.6.6.3.2.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.2.1-3 and A.6.6.3.2.1-4, respectively.

**Table A.6.6.3.2.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

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

**Table A.6.6.3.2.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

| Parameter   | Unit | Test 1  | Test 2 | Comment   |
|---|------|---|--------|---|
|   |      | Value   |        |   |
| NR RF Channel Number                              |      | 1   |        | 1 NR carrier frequency is used in the test  |
| LTE RF Channel Number                             |      | 2   |        | 1 LTE carrier frequency is used in the test   |
| Channel Bandwidth                                 | MHz  | As specified in Tables A.6.6.3.2.1-2 and A.6.6.3.2.1-3. |        |   |
| Active cell                                       |      | Cell 1  |        | Cell 1 is on RF channel number 1  |
| Neighbour cell                                    |      | Cell 2  |        | Cell 2 is on RF channel number 2  |
| Gap Pattern Id                                    |      | 0   |        | As specified in Clause Table 9.1.2-1. Per-UE gap pattern.   |
| NR measurement quantity                           |      | SS-RSRP   |        | Measurement quantity for Cell 1   |
| Inter-RAT E-UTRAN measurement quantity            |      | RSRP  |        | Measurement quantity for Cell 2   |
| b2-Threshold1                                     | dBm  | Note 1  |        | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2   |
| b2-Threshold2EUTRA                                | dBm  | -95   |        | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2                                      |
| Hysteresis  | dB   | 0   |        |   |
| TimeToTrigger                                     | s    | 0   |        |   |
| Filter coefficient                                |      | 0   |        | L3 filtering is not used  |
| DRX   |      | DRX.1   | DRX.7  | DRX cycle configurations DRX.1 and DRX.7 are defined in Table A.3.3.1-1 and Table A.3.3.7-1 respectively. |
| T1  | s    | 5   |        |   |
| T2  | s    | 5   | 15     |   |
| Note 1: Values are defined in Table A.6.6.3.2.1-3 |      |   |        |   |



**Table A.6.6.3.2.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1**

| Parameter  |                  | Unit         | Configuration    | Cell 1                            |        |
|--|------------------|--------------|------------------|-----------------------------------|--------|
|  |                  |              |                  | T1                                | T2     |
| RF channel number                                |                  |              | 1, 2, 3, 4, 5, 6 | 1                                 |        |
| Duplex mode                                      |                  |              | 1, 2, 3          | FDD                               |        |
|  |                  |              | 4, 5, 6          | TDD                               |        |
| TDD Configuration                                | SCS=15 KHz       |              | 2, 5             | TDDConf.1.1                       |        |
|  | SCS=30 KHz       |              | 3, 6             | TDDConf.2.1                       |        |
| BW <sub>channel</sub>                            |                  | MHz          | 1, 4             | 10: N <sub>RB,c</sub> = 52 (FDD)  |        |
|  |                  |              | 2, 5             | 10: N <sub>RB,c</sub> = 52 (TDD)  |        |
|  |                  |              | 3, 6             | 40: N <sub>RB,c</sub> = 106 (TDD) |        |
| PDSCH reference measurement channel              |                  |              | 1, 4             | SR.1.1 FDD                        |        |
|  |                  |              | 2, 5             | SR.1.1 TDD                        |        |
|  |                  |              | 3, 6             | SR.2.1 TDD                        |        |
| RMSI CORSET reference channel                    |                  |              | 1, 4             | CR.1.1 FDD                        |        |
|  |                  |              | 2, 5             | CR.1.1 TDD                        |        |
|  |                  |              | 3, 6             | CR.2.1 TDD                        |        |
| Dedicated CORSET reference channel               |                  |              | 1, 4             | CCR.1.1 FDD                       |        |
|  |                  |              | 2, 5             | CCR.1.1 TDD                       |        |
|  |                  |              | 3, 6             | CCR.2.1 TDD                       |        |
| BWP configurations                               | Initial DL BWP   |              | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                         |        |
|  | Dedicated DL BWP |              | 1, 2, 3, 4, 5, 6 | DLBWP.1.1                         |        |
|  | Initial UL BWP   |              | 1, 2, 3, 4, 5, 6 | ULBWP.0.1                         |        |
|  | Dedicated UL BWP |              | 1, 2, 3, 4, 5, 6 | ULBWP.1.1                         |        |
| OCNG pattern <sup>Note1</sup>                    |                  |              | 1, 2, 3, 4, 5, 6 | OP.1                              |        |
| SMTc configuration                               |                  |              | 1, 2, 3, 4, 5, 6 | SMTc.1                            |        |
| SSB configuration                                |                  |              | 1, 2, 4, 5       | SSB.1 FR1                         |        |
|  |                  |              | 3, 6             | SSB.2 FR1                         |        |
| CSI-RS for tracking                              |                  |              | 1, 4             | TRS.1.1 FDD                       |        |
|  |                  |              | 2, 5             | TRS.1.1 TDD                       |        |
|  |                  |              | 3, 6             | TRS.1.2 TDD                       |        |
| b2-Threshold1                                    |                  | dBm          | 1, 2, 4, 5       | -96                               |        |
|  |                  |              | 3, 6             | -93                               |        |
| EPRE ratio of PSS to SSS                         |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 |        |
| EPRE ratio of PBCH_DMRS to SSS                   |                  |              |                  |                                   |        |
| EPRE ratio of PBCH to PBCH_DMRS                  |                  |              |                  |                                   |        |
| EPRE ratio of PDCCH_DMRS to SSS                  |                  |              |                  |                                   |        |
| EPRE ratio of PDCCH to PDCCH_DMRS                |                  |              |                  |                                   |        |
| EPRE ratio of PDSCH_DMRS to SSS                  |                  |              |                  |                                   |        |
| EPRE ratio of PDSCH to PDSCH_DMRS                |                  |              |                  |                                   |        |
| EPRE ratio of OCNG DMRS to SSS                   |                  |              |                  |                                   |        |
| EPRE ratio of OCNG to OCNG DMRS                  |                  |              |                  |                                   |        |
| N <sub>oc</sub> <sup>Note2</sup>                 |                  | dBm/15 KHz   | 1, 2, 3, 4, 5, 6 | -104                              |        |
| N <sub>oc</sub> <sup>Note2</sup>                 |                  | dBm/SCS      | 1, 2, 4, 5       | -104                              |        |
|  |                  |              | 3, 6             | -101                              |        |
| E <sub>s</sub> /N <sub>oc</sub>                  |                  | dB           | 1, 2, 3, 4, 5, 6 | 16                                | 16     |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup> |                  | dB           | 1, 2, 3, 4, 5, 6 | 16                                | 16     |
| SS-RSRP <sup>Note3</sup>                         |                  | dBm/SCS      | 1, 2, 4, 5       | -88                               | -88    |
|  |                  |              | 3, 6             | -85                               | -85    |
| SSB_RP <sup>Note3</sup>                          |                  | dBm/SCS      | 1, 2, 4, 5       | -88                               | -88    |
|  |                  |              | 3, 6             | -85                               | -85    |
| I <sub>o</sub> <sup>Note3</sup>                  |                  | dBm/9.36 MHz | 1, 2, 4, 5       | -59.94                            | -59.94 |
|  |                  |              | dBm/38.16 MHz    | 3, 6                              | -53.84 |
| Propagation condition                            |                  |              | 1, 2, 3, 4, 5, 6 | TDL-C 300ns 100Hz                 |        |
| Antenna Configuration and Correlation Matrix     |                  |              | 1, 2, 3, 4, 5, 6 | 1x2 Low                           |        |

- |         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | $\hat{E}_s/I_{ot}$ , SS-RSRP, SSB_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |

**Table A.6.6.3.2.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

| Parameter  | Unit      | Configuration    | Cell 2   |                              |
|--|-----------|------------------|--|------------------------------|
|  |           |                  | T1   | T2                           |
| RF channel number  |           | 1, 2, 3, 4, 5, 6 | 2  |                              |
| Duplex mode  |           | 1, 2, 3          | FDD  |                              |
|  |           | 4, 5, 6          | TDD  |                              |
| TDD special subframe configuration <sup>Note1</sup>  |           | 4, 5, 6          | 6  |                              |
| TDD uplink-downlink configuration <sup>Note1</sup>   |           | 4, 5, 6          | 1  |                              |
| BW <sub>channel</sub>  | MHz       | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                              |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |                              |
|  |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |                              |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                              |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                              |
| OCNG Patterns <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |                              |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |                              |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |                              |
| PBCH_RB  |           |                  |  |                              |
| PSS_RA   |           |                  |  |                              |
| SSS_RA   |           |                  |  |                              |
| PCFICH_RB  |           |                  |  |                              |
| PHICH_RA   |           |                  |  |                              |
| PHICH_RB   |           |                  |  |                              |
| PDCCH_RA   |           |                  |  |                              |
| PDCCH_RB   |           |                  |  |                              |
| PDSCH_RA   |           |                  |  |                              |
| PDSCH_RB   |           |                  |  |                              |
| OCNG_RA <sup>Note3</sup>   |           |                  |  |                              |
| OCNG_RB <sup>Note3</sup>   |           |                  |  |                              |
| N <sub>oc</sub> <sup>Note4</sup>   |           |                  |  |                              |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | -Infinity                    |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | -Infinity                    |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -Infinity                    |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -Infinity                    |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | $-76.22+10\log(N_{RB,c}/50)$   | $-76.22+10\log(N_{RB,c}/50)$ |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2, 3, 4, 5, 6 | ETU70  |                              |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |                              |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |                              |

### A.6.6.3.2.2 Test Requirements

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

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

### A.6.6.3.3 SA NR - E-UTRAN event-triggered reporting in DRX in FR1 for UE configured with highSpeedMeasFlag-r16

#### A.6.6.3.3.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements for UE configured with highSpeedMeasFlag-r16 in standalone (SA) operation with PCell in FR1 when DRX is used. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3.

In the test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

The UE shall be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore the UE shall be allocated with PUSCH resource at every DRX cycle.

Supported test configurations are shown in table A.6.6.3.3.1-1. General test parameters are provided in Table A.6.6.3.3.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.3.1-3 and A.6.6.3.3.1-4, respectively.

**Table A.6.6.3.3.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

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

**Table A.6.6.3.3.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Parameter   | Unit | Value   | Comment  |
|---|------|---|--|
| NR RF Channel Number                              |      | 1   | 1 NR carrier frequency is used in the test                           |
| LTE RF Channel Number                             |      | 2   | 1 LTE carrier frequency is used in the test                          |
| Channel Bandwidth                                 | MHz  | As specified in Tables A.6.6.3.3.1-2 and A.6.6.3.3.1-3. |  |
| Active cell                                       |      | Cell 1  | Cell 1 is on RF channel number 1                                     |
| Neighbour cell                                    |      | Cell 2  | Cell 2 is on RF channel number 2                                     |
| Gap Pattern Id                                    |      | 0   | As specified in Clause Table 9.1.2-1. Per-UE gap pattern.            |
| NR measurement quantity                           |      | SS-RSRP   | Measurement quantity for Cell 1                                      |
| Inter-RAT E-UTRAN measurement quantity            |      | RSRP  | Measurement quantity for Cell 2                                      |
| b2-Threshold1                                     | dBm  | Note 1  | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2      |
| b2-Threshold2EUTRA                                | dBm  | -97   | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| Hysteresis  | dB   | 0   |  |
| TimeToTrigger                                     | s    | 0   |  |
| Filter coefficient                                |      | 0   | L3 filtering is not used   |
| DRX   |      | DRX.6   | DRX cycle configurations DRX.6 is defined in Table A.3.3.1-6.        |
| T1  | s    | 5   |  |
| T2  | s    | 5   |  |
| Note 1: Values are defined in Table A.6.6.3.3.1-3 |      |   |  |

**Table A.6.6.3.3.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Parameter   |                  | Unit         | Configuration    | Cell 1                            |        |
|---|------------------|--------------|------------------|-----------------------------------|--------|
|   |                  |              |                  | T1                                | T2     |
| RF channel number   |                  |              | 1, 2, 3, 4, 5, 6 | 1                                 |        |
| Duplex mode   |                  |              | 1, 2, 3          | FDD                               |        |
|   |                  |              | 4, 5, 6          | TDD                               |        |
| TDD Configuration   | SCS=15 KHz       |              | 2, 5             | TDDConf.1.1                       |        |
|   | SCS=30 KHz       |              | 3, 6             | TDDConf.2.1                       |        |
| BW <sub>channel</sub>   |                  | MHz          | 1, 4             | 10: N <sub>RB,c</sub> = 52 (FDD)  |        |
|   |                  |              | 2, 5             | 10: N <sub>RB,c</sub> = 52 (TDD)  |        |
|   |                  |              | 3, 6             | 40: N <sub>RB,c</sub> = 106 (TDD) |        |
| PDSCH reference measurement channel   |                  |              | 1, 4             | SR.1.1 FDD                        |        |
|   |                  |              | 2, 5             | SR.1.1 TDD                        |        |
|   |                  |              | 3, 6             | SR.2.1 TDD                        |        |
| CORSET reference channel  |                  |              | 1, 4             | CR.1.1 FDD                        |        |
|   |                  |              | 2, 5             | CR.1.1 TDD                        |        |
|   |                  |              | 3, 6             | CR.2.1 TDD                        |        |
| BWP configurations  | Initial DL BWP   |              | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                         |        |
|   | Dedicated DL BWP |              | 1, 2, 3, 4, 5, 6 | DLBWP.1.1                         |        |
|   | Initial UL BWP   |              | 1, 2, 3, 4, 5, 6 | ULBWP.0.1                         |        |
|   | Dedicated UL BWP |              | 1, 2, 3, 4, 5, 6 | ULBWP.1.1                         |        |
| OCNG pattern <sup>Note1</sup>   |                  |              | 1, 2, 3, 4, 5, 6 | OP.1                              |        |
| SMTc configuration  |                  |              | 1, 2, 3, 4, 5, 6 | SMTc.1                            |        |
| SSB configuration   |                  |              | 1, 2, 4, 5       | SSB.1 FR1                         |        |
|   |                  |              | 3, 6             | SSB.2 FR1                         |        |
| b2-Threshold1   |                  | dBm          | 1, 2, 4, 5       | -98                               |        |
|   |                  |              | 3, 6             | -95                               |        |
| EPRE ratio of PSS to SSS  |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 |        |
| EPRE ratio of PBCH_DMRS to SSS  |                  |              |                  |                                   |        |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |              |                  |                                   |        |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |              |                  |                                   |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |              |                  |                                   |        |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |              |                  |                                   |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |              |                  |                                   |        |
| EPRE ratio of OCNG DMRS to SSS  |                  |              |                  |                                   |        |
| EPRE ratio of OCNG to OCNG DMRS   |                  |              |                  |                                   |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  |              |                  |                                   |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  | dBm/SCS      | 1, 2, 4, 5       | -106                              |        |
|   |                  |              | 3, 6             | -103                              |        |
| E <sub>s</sub> /N <sub>oc</sub>   |                  | dB           | 1, 2, 3, 4, 5, 6 | 18                                | -2     |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup>  |                  | dB           | 1, 2, 3, 4, 5, 6 | 18                                | -2     |
| SS-RSRP <sup>Note3</sup>  |                  | dBm/SCS      | 1, 2, 4, 5       | -88                               | -108   |
|   |                  |              | 3, 6             | -85                               | -105   |
| SSB_RP <sup>Note3</sup>   |                  | dBm/SCS      | 1, 2, 4, 5       | -88                               | -108   |
|   |                  |              | 3, 6             | -85                               | -105   |
| I <sub>o</sub> <sup>Note3</sup>   |                  | dBm/9.36 MHz | 1, 2, 4, 5       | -59.98                            | -75.92 |
|   |                  |              | dBm/38.16 MHz    | 3, 6                              | -53.88 |
| Propagation condition   |                  |              | 1, 2, 3, 4, 5, 6 | AWGN                              |        |
| Antenna Configuration and Correlation Matrix  |                  |              | 1, 2, 3, 4, 5, 6 | 1x2 Low                           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>\hat{E}_s/I_{ot}</math>, SS-RSRP, SSB_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                  |              |                  |                                   |        |

**Table A.6.6.3.3.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Parameter  | Unit      | Configuration    | Cell 2   |                              |
|--|-----------|------------------|--|------------------------------|
|  |           |                  | T1   | T2                           |
| RF channel number  |           | 1, 2, 3, 4, 5, 6 | 2  |                              |
| Duplex mode  |           | 1, 2, 3          | FDD  |                              |
|  |           | 4, 5, 6          | TDD  |                              |
| TDD special subframe configuration <sup>Note1</sup>  |           | 4, 5, 6          | 6  |                              |
| TDD uplink-downlink configuration <sup>Note1</sup>   |           | 4, 5, 6          | 1  |                              |
| BW <sub>channel</sub>  | MHz       | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                              |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |                              |
|  |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |                              |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                              |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                              |
| OCNG Patterns <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |                              |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |                              |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |                              |
| PBCH_RB  |           |                  |  |                              |
| PSS_RA   |           |                  |  |                              |
| SSS_RA   |           |                  |  |                              |
| PCFICH_RB  |           |                  |  |                              |
| PHICH_RA   |           |                  |  |                              |
| PHICH_RB   |           |                  |  |                              |
| PDCCH_RA   |           |                  |  |                              |
| PDCCH_RB   |           |                  |  |                              |
| PDSCH_RA   |           |                  |  |                              |
| PDSCH_RB   |           |                  |  |                              |
| OCNG_RA <sup>Note3</sup>   |           |                  |  |                              |
| OCNG_RB <sup>Note3</sup>   |           |                  |  |                              |
| N <sub>oc</sub> <sup>Note4</sup>   |           |                  |  |                              |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | 19                           |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2, 3, 4, 5, 6 | -Infinity  | 19                           |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -87                          |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity  | -87                          |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | $-78.22+10\log(N_{RB,c}/50)$   | $-59.16+10\log(N_{RB,c}/50)$ |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2, 3, 4, 5, 6 | AWGN1944   |                              |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |                              |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |                              |



### A.6.6.3.3.2 Test Requirements

In the test, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 4.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

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

## A.6.6.4 L1-RSRP measurement for beam reporting

### A.6.6.4.1 SSB based L1-RSRP measurement when DRX is not used

#### A.6.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.1.1-1.

**Table A.6.6.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.6.6.4.1.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.1.2-1 and Table A.6.6.4.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.6.6.4.1.2-1: General test parameters

| Parameter  | Config | Unit | Value                       |
|--|--------|------|-----------------------------|
| SSB GSCN   | 1~3    |      | freq1                       |
| Duplex mode  | 1      |      | FDD                         |
|  | 2      |      | TDD                         |
|  | 3      |      | TDD                         |
| TDD Configuration  | 1      |      | N/A                         |
|  | 2      |      | TDDConf.1.1                 |
|  | 3      |      | TDDConf.2.1                 |
| $BW_{\text{channel}}$  | 1      | MHz  | 10: $N_{\text{RB},c} = 52$  |
|  | 2      |      | 10: $N_{\text{RB},c} = 52$  |
|  | 3      |      | 40: $N_{\text{RB},c} = 106$ |
| PDSCH Reference measurement channel  | 1      |      | SR.1.1 FDD                  |
|  | 2      |      | SR.1.1 TDD                  |
|  | 3      |      | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel   | 1      |      | CR.1.1 FDD                  |
|  | 2      |      | CR.1.1 TDD                  |
|  | 3      |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |      | CCR.1.1 FDD                 |
|  | 2      |      | CCR.1.1 TDD                 |
|  | 3      |      | CCR.2.1 TDD                 |
| SSB configuration  | 1      |      | SSB.3 FR1                   |
|  | 2      |      | SSB.3 FR1                   |
|  | 3      |      | SSB.4 FR1                   |
| OCNG Patterns  | 1~3    |      | OP.1                        |
| Initial BWP Configuration  | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration   | 1~3    |      | SMTC.1                      |
| TRS Configuration  | 1      |      | TRS.1.1 FDD                 |
|  | 2      |      | TRS.1.1 TDD                 |
|  | 3      |      | TRS.1.2 TDD                 |
| DRX configuration  | 1~3    |      | Off                         |
| reportConfigType   | 1~3    |      | periodic                    |
| reportQuantity   | 1~3    |      | ssb-Index-RSRP              |
| Number of reported RS  | 1~3    |      | 2                           |
| L1-RSRP reporting period   | 1~3    | slot | 80                          |
| T1   | 1~3    | s    | 5                           |
| T2   | 1~3    | s    | 1                           |
| EPRE ratio of PSS to SSS   | 1~3    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                             |
| Propagation condition  |        |      |                             |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |

Table A.6.6.4.1.2-2: SSB specific test parameters

| Parameter  | Config | Unit          | SSB#0  |        | SSB#1     |        |
|--|--------|---------------|--------|--------|-----------|--------|
|  |        |               | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~3    | dBm/15kHz     | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2    | dBm/SSB SCS   | -94.65 |        |           |        |
|  | 3      |               | -91.65 |        |           |        |
| $\hat{E}_s/I_{ot}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| SSB RSRP <sup>Note3</sup>  | 1,2    | dBm/SSB SCS   | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3      |               | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2    | dBm/9.36 MHz  | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3      | dBm/38.16 MHz | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s/N_{oc}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |               |        |        |           |        |

#### A.6.6.4.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.4.2 SSB based L1-RSRP measurement when DRX is used

##### A.6.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.2.1-1.

Table A.6.6.4.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

##### A.6.6.4.2.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.2.2-1 and Table A.6.6.4.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.6.6.4.2.2-1: General test parameters

| Parameter  | Config | Unit | Value                       |
|--|--------|------|-----------------------------|
| SSB GSCN   | 1~3    |      | freq1                       |
| Duplex mode  | 1      |      | FDD                         |
|  | 2      |      | TDD                         |
|  | 3      |      | TDD                         |
| TDD Configuration  | 1      |      | N/A                         |
|  | 2      |      | TDDConf.1.1                 |
|  | 3      |      | TDDConf.2.1                 |
| $BW_{\text{channel}}$  | 1      | MHz  | 10: $N_{\text{RB},c} = 52$  |
|  | 2      |      | 10: $N_{\text{RB},c} = 52$  |
|  | 3      |      | 40: $N_{\text{RB},c} = 106$ |
| PDSCH Reference measurement channel  | 1      |      | SR.1.1 FDD                  |
|  | 2      |      | SR.1.1 TDD                  |
|  | 3      |      | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel   | 1      |      | CR.1.1 FDD                  |
|  | 2      |      | CR.1.1 TDD                  |
|  | 3      |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |      | CCR.1.1 FDD                 |
|  | 2      |      | CCR.1.1 TDD                 |
|  | 3      |      | CCR.2.1 TDD                 |
| SSB configuration  | 1      |      | SSB.3 FR1                   |
|  | 2      |      | SSB.3 FR1                   |
|  | 3      |      | SSB.4 FR1                   |
| OCNG Patterns  | 1~3    |      | OP.1                        |
| Initial BWP Configuration  | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration   | 1~3    |      | SMTC.1                      |
| TRS Configuration  | 1      |      | TRS.1.1 FDD                 |
|  | 2      |      | TRS.1.1 TDD                 |
|  | 3      |      | TRS.1.2 TDD                 |
| DRX configuration  | 1~3    |      | DRX.3                       |
| reportConfigType   | 1~3    |      | periodic                    |
| reportQuantity   | 1~3    |      | ssb-Index-RSRP              |
| Number of reported RS  | 1~3    |      | 2                           |
| L1-RSRP reporting period   | 1~3    | slot | 80                          |
| T1   | 1~3    | s    | 5                           |
| T2   | 1~3    | s    | 1                           |
| EPRE ratio of PSS to SSS   | 1~3    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                             |
| Propagation condition  |        |      |                             |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |

Table A.6.6.4.2.2-2: SSB specific test parameters

| Parameter  | Config | Unit          | SSB#0  |        | SSB#1     |        |
|--|--------|---------------|--------|--------|-----------|--------|
|  |        |               | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~3    | dBm/15kHz     | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2    | dBm/SSB SCS   | -94.65 |        |           |        |
|  | 3      |               | -91.65 |        |           |        |
| $\hat{E}_s/I_{ot}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| SSB RSRP <sup>Note3</sup>  | 1,2    | dBm/SSB SCS   | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3      |               | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2    | dBm/9.36 MHz  | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3      | dBm/38.16 MHz | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s/N_{oc}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |               |        |        |           |        |

#### A.6.6.4.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.6.6.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.3.1-1.

Table A.6.6.4.3.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

##### A.6.6.4.3.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.3.2-1 and Table A.6.6.4.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.4.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.6.6.4.3.2-1: General test parameters

| Parameter  | Config | Unit  | Value                       |
|--|--------|-------|-----------------------------|
| SSB GSCN   | 1~3    |       | freq1                       |
| Duplex mode  | 1      |       | FDD                         |
|  | 2      |       | TDD                         |
|  | 3      |       | TDD                         |
| TDD Configuration  | 1      |       | N/A                         |
|  | 2      |       | TDDConf.1.1                 |
|  | 3      |       | TDDConf.2.1                 |
| BW <sub>channel</sub>  | 1      | MHz   | 10: N <sub>RB,c</sub> = 52  |
|  | 2      |       | 10: N <sub>RB,c</sub> = 52  |
|  | 3      |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel  | 1      |       | SR.1.1 FDD                  |
|  | 2      |       | SR.1.1 TDD                  |
|  | 3      |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel   | 1      |       | CR.1.1 FDD                  |
|  | 2      |       | CR.1.1 TDD                  |
|  | 3      |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |       | CCR.1.1 FDD                 |
|  | 2      |       | CCR.1.1 TDD                 |
|  | 3      |       | CCR.2.1 TDD                 |
| SSB configuration  | 1      |       | SSB.3 FR1                   |
|  | 2      |       | SSB.3 FR1                   |
|  | 3      |       | SSB.4 FR1                   |
| CSI-RS configuration   | 1      |       | CSI-RS 1.3 FDD              |
|  | 2      |       | CSI-RS 1.3 TDD              |
|  | 3      |       | CSI-RS 2.3 TDD              |
| OCNG Patterns  | 1~3    |       | OP.1                        |
| TRS Configuration  | 1      |       | TRS.1.1 FDD                 |
|  | 2      |       | TRS.1.1 TDD                 |
|  | 3      |       | TRS.1.2 TDD                 |
| Initial BWP Configuration  | 1~3    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~3    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration   | 1~3    |       | SMTc.1                      |
| DRX configuration  | 1~3    |       | Off                         |
| reportConfigType   | 1~3    |       | aperiodic                   |
| reportQuantity   | 1~3    |       | cri-RSRP                    |
| Number of reported RS  | 1~3    |       | 2                           |
| qcl-Info   | 1~3    |       | SSB#0 for resource#0        |
|  |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList   | 1~3    | slots | 8                           |
| T1   | 1~3    | s     | 5                           |
| EPRE ratio of PSS to SSS   | 1~3    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |       |                             |
| Propagation condition  |        |       |                             |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

**Table A.6.6.4.3.2-2: CSI-RS specific test parameters**

| Parameter  | Config | Unit          | CSI-RS#0 | CSI-RS#1 |
|--|--------|---------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~3    | dBm/15kHz     | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2    | dBm/SSB SCS   | -94.65   |          |
|  | 3      |               | -91.65   |          |
| $\hat{E}_s / I_{ot}$   | 1~3    | dB            | 0        | 3        |
| CSI-RS RSRP <sup>Note2</sup>   | 1,2    | dBm/SSB SCS   | -94.65   | -91.65   |
|  | 3      |               | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2    | dBm/9.36 MHz  | -63.69   | -61.93   |
|  | 3      | dBm/38.16 MHz | -57.59   | -55.84   |
| $\hat{E}_s / N_{oc}$   | 1~3    | dB            | 0        | 3        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |               |          |          |

#### A.6.6.4.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

#### A.6.6.4.4 CSI-RS based L1-RSRP measurement when DRX is used

##### A.6.6.4.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.4.1-1.

**Table A.6.6.4.4.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

##### A.6.6.4.4.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.4.2-1 and Table A.6.6.4.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.4.4.2-1.



There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.6.6.4.4.2-1: General test parameters

| Parameter  | Config | Unit  | Value                       |
|--|--------|-------|-----------------------------|
| SSB GSCN   | 1~3    |       | freq1                       |
| Duplex mode  | 1      |       | FDD                         |
|  | 2      |       | TDD                         |
|  | 3      |       | TDD                         |
| TDD Configuration  | 1      |       | N/A                         |
|  | 2      |       | TDDConf.1.1                 |
|  | 3      |       | TDDConf.2.1                 |
| BW <sub>channel</sub>  | 1      | MHz   | 10: N <sub>RB,c</sub> = 52  |
|  | 2      |       | 10: N <sub>RB,c</sub> = 52  |
|  | 3      |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel  | 1      |       | SR.1.1 FDD                  |
|  | 2      |       | SR.1.1 TDD                  |
|  | 3      |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel   | 1      |       | CR.1.1 FDD                  |
|  | 2      |       | CR.1.1 TDD                  |
|  | 3      |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |       | CCR.1.1 FDD                 |
|  | 2      |       | CCR.1.1 TDD                 |
|  | 3      |       | CCR.2.1 TDD                 |
| SSB configuration  | 1      |       | SSB.3 FR1                   |
|  | 2      |       | SSB.3 FR1                   |
|  | 3      |       | SSB.4 FR1                   |
| CSI-RS configuration   | 1      |       | CSI-RS 1.3 FDD              |
|  | 2      |       | CSI-RS 1.3 TDD              |
|  | 3      |       | CSI-RS 2.3 TDD              |
| OCNG Patterns  | 1~3    |       | OP.1                        |
| TRS Configuration  | 1      |       | TRS.1.1 FDD                 |
|  | 2      |       | TRS.1.1 TDD                 |
|  | 3      |       | TRS.1.2 TDD                 |
| Initial BWP Configuration  | 1~3    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~3    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration   | 1~3    |       | SMTc.1                      |
| DRX configuration  | 1~3    |       | DRX.3                       |
| reportConfigType   | 1~3    |       | aperiodic                   |
| reportQuantity   | 1~3    |       | cri-RSRP                    |
| Number of reported RS  | 1~3    |       | 2                           |
| qcl-Info   | 1~3    |       | SSB#0 for resource#0        |
|  |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList   | 1~3    | slots | 8                           |
| T1   | 1~3    | s     | 5                           |
| EPRE ratio of PSS to SSS   | 1~3    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |       |                             |
| Propagation condition  |        |       |                             |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

Table A.6.6.4.4.2-2: CSI-RS specific test parameters

| Parameter  | Config | Unit         | CSI-RS#0 | CSI-RS#1 |
|--|--------|--------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~3    | dBm/15kHz    | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2    | dBm/SSB SCS  | -94.65   |          |
|  | 3      |              | -91.65   |          |
| $\hat{E}_s / I_{ot}$   | 1~3    | dB           | 0        | 3        |
| CSI-RS RSRP <sup>Note2</sup>   | 1,2    | dBm/SSB SCS  | -94.65   | -91.65   |
|  | 3      |              | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2    | dBm/9.36 MHz | -63.69   | -61.93   |
|  | 3      |              | -57.59   | -55.84   |
| $\hat{E}_s / N_{oc}$   | 1~3    | dB           | 0        | 3        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |              |          |          |

#### A.6.6.4.4.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.4.5 SSB based L1-RSRP measurement when DRX is used for UE configured with *highSpeedMeasFlag-r16*

##### A.6.6.4.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*. This test will partly verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in clause 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.5.1-1.

Table A.6.6.4.5.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

##### A.6.6.4.5.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.5.2-1 and Table A.6.6.4.5.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.6.6.4.5.2-1: General test parameters for UE configured with *highSpeedMeasFlag-r16*

| Parameter   | Config | Unit | Value                       |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1~3    |      | freq1                       |
| Duplex mode   | 1      |      | FDD                         |
|   | 2      |      | TDD                         |
|   | 3      |      | TDD                         |
| TDD Configuration   | 1      |      | N/A                         |
|   | 2      |      | TDDConf.1.1                 |
|   | 3      |      | TDDConf.2.1                 |
| $BW_{\text{channel}}$   | 1      | MHz  | 10: $N_{\text{RB,c}} = 52$  |
|   | 2      |      | 10: $N_{\text{RB,c}} = 52$  |
|   | 3      |      | 40: $N_{\text{RB,c}} = 106$ |
| PDSCH Reference measurement channel   | 1      |      | SR.1.1 FDD                  |
|   | 2      |      | SR.1.1 TDD                  |
|   | 3      |      | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1      |      | CR.1.1 FDD                  |
|   | 2      |      | CR.1.1 TDD                  |
|   | 3      |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1      |      | CCR.1.1 FDD                 |
|   | 2      |      | CCR.1.1 TDD                 |
|   | 3      |      | CCR.2.1 TDD                 |
| SSB configuration   | 1      |      | SSB.3 FR1                   |
|   | 2      |      | SSB.3 FR1                   |
|   | 3      |      | SSB.4 FR1                   |
| OCNG Patterns   | 1~3    |      | OP.1                        |
| Initial BWP Configuration   | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration  | 1~3    |      | SMTc.1                      |
| TRS Configuration   | 1      |      | TRS.1.1 FDD                 |
|   | 2      |      | TRS.1.1 TDD                 |
|   | 3      |      | TRS.1.2 TDD                 |
| DRX configuration   | 1~3    |      | DRX.3                       |
| reportConfigType  | 1~3    |      | periodic                    |
| reportQuantity  | 1~3    |      | ssb-Index-RSRP              |
| Number of reported RS   | 1~3    |      | 2                           |
| L1-RSRP reporting period  | 1~3    | slot | 80                          |
| T1  | 1~3    | s    | 5                           |
| T2  | 1~3    | s    | 2                           |
| EPRE ratio of PSS to SSS  | 1~3    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| Propagation condition   | 1~2    |      | AWGN 1944 Hz                |
|   | 3      |      | AWGN 3334 Hz                |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |

**Table A.6.6.4.5.2-2: SSB specific test parameters for UE configured with *highSpeedMeasFlag-r16***

| Parameter  | Config | Unit          | SSB#0  |        | SSB#1     |        |
|--|--------|---------------|--------|--------|-----------|--------|
|  |        |               | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~3    | dBm/15kHz     | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2    | dBm/SSB SCS   | -94.65 |        |           |        |
|  | 3      |               | -91.65 |        |           |        |
| $\hat{E}_s / I_{ot}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| SSB RSRP <sup>Note3</sup>  | 1,2    | dBm/SSB SCS   | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3      |               | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2    | dBm/9.36 MHz  | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3      | dBm/38.16 MHz | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s / N_{oc}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |               |        |        |           |        |

### A.6.6.4.5.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.5

### A.6.6.5.1 SA NR - UTRAN FDD event-triggered reporting in non-DRX in FR1

#### A.6.6.5.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT UTRAN FDD measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in Clause 9.4.6.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN FDD neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

Supported test configurations are shown in table A.6.6.5.1.1-1. General test parameters are provided in Table A.6.6.5.1.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.5.1.1-3 and A.6.6.5.1.1-4, respectively.

**Table A.6.6.5.1.1-1: Supported test configurations in SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1**

| Configuration | Description  |
|---------------|--|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, UTRA FDD                   |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, UTRA FDD                   |
| 3             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, UTRA FDD                   |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.6.5.1.1-2: General test parameters for SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1**

| Parameter   | Unit | Value   | Comment   |
|---|------|---|---|
| NR RF Channel Number                              |      | 1   | 1 NR carrier frequency is used in the test                          |
| UTRA RF Channel Number                            |      | 2   | 1 UTRA carrier frequency is used in the test                        |
| Channel Bandwidth                                 | MHz  | As specified in Tables A.6.6.5.1.1-3 and A.6.6.5.1.1-4. |   |
| Active cell                                       |      | Cell 1  | Cell 1 is on RF channel number 1                                    |
| Neighbour cell                                    |      | Cell 2  | Cell 2 is on RF channel number 2                                    |
| Gap Pattern Id                                    |      | 0   | As specified in Clause Table 9.1.2-1. Per-UE gap pattern.           |
| Inter-RAT UTRA measurement quantity               |      | CPICH Ec/Io   | Measurement quantity for Cell 2                                     |
| b1-ThresholdUTRA-FDD                              | dB   | -16.5   | CPICH Ec/Io threshold for SS-RSRP measurement on cell1 for event B1 |
| Hysteresis  | dB   | 0   |   |
| TimeToTrigger                                     | s    | 0   |   |
| Filter coefficient                                |      | 0   | L3 filtering is not used  |
| DRX   |      | OFF   | OFF   |
| T1  | s    | 5   |   |
| T2  | s    | 5   |   |
| Note 1: Values are defined in Table A.6.6.5.1.1-3 |      |   |   |

**Table A.6.6.5.1.1-3: PCell specific test parameters for SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1**

| Parameter   |                  | Unit | Configuration | Cell 1                            |        |
|---|------------------|------|---------------|-----------------------------------|--------|
|   |                  |      |               | T1                                | T2     |
| RF channel number   |                  |      | 1, 2, 3       | 1                                 |        |
| Duplex mode   |                  |      | 1, 2, 3       | FDD                               |        |
| TDD Configuration   | SCS=15 KHz       |      | 2             | TDDConf.1.1                       |        |
|   | SCS=30 KHz       |      | 3             | TDDConf.2.1                       |        |
| BW <sub>channel</sub>   |                  | MHz  | 1             | 10: N <sub>RB,c</sub> = 52 (FDD)  |        |
|   |                  |      | 2             | 10: N <sub>RB,c</sub> = 52 (TDD)  |        |
|   |                  |      | 3             | 40: N <sub>RB,c</sub> = 106 (TDD) |        |
| PDSCH reference measurement channel   |                  |      | 1             | SR.1.1 FDD                        |        |
|   |                  |      | 2             | SR.1.1 TDD                        |        |
|   |                  |      | 3             | SR.2.1 TDD                        |        |
| CORESET reference channel   |                  |      | 1             | CR.1.1 FDD                        |        |
|   |                  |      | 2             | CR.1.1 TDD                        |        |
|   |                  |      | 3             | CR.2.1 TDD                        |        |
| BWP configurations  | Initial DL BWP   |      | 1, 2, 3       | DLBWP.0.1                         |        |
|   | Dedicated DL BWP |      | 1, 2, 3       | DLBWP.1.1                         |        |
|   | Initial UL BWP   |      | 1, 2, 3       | ULBWP.0.1                         |        |
|   | Dedicated UL BWP |      | 1, 2, 3       | ULBWP.1.1                         |        |
| OCNG pattern <sup>Note1</sup>   |                  |      | 1, 2, 3       | OP.1                              |        |
| SMTTC configuration   |                  |      | 1, 2, 3       | SMTTC.1                           |        |
| SSB configuration   |                  |      | 1, 2          | SSB.1 FR1                         |        |
|   |                  |      | 3             | SSB.2 FR1                         |        |
| CSI-RS for tracking   |                  |      | 1             | TRS.1.1 FDD                       |        |
|   |                  |      | 2             | TRS.1.1 TDD                       |        |
|   |                  |      | 3             | TRS.1.2 TDD                       |        |
| EPRE ratio of PSS to SSS  |                  | dB   | 1, 2, 3       | 0                                 |        |
| EPRE ratio of PBCH_DMRS to SSS  |                  |      |               |                                   |        |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |      |               |                                   |        |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |      |               |                                   |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |      |               |                                   |        |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |      |               |                                   |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |      |               |                                   |        |
| EPRE ratio of OCNG DMRS to SSS  |                  |      |               |                                   |        |
| EPRE ratio of OCNG to OCNG DMRS   |                  |      |               |                                   |        |
| N <sub>oc</sub> <sup>Note2</sup>  | dBm/15 KHz       |      | 1, 2, 3       | -106                              |        |
| N <sub>oc</sub> <sup>Note2</sup>  | dBm/SCS          |      | 1, 2          | -106                              |        |
|   |                  |      | 3             | -103                              |        |
| $\hat{E}_s/N_{oc}$  | dB               |      | 1, 2, 3       | 18                                | -2     |
| $\hat{E}_s/I_{ot}$ <sup>Note3</sup>   | dB               |      | 1, 2, 3       | 18                                | -2     |
| SS-RSRP <sup>Note3</sup>  | dBm/SCS          |      | 1, 2          | -88                               | -108   |
|   |                  |      | 3             | -85                               | -105   |
| SSB_RP <sup>Note3</sup>   | dBm/SCS          |      | 1, 2          | -88                               | -108   |
|   |                  |      | 3             | -85                               | -105   |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/9.36 MHz     |      | 1, 2          | -59.98                            | -75.92 |
|   | dBm/38.16 MHz    |      | 3             | -53.88                            | -69.82 |
| Propagation condition   |                  |      | 1, 2, 3       | ETDLA30                           |        |
| Antenna Configuration and Correlation Matrix  |                  |      | 1, 2, 3       | 1x2 Low                           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>\hat{E}_s/I_{ot}</math>, SS-RSRP, SSB_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                  |      |               |                                   |        |



**Table A.6.6.5.1.1-4: UTRAN neighbour cell specific test parameters for SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1**

| Parameter   | Unit         | Cell 2    |        |
|---|--------------|-----------|--------|
|   |              | T1        | T2     |
| UTRA RF Channel Number  |              |           | 2      |
| CPICH_Ec/I <sub>or</sub>  | dB           |           | -10    |
| PCCPCH_Ec/I <sub>or</sub>   | dB           |           | -12    |
| SCH_Ec/I <sub>or</sub>  | dB           |           | -12    |
| PICH_Ec/I <sub>or</sub>   | dB           |           | -15    |
| DPCH_Ec/I <sub>or</sub>   | dB           |           | N/A    |
| OCNS  |              |           | -0.941 |
| $\hat{I}_{or}/I_{oc}$   | dB           | -Infinity | -1.8   |
| $I_{oc}$  | dBm/3.84 MHz |           | -70    |
| CPICH_Ec/I <sub>o</sub>   | dB           | -Infinity | -14    |
| Propagation Condition   |              | AWGN      |        |
| Note 1: The DPCH level is controlled by the power control loop.   |              |           |        |
| Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to I <sub>or</sub> . |              |           |        |

#### A.6.6.5.1.2 Test Requirements

The UE shall send one Event B1 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 2.4s from the start of period T2, i.e. when Cell 2 becomes detectable. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

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

### A.6.6.6 CLI measurements

#### A.6.6.6.1 SRS-RSRP measurement with DRX

##### A.6.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 9.7.2.5 with the testing configurations for NR cells in Table A.6.6.6.1.1-1.

**Table A.6.6.6.1.1-1: Applicable NR configurations for FR1 SRS-RSRP test**

| Configuration  | Description  |
|--|--|
| 1  | NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 2  | NR 30 kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

##### A.6.6.6.1.2 Test Parameters

One cell is deployed in the test, which is FR1 PCell (Cell 1). The test parameters for PCell is given in Table A.6.6.6.1.2-1 and A.6.6.6.1.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table A.6.6.6.1.2-4 and the test parameters for the (virtual) neighbour cell UE in Table A. 6.6.6.1.2-3.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

**Table A.6.6.6.1.2-1: General test parameters for SRS-RSRP event triggered reporting for PCell in FR1**

| Parameter   | Unit | Test configuration | Value      | Comment                  |
|---|------|--------------------|------------|--------------------------|
| Active cell   |      | 1, 2               | Cell 1     |                          |
| RF Channel Number   |      | 1, 2               | 1: Cell 1  |                          |
| SSB configuration   |      | 1                  | SSB.1 FR1  |                          |
|   |      | 2                  | SSB.2 FR1  |                          |
| SMTC configuration  |      | 1                  | SMTC.1     |                          |
|   |      | 2                  | SMTC.1     |                          |
| SRS configuration   |      | 1                  | SRSCConf.1 | Table A.6.6.6.1.2-3      |
|   |      | 2                  | SRSCConf.2 |                          |
| CP length   |      | 1, 2               | Normal     |                          |
| i1-Threshold  | dBm  | 1                  | -97        |                          |
|   |      | 2                  | -95        |                          |
| Hysteresis  | dB   | 1, 2               | 0          |                          |
| Time To Trigger   | s    | 1, 2               | 0          |                          |
| Filter coefficient  |      | 1, 2               | 0          | L3 filtering is not used |
| DRX   |      | 1, 2               | DRX.7      |                          |
| Time offset between DL from serving cell and SRS from test system | µs   | 1,2                | 17.67      |                          |
| T1  | s    | 1, 2               | 5          |                          |
| T2  | s    | 1, 2               | 5          |                          |

**Table A.6.6.6.1.2-2: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PCell in FR1**

| Parameter  | Unit       | Test configuration | Cell 1              |    |
|--|------------|--------------------|---------------------|----|
|  |            |                    | T1                  | T2 |
| TDD configuration  |            | 1                  | TDDConf.1.1         |    |
|  |            | 2                  | TDDConf.2.1         |    |
| PDSCH RMC configuration  |            | 1                  | SR.1.1 TDD          |    |
|  |            | 2                  | SR.2.1 TDD          |    |
| RMSI CORESET RMC configuration   |            | 1                  | CR.1.1 TDD          |    |
|  |            | 2                  | CR.2.1 TDD          |    |
| Dedicated CORESET RMC configuration  |            | 1                  | CCR.1.1 TDD         |    |
|  |            | 2                  | CCR.2.1 TDD         |    |
| OCNG Patterns  |            | 1, 2               | OP.1                |    |
| TRS Configuration  |            | 1                  | TRS.1.1 TDD         |    |
|  |            | 2                  | TRS.1.2 TDD         |    |
| Initial BWP configuration  |            | 1, 2               | DLBWP.0.1 ULBWP.0.1 |    |
| Active DL BWP configuration  |            | 1, 2               | DLBWP.1.1           |    |
| Active UL BWP configuration  |            | 1, 2               | ULBWP.1.1           |    |
| $N_{oc}$ Note 2  | dBm/15 kHz | 1                  | -98                 |    |
|  |            | 2                  |                     |    |
| $N_{oc}$ Note 2  | dBm/SCS    | 1                  | -98                 |    |
|  |            | 2                  | -95                 |    |
| Propagation Condition  |            | 1, 2               | AWGN                |    |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |            |                    |                     |    |

**Table A.6.6.1.2-3: NR Cell specific test parameters for SRS-RSRP event triggered reporting for neighbour cell UE**

| Parameter  | Unit          | Test configuration | Neighbour cell UE |        |
|--|---------------|--------------------|-------------------|--------|
|  |               |                    | T1                | T2     |
| $N_{oc}$ Note 2  | dBm/15 kHz    | 1                  | -98               |        |
|  |               | 2                  |                   |        |
| $N_{oc}$ Note 2  | dBm/SCS       | 1                  | -98               |        |
|  |               | 2                  |                   |        |
| $\hat{E}_s/I_{ot}$   | dB            | 1                  | -infinity         | 4      |
|  |               | 2                  |                   |        |
| $\hat{E}_s/N_{oc}$   | dB            | 1                  | -infinity         | 4      |
|  |               | 2                  |                   |        |
| SRS-RSRP Note 3  | dBm/SCS kHz   | 1                  | -infinity         | -94    |
|  |               | 2                  | -infinity         | -91    |
| Io   | dBm/9.36 MHz  | 1                  | -70.05            | -64.59 |
|  | dBm/38.16 MHz | 2                  | -63.96            | -58.50 |
| Propagation Condition  |               | 1, 2               | AWGN              |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                   |        |

**Table A.6.6.1.2-4: SRS configuration for measurement reporting**

|                 | Field                            | SRSCnf.1 | SRSCnf.2          | Comments |
|-----------------|----------------------------------|----------|-------------------|----------|
| SRS-ResourceSet | srs-ResourceSetId                | 0        | 0                 |          |
|                 | srs-ResourceSetList              | 0        | 0                 |          |
|                 | resourceType                     | Periodic | Periodic          |          |
|                 | Usage                            | Codebook | Codebook          |          |
| SRS-Resource    | SRS-ResourceId                   | 0        | 0                 |          |
|                 | nrofSRS-Ports                    | Port1    | Port1             |          |
|                 | transmissionComb                 | n2       | n2                |          |
|                 | combOffset-n2                    | 0        | 0                 |          |
|                 | cyclicShift-n2                   | 0        | 0                 |          |
|                 | resourceMapping startPosition    | 0        | 0                 |          |
|                 | resourceMapping nrofSymbols      | n1       | n1                |          |
|                 | resourceMapping repetitionFactor | n1       | n1                |          |
|                 | freqDomainPosition               | 0        | 0                 |          |
|                 | freqDomainShift                  | 0        | 0                 |          |
|                 | freqHopping c-SRS                | 12       | 12                |          |
|                 | freqHopping b-SRS                | 0        | 0                 |          |
|                 | freqHopping b-hop                | 0        | 0                 |          |
|                 | groupOrSequenceHopping           | Neither  | Neither           |          |
|                 | resourceType                     | Periodic | Periodic          |          |
|                 | periodicityAndOffset             | sl640, 4 | sl640, 9          |          |
| sequenceId      | 0                                | 0        | Any 10 bit number |          |

### A.6.6.6.1.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 1920 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.6.6.6.2 CLI-RSSI measurement with DRX

#### A.6.6.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of CLI-RSSI measurement. This test will verify the CLI-RSSI measurement requirements in clause 9.7.3.5 with the testing configurations for NR cells in Table A.6.6.6.2.1-1.

**Table A.6.6.6.2.1-1: Applicable NR configurations for FR1 CLI-RSSI test**

| Configuration  | Description                                      |
|--|--|
| 1  | NR 15 kHz SCS, 10 MHz bandwidth, TDD duplex mode |
| 2  | NR 30 kHz SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.6.6.6.2.2 Test Parameters

One cell is deployed in the test, which are FR1 PCell (Cell 1). The test parameters for PCell is given in Table A.6.6.6.2.2-1 and A.6.6.6.2.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI measurement resource and on 1 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.6.6.6.2.2-3.

**Table A.6.6.6.2.2-1: General test parameters for CLI-RSSI event triggered reporting for PCell in FR1**

| Parameter  | Unit | Test configuration | Value           | Comment                  |
|--|------|--------------------|-----------------|--------------------------|
| Active cell  |      | 1, 2               | NR Cell 1       |                          |
| RF Channel Number  |      | 1, 2               | 1: Cell 1       |                          |
| SSB configuration  |      | 1                  | SSB.1 FR1       |                          |
|  |      | 2                  | SSB.2 FR1       |                          |
| SMTC configuration   |      | 1                  | SMTC.1          |                          |
|  |      | 2                  | SMTC.1          |                          |
| CLI-RSSI configuration   |      | 1                  | CLI-RSSICConf.1 | Table A.6.6.6.2.2-3      |
|  |      | 2                  | CLI-RSSICConf.2 |                          |
| CP length  |      | 1, 2               | Normal          |                          |
| i1-Threshold   | dBm  | 1                  | -93             |                          |
|  |      | 2                  | -93             |                          |
| Hysteresis   | dB   | 1, 2               | 0               |                          |
| Time To Trigger  | s    | 1, 2               | 0               |                          |
| Filter coefficient   |      | 1, 2               | 0               | L3 filtering is not used |
| DRX  |      | 1, 2               | DRX.7           |                          |
| Time offset between DL from serving cell and OCNG from test system | μs   | 1,2                | 17.67           |                          |
| T1   | s    | 1, 2               | 5               |                          |
| T2   | s    | 1, 2               | 2               |                          |

**Table A.6.6.2.2-2: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR1**

| Parameter  | Unit          | Test configuration | Cell 1              |        |
|--|---------------|--------------------|---------------------|--------|
|  |               |                    | T1                  | T2     |
| TDD configuration  |               | 1                  | TDDConf.1.1         |        |
|  |               | 2                  | TDDConf.2.1         |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 TDD          |        |
|  |               | 2                  | SR.2.1 TDD          |        |
| PUSCH parameters   |               | 1                  | N/A                 |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 TDD          |        |
|  |               | 2                  | CR.2.1 TDD          |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 TDD         |        |
|  |               | 2                  | CCR.2.1 TDD         |        |
| OCNG Patterns <sup>Note 3</sup>  |               | 1, 2               | OP.1                |        |
| TRS Configuration  |               | 1                  | TRS.1.1 TDD         |        |
|  |               | 2                  | TRS.1.2 TDD         |        |
| Initial BWP configuration  |               | 1, 2               | DLBWP.0.1 ULBWP.0.1 |        |
| Active DL BWP configuration  |               | 1, 2               | DLBWP.1.1           |        |
| Active UL BWP configuration  |               | 1, 2               | ULBWP.1.1           |        |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>  | dBm/15 kHz    | 1                  | -116                | -108   |
|  |               | 2                  |                     |        |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>  | dBm/SCS       | 1                  | -116                | -108   |
|  |               | 2                  | -113                | -105   |
| Io on CLI-RSSI measurement resource  | dBm/9.36 MHz  | 1                  | -88.05              | -80.05 |
|  | dBm/38.16 MHz | 2                  | -81.96              | -74.00 |
| Io on CLI-RSSI measurement resource  | dBm/1.08 MHz  | 1                  | -97.43              | -89.43 |
|  | dBm/1.08 MHz  | 2                  | -97.44              | -89.44 |
| Propagation Condition  |               | 1, 2               | AWGN                |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: OCNG is not transmitted in the CLI-RSSI measurement resources.</p> |               |                    |                     |        |

**Table A.6.6.2.2-3: CLI-RSSI measurement resource configuration for measurement reporting**

|               | Field                    | CLI-RSSIConf.1 | CLI-RSSIConf.2 |
|---------------|--------------------------|----------------|----------------|
| RSSI-Resource | rss-ResourceId           | 0              | 0              |
|               | rss-SCS                  | 15             | 30             |
|               | startPRB                 | 0              | 0              |
|               | nrofPRBs                 | 52             | 106            |
|               | startPosition            | 3              | 3              |
|               | nrofSymbols              | 11             | 11             |
|               | rss-PeriodicityAndOffset | sl640, 4       | sl640, 9       |

### A.6.6.2.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 640 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.7 NR measurements with autonomous gaps

### A.6.6.7.1 SA intra-frequency CGI identification of NR neighbor cell in FR1

#### A.6.6.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of intra-frequency CGI identification of an NR neighbour cell in FR1 with autonomous gaps. This test shall partly verify the measurement requirements in Clause 9.11.

#### A.6.6.7.1.2 Test Parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the FR1 PCell and Cell 2 is an FR1 neighbour cell on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Table A.6.6.7.1.1-2 and A.6.6.7.1.3-2 below. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable. A measurement object is configured for the frequency of the PCell and it is indicated to the UE that event-triggered reporting with Event A3 is used. The UE is expected to detect and send a measurement report with Event A3.

A new RRC message triggering CGI identification shall be sent to the UE during period T2, after the UE has reported Event A3. The RRC message shall create a measurement report configuration with purpose *reportCGI* and *useAutonomousGaps* set to TRUE. The start of T3 is the instant when the last TTI containing the RRC message implying CGI identification is sent to the UE.

The test equipment verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell during T3 until a measurement report with CGI is sent.

**Table A.6.6.71.1.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.6.7.1.2-2: General test parameters for SA intra-frequency CGI identification of NR neighbor cell in FR1**

| Parameter                                       | Unit | Test configuration | Value                | Comment   |
|---|------|--------------------|----------------------|---|
| Active cell                                     |      | 1, 2, 3            | Cell 1               |   |
| Neighbour cell                                  |      | 1, 2, 3            | Cell 2               | Cell to be identified.  |
| RF Channel Number                               |      | 1, 2, 3            | 1: Cell 1 and Cell 2 |   |
| SSB configuration                               |      | 1                  | SSB.1 FR1            |   |
|   |      | 2                  | SSB.1 FR1            |   |
|   |      | 3                  | SSB.2 FR1            |   |
| SMTTC configuration                             |      | 1                  | SMTTC.2              |   |
|   |      | 2                  | SMTTC.1              |   |
|   |      | 3                  | SMTTC.1              |   |
| A3-Offset                                       | dB   | 1, 2, 3            | -4.5                 |   |
| CP length                                       |      | 1, 2, 3            | Normal               |   |
| Hysteresis                                      | dB   | 1, 2, 3            | 0                    |   |
| Time To Trigger                                 | s    | 1, 2, 3            | 0                    |   |
| Filter coefficient                              |      | 1, 2, 3            | 0                    | L3 filtering is not used  |
| DRX   |      | 1, 2, 3            |                      | OFF   |
| Time offset between serving and neighbour cells |      | 1                  | 3 ms                 | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3 $\mu$ s            | Synchronous cells   |
|   |      | 3                  | 3 $\mu$ s            | Synchronous cells   |
| T1  | s    | 1, 2, 3            | 5                    |   |
| T2  | s    | 1, 2, 3            | 5                    |   |
| T2  | s    | 1, 2, 3            | 5                    |   |

**Table A.6.6.7.1.2-3: NR Cell specific test parameters for SA intra-frequency CGI identification of NR neighbor cell in FR1**

| Parameter   | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |        |
|---|---------------|--------------------|------------------------|--------|------------------------|--------|
|   |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration   |               | 1                  | TN/A                   |        | TN/A                   |        |
|   |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1            |        |
|   |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration   |               | 1                  | SR.1.1 FDD             |        | N/A                    |        |
|   |               | 2                  | SR.1.1 TDD             |        |                        |        |
|   |               | 3                  | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration  |               | 1                  | CR.1.1 FDD             |        | CR.1.1 FDD             |        |
|   |               | 2                  | CR.1.1 TDD             |        | CR.1.1 TDD             |        |
|   |               | 3                  | CR.2.1 TDD             |        | CR.2.1 TDD             |        |
| Dedicated CORESET RMC configuration   |               | 1                  | CCR.1.1 FDD            |        | CCR.1.1 FDD            |        |
|   |               | 2                  | CCR.1.1 TDD            |        | CCR.1.1 TDD            |        |
|   |               | 3                  | CCR.2.1 TDD            |        | CCR.2.1 TDD            |        |
| OCNG Patterns   |               | 1, 2, 3            | OP.1                   |        | OP.1                   |        |
| TRS Configuration   |               | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
|   |               | 2                  | TRS.1.1 TDD            |        | N/A                    |        |
|   |               | 3                  | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration   |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration   |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration   |               | 1, 2, 3            | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS  |               | 1, 2, 3            | SSB                    |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/SCS       | 1                  | -98                    |        |                        |        |
|   |               | 2                  | -98                    |        |                        |        |
|   |               | 3                  | -95                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 kHz    | 1                  | -98                    |        |                        |        |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$  | dB            | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$  | dB            | 1                  | 4                      | 4      | -Infinity              | 4      |
|   |               | 2                  |                        |        |                        |        |
|   |               | 3                  |                        |        |                        |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 2                  | -94                    | -94    | -Infinity              | -94    |
|   |               | 3                  | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>  | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|   | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | --58.50                | -56.16 |
| Propagation Condition   |               | 1, 2, 3            | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

### A.6.6.7.1.3 Test Requirements

The UE shall send a measurement report containing the CGI of cell 2 within 252 ms from the start of time period T3.

Test requirement = RRC Procedure delay +  $T_{identify\_CGI}$  + reporting delay

$$= 10 + 240 + 2\text{ms from the start of T3}$$



= 252 ms

The UE shall be scheduled continuously throughout the test. From the start of T3 until 252 ms, the interruption on PCell shall not be more than the values specified for SA in clause 8.2.2.2.14.

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

### A.6.6.7.2 Identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA

#### A.6.6.7.2.1 Test Purpose and Environment

This test is to verify the requirement for identification of a new CGI of E-UTRA cell with autonomous gaps in NR SA in clause 9.4.7.

The test scenario comprises of one NR carrier and an E-UTRA carrier and two cells as given in tables A.6.6.7.2.1-1, A.6.6.7.2.1-2, A.6.6.7.2.1-3 and A.6.6.7.2.1-4. PDCCHs indicating new transmissions shall be sent continuously to ensure that the UE would have ACK/NACK sending during identifying a new CGI of E-UTRAN cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE is expected to detect and send a measurement report.

A RRC message implying SI reading shall be sent to the UE during period T2, after the UE has reported Event B2. The RRC message shall create a measurement report configuration with purpose *reportCGI* and *useAutonomousGaps* set to TRUE. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading is sent to the UE.

**Table A.6.6.7.2.1-1: Supported test configurations of inter-RAT E-UTRAN cell using autonomous gap in SA**

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

**Table A.6.6.7.2.1-2: General test parameters for identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA**

| Parameter                               | Unit | Value  | Comment                                      |
|---|------|--------|--|
| NR RF Channel Number                    |      | 1      | 1 NR carrier frequency is used in the test   |
| LTE RF Channel Number                   |      | 2      | 1 LTE carrier frequency is used in the test  |
| Active cell                             |      | Cell 1 |  |
| Neighbour cell                          |      | Cell 2 | Cell to be identified.                       |
| LTE Channel Bandwidth                   | MHz  | 10     |  |
| LTE PDSCH/PCFICH/PDCCH/PHICH parameters |      |        | As specified in clause A.3.7.2.1             |
| CP length                               |      | Normal |  |
| Hysteresis                              | dB   | 0      |  |
| Time To Trigger                         | s    | 0      |  |
| Filter coefficient                      |      | 0      | L3 filtering is not used                     |
| DRX                                     |      | OFF    |  |
| useAutonomousGaps                       |      | TRUE   | As specified in clause 5.5.3.1 in TS 38.331. |
| Time offset between cells               | ms   | 3      | Asynchronous cells                           |
| T1                                      | s    | 5      |  |
| T2                                      | s    | ≤10    |  |
| T3                                      | s    | 5      |  |

**Table A.6.6.7.2.1-3: PCell specific test parameters for identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR**

| Parameter   |                  | Unit         | Configuration    | Cell 1                            |        |        |
|---|------------------|--------------|------------------|-----------------------------------|--------|--------|
|   |                  |              |                  | T1                                | T2     | T3     |
| RF channel number   |                  |              | 1, 2, 3, 4, 5, 6 | 1                                 |        |        |
| Duplex mode   |                  |              | 1, 2, 3          | FDD                               |        |        |
|   |                  |              | 4, 5, 6          | TDD                               |        |        |
| TDD Configuration   | SCS=15 KHz       |              | 2, 5             | TDDConf.1.1                       |        |        |
|   | SCS=30 KHz       |              | 3, 6             | TDDConf.2.1                       |        |        |
| BW <sub>channel</sub>   |                  | MHz          | 1, 4             | 10: N <sub>RB,c</sub> = 52 (FDD)  |        |        |
|   |                  |              | 2, 5             | 10: N <sub>RB,c</sub> = 52 (TDD)  |        |        |
|   |                  |              | 3, 6             | 40: N <sub>RB,c</sub> = 106 (TDD) |        |        |
| PDSCH reference measurement channel   |                  |              | 1, 4             | SR.1.1 FDD                        |        |        |
|   |                  |              | 2, 5             | SR.1.1 TDD                        |        |        |
|   |                  |              | 3, 6             | SR.2.1 TDD                        |        |        |
| CORSET reference channel  |                  |              | 1, 4             | CR.1.1 FDD                        |        |        |
|   |                  |              | 2, 5             | CR.1.1 TDD                        |        |        |
|   |                  |              | 3, 6             | CR.2.1 TDD                        |        |        |
| BWP configurations  | Initial DL BWP   |              | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                         |        |        |
|   | Dedicated DL BWP |              | 1, 2, 3, 4, 5, 6 | DLBWP.1.1                         |        |        |
|   | Initial UL BWP   |              | 1, 2, 3, 4, 5, 6 | ULBWP.0.1                         |        |        |
|   | Dedicated UL BWP |              | 1, 2, 3, 4, 5, 6 | ULBWP.1.1                         |        |        |
| OCNG pattern <sup>Note1</sup>   |                  |              | 1, 2, 3, 4, 5, 6 | OP.1                              |        |        |
| SMTC configuration  |                  |              | 1, 2, 3, 4, 5, 6 | SMTC.1                            |        |        |
| SSB configuration   |                  |              | 1, 2, 4, 5       | SSB.1 FR1                         |        |        |
|   |                  |              | 3, 6             | SSB.2 FR1                         |        |        |
| b2-Threshold1   |                  | dBm          | 1, 2, 4, 5       | -98                               |        |        |
|   |                  |              | 3, 6             | -95                               |        |        |
| b2-Threshold2EUTRA  |                  | dBm/15kHz    | 1, 2, 3, 4, 5, 6 | -109                              |        |        |
| EPRE ratio of PSS to SSS  |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 |        |        |
| EPRE ratio of PBCH_DMRS to SSS  |                  |              |                  |                                   |        |        |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |              |                  |                                   |        |        |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |              |                  |                                   |        |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |              |                  |                                   |        |        |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |              |                  |                                   |        |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |              |                  |                                   |        |        |
| EPRE ratio of OCNG DMRS to SSS  |                  |              |                  |                                   |        |        |
| EPRE ratio of OCNG to OCNG DMRS   |                  |              |                  |                                   |        |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  |              |                  |                                   |        |        |
| N <sub>oc</sub> <sup>Note2</sup>  |                  | dBm/SCS      | 1, 2, 4, 5       | -106                              |        |        |
|   |                  |              | 3, 6             | -103                              |        |        |
| E <sub>s</sub> /N <sub>oc</sub>   |                  | dB           | 1, 2, 3, 4, 5, 6 | 18                                | -2     | -2     |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup>  |                  | dB           | 1, 2, 3, 4, 5, 6 | 18                                | -2     | -2     |
| SS-RSRP <sup>Note3</sup>  |                  | dBm/SCS      | 1, 2, 4, 5       | -88                               | -108   | -108   |
|   |                  |              | 3, 6             | -85                               | -105   | -105   |
| SSB_RP <sup>Note3</sup>   |                  | dBm/SCS      | 1, 2, 4, 5       | -88                               | -108   | -108   |
|   |                  |              | 3, 6             | -85                               | -105   | -105   |
| I <sub>o</sub> <sup>Note3</sup>   |                  | dBm/9.36 MHz | 1, 2, 4, 5       | -59.98                            | -75.92 | -75.92 |
|   |                  |              | dBm/38.16 MHz    | 3, 6                              | -53.88 | -69.82 |
| Propagation condition   |                  |              | 1, 2, 3, 4, 5, 6 | AWGN                              |        |        |
| Antenna Configuration and Correlation Matrix  |                  |              | 1, 2, 3, 4, 5, 6 | 1x2 Low                           |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: E<sub>s</sub>/I<sub>ot</sub>, SS-RSRP, SSB_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                  |              |                  |                                   |        |        |

**Table A.6.6.7.2.1-4: Cell specific test parameters for inter-RAT E-UTRAN cell for identification of a new CGI of E-UTRA cell using autonomous gaps**

| Parameter   | Unit      | Configuration    | Cell 2                         |     |     |
|---|-----------|------------------|--------------------------------|-----|-----|
|   |           |                  | T1                             | T2  | T3  |
| RF channel number   |           | 1, 2, 3, 4, 5, 6 | 2                              |     |     |
| Duplex mode   |           | 1, 2, 3          | FDD                            |     |     |
|   |           | 4, 5, 6          | TDD                            |     |     |
| TDD special subframe configuration <sup>Note1</sup>   |           | 4, 5, 6          | 6                              |     |     |
| TDD uplink-downlink configuration <sup>Note1</sup>  |           | 4, 5, 6          | 1                              |     |     |
| BW <sub>channel</sub>   | MHz       | 1, 2, 3, 4, 5, 6 | 10 MHz: N <sub>RB,C</sub> = 50 |     |     |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 10 MHz: R.3 FDD                |     |     |
|   |           | 4, 5, 6          | 10 MHz: R.0 TDD                |     |     |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1, 2, 3          | 10 MHz: R.6 FDD                |     |     |
|   |           | 4, 5, 6          | 10 MHz: R.6 TDD                |     |     |
| OCNG Patterns <sup>Note2</sup>  |           | 1, 2, 3          | 10 MHz: OP.10 FDD              |     |     |
|   |           | 4, 5, 6          | 10 MHz: OP.1 TDD               |     |     |
| PBCH_RA   | dB        | 1, 2, 3, 4, 5, 6 | 0                              |     |     |
| PBCH_RB   |           |                  |                                |     |     |
| PSS_RA  |           |                  |                                |     |     |
| SSS_RA  |           |                  |                                |     |     |
| PCFICH_RB   |           |                  |                                |     |     |
| PHICH_RA  |           |                  |                                |     |     |
| PHICH_RB  |           |                  |                                |     |     |
| PDCCH_RA  |           |                  |                                |     |     |
| PDCCH_RB  |           |                  |                                |     |     |
| PDSCH_RA  |           |                  |                                |     |     |
| PDSCH_RB  |           |                  |                                |     |     |
| OCNG_RA <sup>Note3</sup>  |           |                  |                                |     |     |
| OCNG_RB <sup>Note3</sup>  |           |                  |                                |     |     |
| N <sub>oc</sub> <sup>Note4</sup>  |           |                  |                                |     |     |
| $\bar{E}_s/N_{oc}$  | dB        | 1, 2, 3, 4, 5, 6 | -Infinity                      | 7   | 7   |
| $\bar{E}_s/I_{ot}$ <sup>Note5</sup>   | dB        | 1, 2, 3, 4, 5, 6 | -Infinity                      | 7   | 7   |
| RSRP <sup>Note5</sup>   | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity                      | -99 | -99 |
| SCH_RP <sup>Note5</sup>   | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity                      | -99 | -99 |
| Propagation Condition   |           | 1, 2, 3, 4, 5, 6 | AWGN                           |     |     |
| Antenna Configuration and Correlation Matrix  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low                        |     |     |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\bar{E}_s/I_{ot}</math>, RSRP, and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |           |                  |                                |     |     |

### A.6.6.7.2.2 Test Requirements

The UE shall transmit a measurement report containing the cell global identifier of cell 2 within 200 milliseconds from the start of T3.

Test requirement = RRC Procedure delay with additional margin + T<sub>identify\_CGIE-UTRAN</sub> + reporting delay

= 15 + 30 + 150 + 2ms from the start of T3

= 197 ms, allow 200 ms.

- The UE shall be scheduled continuously throughout the test, and from the start of T3 until 200 ms at least the number of ACK/NACK specified in NOTE 2 shall be detected as being transmitted by the UE.

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

NOTE 1: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 2: The overall ACK/NACK number is caused by two parts. Firstly, at least X ACK/NACK shall be sent during identifying the cell global identifier of cell 2, where X is defined in Table 8.2.2.2.15-1. Secondly, given that continuous DL data allocation, additional 43, 14 and 34 ACK/NACK shall be sent for FDD 15 kHz, TDD 15 kHz and TDD 30 kHz, respectively, from the start of T3 until 200 ms excludes 150 ms for identifying the cell global identifier of cell 2.

## A.6.6.8 L1-SINR measurement for beam reporting

### A.6.6.8.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured when DRX is used

#### A.6.6.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.1, with the testing configurations for NR cells in Table A.6.6.8.1.1-1.

**Table A.6.6.8.1.1-1: Applicable NR configurations for FR1 CSI-RS based L1-SINR test**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.6.6.8.1.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.8.1.2-1 and Table A.6.6.8.1.2-2 below.

In the CSI-RS measurement configuration, UE is indicated to perform L1-SINR measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.8.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.6.6.8.1.2-1: General test parameters

| Parameter   | Config | Unit  | Value                       |
|---|--------|-------|-----------------------------|
| SSB GSCN  | 1~3    |       | freq1                       |
| Duplex mode   | 1      |       | FDD                         |
|   | 2      |       | TDD                         |
|   | 3      |       | TDD                         |
| TDD Configuration   | 1      |       | N/A                         |
|   | 2      |       | TDDConf.1.1                 |
|   | 3      |       | TDDConf.2.1                 |
| BW <sub>channel</sub>   | 1      | MHz   | 10: N <sub>RB,c</sub> = 52  |
|   | 2      |       | 10: N <sub>RB,c</sub> = 52  |
|   | 3      |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1      |       | SR.1.1 FDD                  |
|   | 2      |       | SR.1.1 TDD                  |
|   | 3      |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1      |       | CR.1.1 FDD                  |
|   | 2      |       | CR.1.1 TDD                  |
|   | 3      |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1      |       | CCR.1.1 FDD                 |
|   | 2      |       | CCR.1.1 TDD                 |
|   | 3      |       | CCR.2.1 TDD                 |
| SSB configuration   | 1      |       | SSB.3 FR1                   |
|   | 2      |       | SSB.3 FR1                   |
|   | 3      |       | SSB.4 FR1                   |
| CSI-RS configuration  | 1      |       | CSI-RS.1.3 FDD              |
|   | 2      |       | CSI-RS.1.3TDD               |
|   | 3      |       | CSI-RS.2.3TDD               |
| OCNG Patterns   | 1~3    |       | OP.1                        |
| TRS Configuration   | 1      |       | TRS.1.1 FDD                 |
|   | 2      |       | TRS.1.1 TDD                 |
|   | 3      |       | TRS.1.2 TDD                 |
| Initial BWP Configuration   | 1~3    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~3    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration  | 1~3    |       | SMTC.1                      |
| DRX configuration   | 1~3    |       | DRX.3                       |
| reportConfigType  | 1~3    |       | aperiodic                   |
| reportQuantity-r16  | 1~3    |       | cri-SINR-r16                |
| Number of reported RS   | 1~3    |       | 2                           |
| qcl-Info  | 1~3    |       | SSB#0 for resource#0        |
|   |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList  | 1~3    | slots | 26                          |
| T1  | 1~3    | s     | 5                           |
| EPRE ratio of PSS to SSS  | 1~3    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |       |                             |
| Propagation condition   | 1~3    |       | AWGN                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

Table A.6.6.8.1.2-2: CSI-RS specific test parameters

| Parameter  | Config | Unit          | CSI-RS#0 | CSI-RS#1 |
|--|--------|---------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~3    | dBm/15kHz     | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2    | dBm/SSB SCS   | -94.65   |          |
|  | 3      |               | -91.65   |          |
| $\hat{E}_s/I_{ot}$   | 1~3    | dB            | 0        | 3        |
| CSI-RS RSRP <sup>Note3</sup>   | 1,2    | dBm/SSB SCS   | -94.65   | -91.65   |
|  | 3      |               | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2    | dBm/9.36 MHz  | -63.69   | -61.93   |
|  | 3      | dBm/38.16 MHz | -57.59   | -55.84   |
| $\hat{E}_s/N_{oc}$   | 1~3    | dB            | 0        | 3        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |               |          |          |

### A.6.6.8.1.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.27.1.1 and relative accuracy requirement in clause 10.1.27.1.2.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.6.6.8.2 L1-SINR measurement with SSB based CMR and dedicated IMR when DRX is not used

#### A.6.6.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.2, with the testing configurations for NR cells in Table A.6.6.8.2.1-1.

**Table A.6.6.8.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.6.6.8.2.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.8.2.2-1 and Table A.6.6.8.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the SSBs and the associated CSI-RS resources, and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD measurements based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

Table A.6.6.8.2.2-1: General test parameters

| Parameter   | Config | Unit | Value                       |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1~3    |      | freq1                       |
| Duplex mode   | 1      |      | FDD                         |
|   | 2      |      | TDD                         |
|   | 3      |      | TDD                         |
| TDD Configuration   | 1      |      | N/A                         |
|   | 2      |      | TDDConf.1.1                 |
|   | 3      |      | TDDConf.2.1                 |
| BW <sub>channel</sub>   | 1      | MHz  | 10: N <sub>RB,c</sub> = 52  |
|   | 2      |      | 10: N <sub>RB,c</sub> = 52  |
|   | 3      |      | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1      |      | SR.1.1 FDD                  |
|   | 2      |      | SR.1.1 TDD                  |
|   | 3      |      | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1      |      | CR.1.1 FDD                  |
|   | 2      |      | CR.1.1 TDD                  |
|   | 3      |      | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1      |      | CCR.1.1 FDD                 |
|   | 2      |      | CCR.1.1 TDD                 |
|   | 3      |      | CCR.2.1 TDD                 |
| SSB configuration   | c      |      | SSB.3 FR1                   |
|   | 2      |      | SSB.3 FR1                   |
|   | 3      |      | SSB.4 FR1                   |
| CSI-RS configuration  | 1      |      | CSI-RS 1.1A FDD             |
|   | 2      |      | CSI-RS 1.1A TDD             |
|   | 3      |      | CSI-RS 2.1A TDD             |
| OCNG Patterns   | 1~3    |      | OP.1                        |
| Initial BWP Configuration   | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration  | 1~3    |      | SMTc.1                      |
| TRS Configuration   | 1      |      | TRS.1.1 FDD                 |
|   | 2      |      | TRS.1.1 TDD                 |
|   | 3      |      | TRS.1.2 TDD                 |
| DRX configuration   | 1~3    |      | off                         |
| reportConfigType  | 1~3    |      | periodic                    |
| reportQuantity-r16  | 1~3    |      | ssb-Index-SINR-r16          |
| Number of reported RS   | 1~3    |      | 2                           |
| L1-SINR reporting period  | 1~3    | slot | 80                          |
| T1  | 1~3    | s    | 5                           |
| T2  | 1~3    | s    | 1                           |
| EPRE ratio of PSS to SSS  | 1~3    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| Propagation condition   | 1~3    |      | AWGN                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |



Table A.6.6.8.2.2-2: SSB specific test parameters

| Parameter  | Config | Unit          | SSB#0  |        | SSB#1     |        |
|--|--------|---------------|--------|--------|-----------|--------|
|  |        |               | T1     | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~3    | dBm/15kHz     | -94.65 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2    | dBm/SSB SCS   | -94.65 |        |           |        |
|  | 3      |               | -91.65 |        |           |        |
| $\hat{E}_s/I_{ot}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| SSB RSRP <sup>Note3</sup>  | 1,2    | dBm/SSB SCS   | -94.65 | -94.65 | -Infinity | -91.65 |
|  | 3      |               | -91.65 | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2    | dBm/9.36 MHz  | -63.69 | -63.69 | -66.70    | -61.93 |
|  | 3      | dBm/38.16 MHz | -57.59 | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s/N_{oc}$   | 1~3    | dB            | 0      | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |               |        |        |           |        |

Table A.6.6.8.2.2-3: CSI-RS specific test parameters

| Parameter  | Config | Unit           | CSI-RS#0 |        | CSI-RS#1  |        |
|--|--------|----------------|----------|--------|-----------|--------|
|  |        |                | T1       | T2     | T1        | T2     |
| $N_{oc}$ <sup>Note2</sup>  | 1~3    | dBm/15kHz      | -94.65   |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | 1,2    | dBm/CSI-RS SCS | -94.65   |        |           |        |
|  | 3      |                | -91.65   |        |           |        |
| $\hat{E}_s/I_{ot}$   | 1~3    | dB             | 0        | 0      | -Infinity | 3      |
| CSI-RS RSRP <sup>Note3</sup>   | 1,2    | dBm/CSI-RS SCS | -94.65   | -94.65 | -Infinity | -91.65 |
|  | 3      |                | -91.65   | -91.65 | -Infinity | -88.65 |
| $I_o$ <sup>Note3</sup>   | 1,2    | dBm/9.36 MHz   | -63.69   | -63.69 | -66.70    | -61.93 |
|  | 3      | dBm/38.16 MHz  | -57.59   | -57.59 | -60.61    | -55.84 |
| $\hat{E}_s/N_{oc}$   | 1~3    | dB             | 0        | 0      | -Infinity | 3      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |                |          |        |           |        |

### A.6.6.8.2.3 Test Requirements

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 while meeting the accuracy requirement in clause 10.1.27.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.6.6.8.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR configured when DRX is not used

#### A.6.6.8.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with CSI-RS based CMR and dedicated IMR configured in clause 9.8.4.3, with the testing configurations for NR cells in Table A.6.6.8.3.1-1.

**Table A.6.6.8.3.1-1: Applicable NR configurations for FR1 L1-SINR test with CMR and dedicated IMR**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.6.6.8.3.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.8.3.2-1 and Table A.6.6.8.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the configured CSI-RS as CMR and an associated CSI-IM as IMR, and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. UE is also configured to measure L1-SINR based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.8.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs, and UE is configured to perform L1-SINR measurement based on the CSI-RS as CMR and the CSI-IM as IMR.

Table A.6.6.8.3.2-1: General test parameters

| Parameter   | Config | Unit  | Value                       |
|---|--------|-------|-----------------------------|
| SSB GSCN  | 1~3    |       | freq1                       |
| Duplex mode   | 1      |       | FDD                         |
|   | 2      |       | TDD                         |
|   | 3      |       | TDD                         |
| TDD Configuration   | 1      |       | N/A                         |
|   | 2      |       | TDDConf.1.1                 |
|   | 3      |       | TDDConf.2.1                 |
| BW <sub>channel</sub>   | 1      | MHz   | 10: N <sub>RB,c</sub> = 52  |
|   | 2      |       | 10: N <sub>RB,c</sub> = 52  |
|   | 3      |       | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel   | 1      |       | SR.1.1 FDD                  |
|   | 2      |       | SR.1.1 TDD                  |
|   | 3      |       | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel  | 1      |       | CR.1.1 FDD                  |
|   | 2      |       | CR.1.1 TDD                  |
|   | 3      |       | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1      |       | CCR.1.1 FDD                 |
|   | 2      |       | CCR.1.1 TDD                 |
|   | 3      |       | CCR.2.1 TDD                 |
| SSB configuration   | 1      |       | SSB.3 FR1                   |
|   | 2      |       | SSB.3 FR1                   |
|   | 3      |       | SSB.4 FR1                   |
| CSI-RS configuration  | 1      |       | CSI-RS 1.3 FDD              |
|   | 2      |       | CSI-RS 1.3 TDD              |
|   | 3      |       | CSI-RS 2.3 TDD              |
| CSI-IM configuration  | 1      |       | CSI-IM.1.2 FDD              |
|   | 2      |       | CSI-IM.1.2 TDD              |
|   | 3      |       | CSI-IM.2.2 TDD              |
| OCNG Patterns   | 1~3    |       | OP.1                        |
| TRS Configuration   | 1      |       | TRS.1.1 FDD                 |
|   | 2      |       | TRS.1.1 TDD                 |
|   | 3      |       | TRS.1.2 TDD                 |
| Initial BWP Configuration   | 1~3    |       | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~3    |       | DLBWP.1.1<br>ULBWP.1.1      |
| SMTc configuration  | 1~3    |       | SMTc.1                      |
| DRX configuration   | 1~3    |       | Off                         |
| reportConfigType  | 1~3    |       | aperiodic                   |
| reportQuantity-r16  | 1~3    |       | cri-SINR-r16                |
| Number of reported RS   | 1~3    |       | 2                           |
| qcl-Info  | 1~3    |       | SSB#0 for resource#0        |
|   |        |       | SSB#1 for resource#1        |
| reportSlotOffsetList  | 1~3    | slots | 26                          |
| T1  | 1~3    | s     | 5                           |
| EPRE ratio of PSS to SSS  | 1~3    | dB    | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |       |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |       |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |       |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |       |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |       |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |       |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |       |                             |
| Propagation condition   | 1~3    |       | AWGN                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |       |                             |

### A.6.6.8.3.2-2: CSI-RS specific test parameters

| Parameter  | Config | Unit          | CSI-RS#0 | CSI-RS#1 |
|--|--------|---------------|----------|----------|
| $N_{oc}$ <sup>Note1</sup>  | 1~3    | dBm/15kHz     | -94.65   |          |
| $N_{oc}$ <sup>Note1</sup>  | 1,2    | dBm/SSB SCS   | -94.65   |          |
|  | 3      |               | -91.65   |          |
| $\hat{E}_s/I_{ot}$   | 1~3    | dB            | 0        | 3        |
| CSI-RS RSRP <sup>Note2</sup>   | 1,2    | dBm/SSB SCS   | -94.65   | -91.65   |
|  | 3      |               | -91.65   | -88.65   |
| $I_o$ <sup>Note2</sup>   | 1,2    | dBm/9.36 MHz  | -63.69   | -61.93   |
|  | 3      | dBm/38.16 MHz | -57.59   | -55.84   |
| $\hat{E}_s/N_{oc}$   | 1~3    | dB            | 0        | 3        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |        |               |          |          |

### A.6.6.8.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR while meeting the accuracy requirement in clause 10.1.27.3.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.9 Idle Mode CA/DC Measurements

### A.6.6.9.1 SA Idle mode CA/DC measurement for FR1

#### A.6.6.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE performs the required measurements on the serving cell and the configured inter-frequency carrier for idle mode measurement reporting after the UE has entered Idle mode. This test will partly verify the Idle mode CA/DC measurements requirements in clause 4.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.9.1.1-1, A.6.6.9.1.1-2, A.6.6.9.1.1-3 and A.6.6.9.1.1-4.

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. During T1, the UE is connected to cell 1 only and shall not have any timing information of cell 2. UE is configured with early measurement reporting with channel 2. Beam level reporting for early measurements is not configured. The connection is released at the end of T1. T2 starts when the connection is released. During the time periods T2 UE is in Idle mode. At T3 the UE is paged for connection setup and requested by the network to send idle mode measurements.

**Table A.6.6.9.1.1-1: supported test configuration**

| Config   | Description  |
|--|--|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |
| Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell           |  |

**Table A.6.6.9.1.1-2: General test parameters for SA Idle mode CA/DC measurement for FR1**

| Parameter                                       | Unit | Test configuration | Value             | Comment   |
|---|------|--------------------|-------------------|---|
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2              | Two FR1 NR carrier frequencies is used.   |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell2          | NR cell 2 is on NR RF channel number 2.   |
| SMTC-SSB parameters                             |      | Config 1           | SSB.1 FR1         | As specified in clause A.3.10.1   |
|   |      | Config 2           | SSB.1 FR1         | As specified in clause A.3.10.1   |
|   |      | Config 3           | SSB.2 FR1         | As specified in clause A.3.10.1   |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                 |   |
| PRACH configuration index                       |      | Config 1,2,3       | 102               | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                 |
| CP length                                       |      | Config 1,2,3       | Normal            |   |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                 |   |
| Filter coefficient                              |      | Config 1,2,3       | 0                 | L3 filtering is not used  |
| DRX in connected mode                           |      | Config 1,2,3       | OFF               | DRX is not used   |
| DRX in idle mode                                | s    | Config 1,2,3       | [0.32]            | The value shall be used for all cells in the test.                                  |
| T331  | s    |                    | 300               |   |
| Time offset between serving and neighbour cells |      | Config 1           | 3ms               | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs               | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 10                |   |
| T2  | s    | Config 1,2,3       | [11.52]           |   |
| T3  | s    | Config 1,2,3       | 10                |   |

**Table A.6.6.9.1.1-3: Cell specific test parameters for connected mode for SA Idle mode CA/DC measurement for FR1**

| Parameter                                 |                  | Unit       | Test configuration | Cell 1                      |    |    | Cell 2     |    |    |
|---|------------------|------------|--------------------|-----------------------------|----|----|------------|----|----|
|   |                  |            |                    | T1                          | T2 | T3 | T1         | T2 | T3 |
| NR RF Channel Number                      |                  |            | Config 1,2,3       | 1                           |    |    | 2          |    |    |
| Duplex mode                               |                  |            | Config 1           | FDD                         |    |    |            |    |    |
|   |                  |            | Config 2,3         | TDD                         |    |    |            |    |    |
| TDD configuration                         |                  |            | Config 1           | Not Applicable              |    |    |            |    |    |
|   |                  |            | Config 2           | TDDConf.1.1                 |    |    |            |    |    |
|   |                  |            | Config 3           | TDDConf.2.1                 |    |    |            |    |    |
| BW <sub>channel</sub>                     |                  | MHz        | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |    |            |    |    |
|   |                  |            | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |    |            |    |    |
| BWP BW                                    |                  | MHz        | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |    |    |            |    |    |
|   |                  |            | Config 3           | 40: N <sub>RB,c</sub> = 106 |    |    |            |    |    |
| BWP configuration                         | Initial DL BWP   |            | Config 1, 2, 3     | DLBWP.0.1                   |    |    | NA         |    |    |
|   | Initial UL BWP   |            |                    | ULBWP.0.1                   |    |    | NA         |    |    |
|   | Dedicated DL BWP |            |                    | DLBWP.1.1                   |    |    | NA         |    |    |
|   | Dedicated UL BWP |            |                    | ULBWP.1.1                   |    |    | NA         |    |    |
| TRS configuration                         |                  |            | Config 1           | TRS.1.1 FDD                 |    |    | NA         |    |    |
|   |                  |            | Config 2           | TRS.1.1 TDD                 |    |    | NA         |    |    |
|   |                  |            | Config 3           | TRS.1.2 TDD                 |    |    | NA         |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |            | Config 1,2,3       | OP.1                        |    |    | OP.1       |    |    |
| PDSCH Reference measurement channel       |                  |            | Config 1           | SR.1.1 FDD                  |    |    | SR.1.1 FDD |    |    |
|   |                  |            | Config 2           | SR.1.1 TDD                  |    |    | SR.1.1 TDD |    |    |
|   |                  |            | Config 3           | SR2.1 TDD                   |    |    | SR2.1 TDD  |    |    |
| CORESET Reference Channel                 |                  |            | Config 1           | CR.1.1 FDD                  |    |    | CR.1.1 FDD |    |    |
|   |                  |            | Config 2           | CR.1.1 TDD                  |    |    | CR.1.1 TDD |    |    |
|   |                  |            | Config 3           | CR2.1 TDD                   |    |    | CR2.1 TDD  |    |    |
| SSB parameters                            |                  |            | Config 1           | SSB.1 FR1                   |    |    | SSB.5 FR1  |    |    |
|   |                  |            | Config 2           | SSB.1 FR1                   |    |    | SSB.5 FR1  |    |    |
|   |                  |            | Config 3           | SSB.2 FR1                   |    |    | SSB.6 FR1  |    |    |
| SMTC configuration defined in A.3.11      |                  |            | Config 1           | SMTC.2                      |    |    | SMTC.5     |    |    |
|   |                  |            | Config 2, 3        | SMTC.1                      |    |    | SMTC.4     |    |    |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz        | Config 1,2         | 15                          |    |    |            |    |    |
|   |                  |            | Config 3           | 30                          |    |    |            |    |    |
| EPRE ratio of PSS to SSS                  |                  |            | Config 1,2,3       | 0                           |    |    | 0          |    |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |            |                    |                             |    |    |            |    |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |            |                    |                             |    |    |            |    |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |            |                    |                             |    |    |            |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |            |                    |                             |    |    |            |    |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |            |                    |                             |    |    |            |    |    |
| EPRE ratio of PDSCH to PDSCH              |                  |            |                    |                             |    |    |            |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |            |                    |                             |    |    |            |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |            |                    |                             |    |    |            |    |    |
| $N_{oc}$ <sup>Note2</sup>                 |                  | dBm/15 kHz |                    | -98                         |    |    | -98        |    |    |
| $N_{oc}$ <sup>Note2</sup>                 |                  |            | Config 1,2         | -98                         |    |    | -98        |    |    |
| $N_{oc}$ <sup>Note2</sup>                 |                  | dBm/S CS   | Config 3           | -95                         |    |    | -95        |    |    |

|  |                  |                    |                |                |            |               |            |            |
|--|------------------|--------------------|----------------|----------------|------------|---------------|------------|------------|
| SS-RSRP <sup>Note 3</sup>  | dBm/S<br>CS      | Config 1,2         | -91            | -91            | -91        | -<br>infinite | -98        | -98        |
|  |                  | Config 3           | -88            | -88            | -88        | -<br>infinite | -95        | -95        |
| $\hat{E}_s/I_{ot}$   | dB               | Config 1,2,3,4,5,6 | 7              | 7              | 7          | -<br>infinite | 0          | 0          |
| $\hat{E}_s/N_{oc}$   | dB               | Config 1,2,3       | 7              | 7              | 7          | infinite      | 0          | 0          |
| $I_o$ <sup>Note3</sup>   | dBm/9.<br>36MHz  | Config 1,2         | -<br>62.2<br>6 | -<br>62.2<br>6 | -<br>62.26 | -70.5         | -<br>67.04 | -<br>67.04 |
|  | dBm/38<br>.16MHz | Config 3           | -<br>56.1<br>5 | -<br>56.1<br>5 | -<br>56.15 | -<br>63.94    | -<br>60.93 | -<br>60.93 |
| Propagation Condition  |                  | Config 1,2,3       | AWGN           |                |            | AWGN          |            |            |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |                  |                    |                |                |            |               |            |            |

**Table A.6.6.9.1.1-4: Cell specific test parameters for idle mode for SA Idle mode CA/DC measurement for FR1**

| Parameter | Unit | Test configuration | Cell 1 |    |    | Cell 2 |    |    |
|-----------|------|--------------------|--------|----|----|--------|----|----|
|           |      |                    | T1     | T2 | T3 | T1     | T2 | T3 |



| NR RF Channel Number   |              | 1,2,3   | 1                       |          |          | 2                       |          |          |
|--|--------------|---------|-------------------------|----------|----------|-------------------------|----------|----------|
| TDD configuration  |              | 1       | N/A                     |          |          | N/A                     |          |          |
|  |              | 2       | TDDConf.1.1             |          |          | TDDConf.1.1             |          |          |
|  |              | 3       | TDDConf.2.1             |          |          | TDDConf.2.1             |          |          |
| PDSCH RMC configuration  |              | 1       | SR.1.1 FDD              |          |          | SR.1.1 FDD              |          |          |
|  |              | 2       | SR.1.1 TDD              |          |          | SR.1.1 TDD              |          |          |
|  |              | 3       | SR.2.1 TDD              |          |          | SR.2.1 TDD              |          |          |
| RMSI CORESET RMC configuration   |              | 1       | CR.1.1 FDD              |          |          | CR.1.1 FDD              |          |          |
|  |              | 2       | CR.1.1 TDD              |          |          | CR.1.1 TDD              |          |          |
|  |              | 3       | CR.2.1 TDD              |          |          | CR.2.1 TDD              |          |          |
| Dedicated CORESET RMC configuration  |              | 1       | CCR.1.1 FDD             |          |          | CCR.1.1 FDD             |          |          |
|  |              | 2       | CCR.1.1 TDD             |          |          | CCR.1.1 TDD             |          |          |
|  |              | 3       | CCR.2.1 TDD             |          |          | CCR.2.1 TDD             |          |          |
| OCNG Pattern   |              | 1, 2, 3 | OP.1 defined in A.3.2.1 |          |          | OP.1 defined in A.3.2.1 |          |          |
| Initial DL BWP configuration   |              | 1, 2, 3 | DLBWP.0.1               |          |          | DLBWP.0.1               |          |          |
| Initial UL BWP configuration   |              | 1, 2, 3 | ULBWP.0.1               |          |          | ULBWP.0.1               |          |          |
| RLM-RS   |              | 1, 2, 3 | SSB                     |          |          | SSB                     |          |          |
| Qrxlevmin  | dBm/SCS      | 1, 2    | -140                    |          |          | -140                    |          |          |
|  |              | 3       | -137                    |          |          | -137                    |          |          |
| Pcompensation  | dB           | 1, 2, 3 | 0                       |          |          | 0                       |          |          |
| Cell_selection_and_reselection_quality_measurement   |              | 1, 2, 3 | SS-RSRP                 |          |          | SS-RSRP                 |          |          |
| $\hat{E}_s / I_{ot}$   | dB           | 1       | [14]                    | [14]     | [14]     | -infinity               | [12]     | [12]     |
|  |              | 2       |                         |          |          |                         |          |          |
|  |              | 3       |                         |          |          |                         |          |          |
| $N_{oc}$ Note2   | dBm/SCS      | 1       | [-98]                   |          |          |                         |          |          |
|  |              | 2       | [-98]                   |          |          |                         |          |          |
|  |              | 3       | [-95]                   |          |          |                         |          |          |
| $N_{oc}$ Note2   | dBm/15 kHz   | 1       | [-98]                   |          |          |                         |          |          |
|  |              | 2       |                         |          |          |                         |          |          |
|  |              | 3       |                         |          |          |                         |          |          |
| $\hat{E}_s / N_{oc}$   | dB           | 1       | [7]                     | [7]      | [7]      | -infinity               | [0]      | [0]      |
|  |              | 2       |                         |          |          |                         |          |          |
|  |              | 3       |                         |          |          |                         |          |          |
| SS-RSRP Note3  | dBm/SCS      | 1       | [-91]                   | [-91]    | [-91]    | -infinity               | [-98]    | [-98]    |
|  |              | 2       | [-91]                   | [-91]    | [-91]    | -infinity               | [-98]    | [-98]    |
|  |              | 3       | [-88]                   | [-88]    | [-88]    | -infinity               | [-95]    | [-95]    |
| Io   | dBm/9.36 MHz | 1       | [-62.26]                | [-62.26] | [-62.26] | [-70.5]                 | [-67.04] | [-67.04] |
|  |              | 2       | [-62.26]                | [-62.26] | [-62.26] | [-70.5]                 | [-67.04] | [-67.04] |
|  |              | 3       | [-56.15]                | [-56.15] | [-56.15] | [-63.94]                | [-60.93] | [-60.93] |
| Treselection   | s            | 1, 2, 3 | 0                       | 0        | 0        | 0                       | 0        | 0        |
| SnointrasearchP  | dB           | 1, 2, 3 | Not sent                |          |          | Not sent                |          |          |
| Propagation Condition  |              | 1, 2, 3 | AWGN                    |          |          |                         |          |          |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |         |                         |          |          |                         |          |          |

### A.6.6.9.1.2 Test Requirements

The UE behaviour during time durations T2 and T3 shall be as follows:

During the time period T2 the UE is in Idle mode and the signal level of cell 2 is changed. The UE shall not perform reselection. The UE shall perform Idle Mode CA measurement according to Section 4.4.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report for cell 2. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for Cell 2 meets the requirements in Section 10.X and test ends.

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

## A.6.6.10 CSI-RS based intra-frequency Measurements

### A.6.6.10.1 SA event triggered reporting tests without gap under non-DRX

#### A.6.6.10.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA CSI-RS based L3 intra-frequency requirements in clauses 9.10.2.

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Table A.6.6.10.1.1-1 and A.6.6.10.1.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

**Table A.6.6.10.1.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode                      |
| 2             | 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode                      |
| 3             | 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode                      |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.6.6.10.1.1-2: General test parameters for SA intra-frequency event triggered reporting without gap for FR1**

| Parameter                                       | Unit | Test configuration | Value                | Comment  |
|---|------|--------------------|----------------------|--|
| Active cell                                     |      | 1, 2, 3            | Cell 1               |  |
| Neighbour cell                                  |      | 1, 2, 3            | Cell 2               | Cell to be identified and measured.  |
| RF Channel Number                               |      | 1, 2, 3            | 1: Cell 1 and Cell 2 |  |
| SSB configuration                               |      | 1                  | SSB.1 FR1            |  |
|   |      | 2                  | SSB.1 FR1            |  |
|   |      | 3                  | SSB.2 FR1            |  |
| SMTC configuration                              |      | 1                  | SMTC.2               |  |
|   |      | 2                  | SMTC.1               |  |
|   |      | 3                  | SMTC.1               |  |
| CSI-RS configuration for RRM                    |      | 1                  | CSI-RS.RRM.FR1.1 FDD |  |
|   |      | 2                  | CSI-RS.RRM.FR1.1 TDD |  |
|   |      | 3                  | CSI-RS.RRM.FR1.2 TDD |  |
| A3-Offset                                       | dB   | 1, 2, 3            | -4.5                 |  |
| CP length                                       |      | 1, 2, 3            | Normal               |  |
| Hysteresis                                      | dB   | 1, 2, 3            | 0                    |  |
| Time To Trigger                                 | s    | 1, 2, 3            | 0                    |  |
| Filter coefficient                              |      | 1, 2, 3            | 0                    | L3 filtering is not used   |
| DRX   |      | 1, 2, 3            |                      | OFF  |
| Time offset between serving and neighbour cells | μs   | 1                  | 4.7                  | Asynchronous cells.<br>The timing of Cell 2 is CP later than the timing of Cell 1. |
|   |      | 2                  | 4.7                  | Synchronous cells  |
|   |      | 3                  | 2.35                 | Synchronous cells  |
| T1  | s    | 1, 2, 3            | 5                    |  |
| T2  | s    | 1, 2, 3            | 1                    |  |

Table A.6.6.10.1.1-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FR1

| Parameter  | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |        |
|--|---------------|--------------------|------------------------|--------|------------------------|--------|
|  |               |                    | T1                     | T2     | T1                     | T2     |
| TDD configuration  |               | 1                  | TN/A                   |        | TN/A                   |        |
|  |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1            |        |
|  |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1            |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD             |        | N/A                    |        |
|  |               | 2                  | SR.1.1 TDD             |        |                        |        |
|  |               | 3                  | SR.2.1 TDD             |        |                        |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD             |        | CR.1.1 FDD             |        |
|  |               | 2                  | CR.1.1 TDD             |        | CR.1.1 TDD             |        |
|  |               | 3                  | CR.2.1 TDD             |        | CR.2.1 TDD             |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD            |        | CCR.1.1 FDD            |        |
|  |               | 2                  | CCR.1.1 TDD            |        | CCR.1.1 TDD            |        |
|  |               | 3                  | CCR.2.1 TDD            |        | CCR.2.1 TDD            |        |
| OCNG Patterns  |               | 1, 2, 3            | OP.1                   |        | OP.1                   |        |
| TRS Configuration  |               | 1                  | TRS.1.1 FDD            |        | N/A                    |        |
|  |               | 2                  | TRS.1.1 TDD            |        | N/A                    |        |
|  |               | 3                  | TRS.1.2 TDD            |        | N/A                    |        |
| Initial BWP configuration  |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |        |
| Active DL BWP configuration  |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.1              |        |
| Active UL BWP configuration  |               | 1, 2, 3            | ULBWP.1.1              |        | ULBWP.1.1              |        |
| RLM-RS   |               | 1, 2, 3            | SSB                    |        | SSB                    |        |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/SCS       | 1                  | -98                    |        |                        |        |
|  |               | 2                  | -98                    |        |                        |        |
|  |               | 3                  | -95                    |        |                        |        |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/15 kHz    | 1                  | -98                    |        |                        |        |
|  |               | 2                  |                        |        |                        |        |
|  |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/I_{ot}$   | dB            | 1                  | 4                      | -1.46  | -Infinity              | -1.46  |
|  |               | 2                  |                        |        |                        |        |
|  |               | 3                  |                        |        |                        |        |
| $\hat{E}_s/N_{oc}$   | dB            | 1                  | 4                      | 4      | -Infinity              | 4      |
|  |               | 2                  |                        |        |                        |        |
|  |               | 3                  |                        |        |                        |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity              | -94    |
|  |               | 2                  | -94                    | -94    | -Infinity              | -94    |
|  |               | 3                  | -91                    | -91    | -Infinity              | -91    |
| CSI-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1                  | -94                    | -94    | -Infinity              | -94    |
|  |               | 2                  | -94                    | -94    | -Infinity              | -94    |
|  |               | 3                  | -91                    | -91    | -Infinity              | -91    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|  | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | --64.60                | -62.25 |
|  | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | --58.50                | -56.16 |
| Propagation Condition  |               | 1, 2, 3            | AWGN                   |        |                        |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |                        |        |

### A.6.6.10.1.2 Test Requirements

In this test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.11 CSI-RS based inter-frequency Measurements

### A.6.6.11.1 SA event triggered reporting tests with gap under DRX

#### A.6.6.11.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA CSI-RS based L3 inter-frequency measurement requirements in clause 9.10.3.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.11.1.1-1, A.6.6.11.1.1-2 and A.6.6.11.1.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.11.1.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.11.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.6.6.11.1.1-1: SA event triggered reporting tests for FR1-FR1**

| Config  | Description  |
|---------|--|
| 1       | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode                  |
| 2       | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode                  |
| 3       | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode                  |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |
| Note 2: | target NR cell has the same SCS, BW and duplex mode as NR serving cell           |

**Table A.6.6.11.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1**

| Parameter                                       | Unit    | Test configuration | Value             |        | Comment  |
|---|---------|--------------------|-------------------|--------|--|
|   |         |                    | Test 1            | Test 2 |  |
| NR RF Channel Number                            |         | Config 1,2,3       | 1, 2              |        | Two FR1 NR carrier frequencies is used.  |
| Active cell                                     |         | Config 1,2,3       | NR cell 1 (Pcell) |        | NR Cell 1 is on NR RF channel number 1.  |
| Neighbour cell                                  |         | Config 1,2,3       | NR cell2          |        | NR cell 2 is on NR RF channel number 2.  |
| Gap Pattern Id                                  |         | Config 1,2,3       | 0                 | 4      | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |         | Config 1,2,3       | 9                 | 9      |  |
| A3-Offset                                       | dB      | Config 1,2,3       | -6                |        |  |
| Hysteresis                                      | dB      | Config 1,2,3       | 0                 |        |  |
| CP length                                       |         | Config 1,2,3       | Normal            |        |  |
| TimeToTrigger                                   | s       | Config 1,2,3       | 0                 |        |  |
| Filter coefficient                              |         | Config 1,2,3       | 0                 |        | L3 filtering is not used   |
| DRX   |         | Config 1,2,3       | DRX.5             | DRX.5  | As specified in clause A.3.3   |
| Time offset between serving and neighbour cells | $\mu$ s | Config 1           | 4.7               |        | Asynchronous cells.<br>The timing of Cell 2 is CP later than the timing of Cell 1. |
|   |         | Config 2           | 4.7               |        | Synchronous cells.   |
|   |         | Config 3           | 2.35              |        | Synchronous cells.   |
| T1  | s       | Config 1,2,3       | 5                 |        |  |
| T2  | s       | Config 1,2,3       | 10                | 10     |  |

**Table A.6.6.11.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

| Parameter                                 |                  | Unit | Test configuration | Cell 1                      |                      | Cell 2 |    |
|---|------------------|------|--------------------|-----------------------------|----------------------|--------|----|
|   |                  |      |                    | T1                          | T2                   | T1     | T2 |
| NR RF Channel Number                      |                  |      | Config 1,2,3       | 1                           |                      | 2      |    |
| Duplex mode                               |                  |      | Config 1           | FDD                         |                      |        |    |
|   |                  |      | Config 2,3         | TDD                         |                      |        |    |
| TDD configuration                         |                  |      | Config 1           | Not Applicable              |                      |        |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |                      |        |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |                      |        |    |
| BW <sub>channel</sub>                     |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |                      |        |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |                      |        |    |
| BWP BW                                    |                  | MHz  | Config 1,2         | 10: N <sub>RB,c</sub> = 52  |                      |        |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |                      |        |    |
| BWP configuration                         | Initial DL BWP   |      | Config 1, 2, 3     | DLBWP.0.1                   | NA                   |        |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                   | NA                   |        |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   | NA                   |        |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   | NA                   |        |    |
| TRS configuration                         |                  |      | Config 1           | TRS.1.1 FDD                 | NA                   |        |    |
|   |                  |      | Config 2           | TRS.1.1 TDD                 | NA                   |        |    |
|   |                  |      | Config 3           | TRS.1.2 TDD                 | NA                   |        |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |      | Config 1,2,3       | OP.1                        | OP.1                 |        |    |
| PDSCH Reference measurement channel       |                  |      | Config 1           | SR.1.1 FDD                  |                      |        |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |                      |        |    |
|   |                  |      | Config 3           | SR2.1 TDD                   |                      |        |    |
| CORESET Reference Channel                 |                  |      | Config 1           | CR.1.1 FDD                  | -                    |        |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |                      |        |    |
|   |                  |      | Config 3           | CR2.1 TDD                   |                      |        |    |
| SSB parameters                            |                  |      | Config 1           | SSB.1 FR1                   | SSB.5 FR1            |        |    |
|   |                  |      | Config 2           | SSB.1 FR1                   | SSB.5 FR1            |        |    |
|   |                  |      | Config 3           | SSB.2 FR1                   | SSB.6 FR1            |        |    |
| SMTC configuration defined in A.3.11      |                  |      | Config 1           | SMTC.2                      | SMTC.5               |        |    |
|   |                  |      | Config 2, 3        | SMTC.1                      | SMTC.4               |        |    |
| CSI-RS configuration for RRM              |                  |      | Config 1           | CSI-RS.RRM.FR1.1 FDD        | CSI-RS.RRM.FR1.1 FDD |        |    |
|   |                  |      | Config 2           | CSI-RS.RRM.FR1.1 TDD        | CSI-RS.RRM.FR1.1 TDD |        |    |
|   |                  |      | Config 3           | CSI-RS.RRM.FR1.2 TDD        | CSI-RS.RRM.FR1.2 TDD |        |    |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz  | Config 1,2         | 15                          |                      |        |    |
|   |                  |      | Config 3           | 30                          |                      |        |    |
| EPRE ratio of PSS to SSS                  |                  |      | Config 1,2,3       | 0                           | 0                    |        |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |      |                    |                             |                      |        |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |      |                    |                             |                      |        |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |      |                    |                             |                      |        |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |      |                    |                             |                      |        |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |      |                    |                             |                      |        |    |
| EPRE ratio of PDSCH to PDSCH              |                  |      |                    |                             |                      |        |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |      |                    |                             |                      |        |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |      |                    |                             |                      |        |    |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/15 kHz       |      |                    | -98                         | -98                  |        |    |
| $N_{oc}$ <sup>Note2</sup>                 | dBm/S CS         |      | Config 1,2         | -98                         | -98                  |        |    |
|   |                  |      | Config 3           | -95                         | -95                  |        |    |



|  |                  |              |        |        |           |        |
|--|------------------|--------------|--------|--------|-----------|--------|
| CSI-RSRP <sup>Note 3</sup>   | dBm/S<br>CS      | Config 1,2   | -94    | -94    | -Infinity | -91    |
|  |                  | Config 3     | -91    | -91    | -Infinity | -88    |
| SS-RSRP <sup>Note 3</sup>  | dBm/S<br>CS      | Config 1,2   | -94    | -94    | -Infinity | -91    |
|  |                  | Config 3     | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$   | dB               | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$   | dB               | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.<br>36MHz  | Config 1,2   | -64.59 | -64.59 | -70.05    | -62.26 |
|  | dBm/38<br>.16MHz | Config 3     | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |                  | Config 1,2,3 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |                  |              |        |        |           |        |

#### A.6.6.11.1.2 Test Requirements

In test 1 with per-UE gap and test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 9280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.12 RSTD measurements

##### A. 6.6.12.1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA

###### A. 6.6.12.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in Table A.6.6.12.1.1-1.

**Table A.6.6.12.1.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All 3 cells are on the same RF channel in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2.

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of T2, where  $\Delta T = 50$  ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #0 before T2.

The general test parameters are listed in Table A.6.6.12.1.1-2, and cell specific test parameters are listed in Table A.6.6.12.1.1-3.

**Table A.6.6.12.1.1-2: General test parameters for RSTD measurement reporting delay**

| Parameter   | Unit         | Value   | Comment  |
|---|--------------|---|--|
| Reference cell  |              | Cell 1  | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355[34]. The reference cell is the PCell in this test case. |
| Neighbor cells  |              | Cell 2 and Cell 3   | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data.   |
| SSB configuration   | Config 1     | SSB.1 FR1   |  |
|   | Config 2     | SSB.1 FR1   |  |
|   | Config 3     | SSB.2 FR1   |  |
| SMTC configuration  | Config 1     | SMTC.2  |  |
|   | Config 2     | SMTC.1  |  |
|   | Config 3     | SMTC.1  |  |
| PDSCH RMC configuration   | Config 1     | SR.1.1 FDD  |  |
|   | Config 2     | SR.1.1 TDD  |  |
|   | Config 3     | SR.2.1 TDD  |  |
| RMSI CORESET RMC configuration  | Config 1     | CR.1.1 FDD  | As specified in clause A.3.1.2.1   |
|   | Config 2     | CR.1.1 TDD  |  |
|   | Config 3     | CR.2.1 TDD  |  |
| Dedicated CORESET RMC configuration   | Config 1     | CR.1.1 FDD  |  |
|   | Config 2     | CR.1.1 TDD  |  |
|   | Config 3     | CR.2.1 TDD  |  |
| Initial BWP configuration   | Config 1,2,3 | DLBWP.0.1<br>ULBWP.0.1  |  |
| Active DL BWP configuration   | Config 1,2,3 | DLBWP.1.1   |  |
| Active UL BWP configuration   | Config 1,2,3 | ULBWP.1.1   |  |
| PRS Configuration   | Config 1     | PRS.1.1 FR1   | As specified in clause A.3.31  |
|   | Config 2     | PRS.1.2 FR1   |  |
|   | Config 3     | PRS.2.1 FR1   |  |
| Physical cell ID PCI  |              | (PCI of Cell 1 – PCI of Cell 2)mod6=0<br>and<br>(PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters   |
| CP length   |              | Normal  |  |
| DRX   |              | OFF   |  |
| Measurement gap   |              | GP#24 or GP#0   | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured   |
| Radio frame receive time offset between the cells at the UE antenna connector | µs           | Cell 2 to Cell 1: 0<br>Cell 3 to Cell 1: 3  | PRS are transmitted from synchronous cells   |
| Expected RSTD   | µs           | Cell 2: 3<br>Cell 3: 3<br>Other neighbour cells:<br>randomly between -3 and 3         | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator   |

|   |    |  |   |
|---|----|--|---|
| Expected RSTD uncertainty for all neighbour cells   | µs | 5  | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data |    | 16   | Including the reference cell  |
| PRS muting info                                     |    | Cell 1: '10'<br>Cell 2: '01'<br>Cell 3: '10' | Corresponds to prs-MutingInfo defined in TS 37.355 [34]   |
| PRS resource RE offset                              |    | Cell 1: 0<br>Cell 2: 0<br>Cell 3: 1          | Cell 1 and Cell 3 are configured with different resource offsets  |
| T1  | s  | 3  | The length of the time interval from the beginning of each test   |
| T2  | s  | [1..28]                                      | The length of the time interval that follows immediately after time interval T1   |

**Table A.6.6.12.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

| Parameter  |          | Unit         | Cell 1    | Cell 2    | Cell 3    |
|--|----------|--------------|-----------|-----------|-----------|
| NR RF Channel Number   |          |              | 1         | 1         | 1         |
| Positioning frequency layer  |          |              | 1         | 1         | 1         |
| Correlation Matrix and Antenna Configuration   |          |              | 1x2 Low   | 1x2 Low   | 1x2 Low   |
| OCNG patterns defined in A.3.2.1   |          |              | OP.1      | N/A       | N/A       |
| $N_{oc}$ <small>Note 3</small>   | Config 1 | dBm/SCS      | -98       |           |           |
|  | Config 2 | dBm/SCS      | -98       |           |           |
|  | Config 3 | dBm/SCS      | -95       |           |           |
| PRS $\hat{E}_s/N_{oc}$   |          | dB           | -Infinity | -Infinity | -Infinity |
| SSB $\hat{E}_s/N_{oc}$   |          | dB           | 10        | -Infinity | -Infinity |
| $I_o$ <small>Note 4</small>  | Config 1 | dBm/9.36MHz  | -68.63    | -70.05    | -70.05    |
|  | Config 2 | dBm/9.36MHz  | -68.63    | -70.05    | -70.05    |
|  | Config 3 | dBm/38.16MHz | -63.20    | -63.96    | -63.96    |
| SSB RP <small>Note 4</small>   | Config 1 | dBm/SCS      | -88       | -Infinity | -Infinity |
|  | Config 2 | dBm/SCS      | -88       | -Infinity | -Infinity |
|  | Config 3 | dBm/SCS      | -88       | -Infinity | -Infinity |
| Propagation Condition  |          |              | AWGN      |           |           |
| <p>Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 4: SSB RP and <math>I_o</math> levels have been derived from other parameters and are given for information purpose. These are not settable test parameters.</p> |          |              |           |           |           |

**Table A.6.6.12.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|-----------|------|--------|--------|--------|
|           |      | T2     | T2     | T2     |

|  |          |              |                           |                           |                           |
|--|----------|--------------|---------------------------|---------------------------|---------------------------|
| NR RF Channel Number   |          |              | 1                         | 1                         | 1                         |
| Correlation Matrix and Antenna Configuration   |          |              | 1x2 Low                   | 1x2 Low                   | 1x2 Low                   |
| OCNG patterns defined in A.3.2.1   |          |              | OP.1                      | OP.1                      | OP.1                      |
| PRACH configuration  |          |              | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| $N_{oc}$ <sup>Note 3</sup>   | Config 1 | dBm/SCS      | -98                       | -98                       | -98                       |
|  | Config 2 | dBm/SCS      | -98                       | -98                       | -98                       |
|  | Config 3 | dBm/SCS      | -95                       | -95                       | -95                       |
| PRS $\hat{E}_s/N_{oc}$   | Config 1 | dB           | -5.45                     | -11.67                    | -11.67                    |
|  | Config 2 | dB           | -5.45                     | -11.67                    | -11.67                    |
|  | Config 3 | dB           | -5.45                     | -11.67                    | -11.67                    |
| $I_o$ <sup>Note 4</sup>  | Config 1 | dBm/9.36MHz  | -69.59                    | -69.93                    | -69.93                    |
|  | Config 2 | dBm/96.48MHz | -69.59                    | -69.93                    | -69.93                    |
|  | Config 3 | dBm/38.16MHz | -63.72                    | -63.89                    | -63.89                    |
| PRS $\hat{E}_s/I_{ot}$   |          | dB           | -6                        | 13                        | -13                       |
| Propagation Condition  |          |              | AWGN                      |                           |                           |
| <p>Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS.</p> <p>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |          |              |                           |                           |                           |

### A.6.6.12.1.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.1.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD1970049

## A. 6.6.12.2 NR RSTD measurement reporting delay test case for dual positioning frequency layers in FR1 SA

### A. 6.6.12.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR1 in standalone scenario when dual positioning frequency layers are configured.

The supported test configurations are specified in Table A.6.6.12.2.1-1.

**Table A.6.6.12.2.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. Cell 3 is on a different RF channel with Cell 1 and Cell 2.

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2.

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of T2, where  $\Delta T = 50$  ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #0 before T2.

The general test parameters are listed in Table A.6.6.12.2.1-2, and cell specific test parameters are listed in Table A.6.6.12.2.1-3.

**Table A.6.6.12.2.1-2: General test parameters for RSTD measurement reporting delay**



| Parameter   |              | Unit | Value   | Comment  |
|---|--------------|------|---|--|
| Reference cell  |              |      | Cell 1  | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355[34]. The reference cell is the PCell in this test case. |
| Neighbor cells  |              |      | Cell 2 and Cell 3   | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data.   |
| SSB configuration   | Config 1     |      | SSB.1 FR1   |  |
|   | Config 2     |      | SSB.1 FR1   |  |
|   | Config 3     |      | SSB.2 FR1   |  |
| SMTC configuration  | Config 1     |      | SMTC.2  |  |
|   | Config 2     |      | SMTC.1  |  |
|   | Config 3     |      | SMTC.1  |  |
| PDSCH RMC configuration   | Config 1     |      | SR.1.1 FDD  |  |
|   | Config 2     |      | SR.1.1 TDD  |  |
|   | Config 3     |      | SR.2.1 TDD  |  |
| RMSI CORESET RMC configuration  | Config 1     |      | CR.1.1 FDD  | As specified in clause A.3.1.2.1   |
|   | Config 2     |      | CR.1.1 TDD  |  |
|   | Config 3     |      | CR.2.1 TDD  |  |
| Dedicated CORESET RMC configuration   | Config 1     |      | CR.1.1 FDD  |  |
|   | Config 2     |      | CR.1.1 TDD  |  |
|   | Config 3     |      | CR.2.1 TDD  |  |
| Initial BWP configuration   | Config 1,2,3 |      | DLBWP.0.1<br>ULBWP.0.1  |  |
| Active DL BWP configuration   | Config 1,2,3 |      | DLBWP.1.1   |  |
| Active UL BWP configuration   | Config 1,2,3 |      | ULBWP.1.1   |  |
| PRS Configuration   | Config 1     |      | PRS.1.1 FR1   | As specified in clause A.3.xx  |
|   | Config 2     |      | PRS.1.2 FR1   |  |
|   | Config 3     |      | PRS.2.1 FR1   |  |
| Physical cell ID PCI  |              |      | (PCI of Cell 1 – PCI of Cell 2)mod6=0<br>and<br>(PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters   |
| CP length   |              |      | Normal  |  |
| DRX   |              |      | OFF   |  |
| Measurement gap   |              |      | GP#24 or GP#0   | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured   |
| Radio frame receive time offset between the cells at the UE antenna connector |              | µs   | Cell 2 to Cell 1: 0<br>Cell 3 to Cell 1: 3  | PRS are transmitted from synchronous cells   |
| Expected RSTD   |              | µs   | Cell 2: 3<br>Cell 3: 3<br>Other neighbour cells:<br>randomly between -3 and 3         | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator   |
| Expected RSTD uncertainty for all neighbour cells                             |              | µs   | 500   | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index  |

|   |   |  |   |
|---|---|--|---|
| Number of cells provided in DL-TDOA assistance data |   | 16   | Including the reference cell  |
| PRS muting info                                     |   | Cell 1: '10'<br>Cell 2: '01'<br>Cell 3: '10' | Corresponds to prs-MutingInfo defined in TS 37.355 [34]                         |
| PRS resource RE offset                              |   | Cell 1: 0<br>Cell 2: 0<br>Cell 3: 1          | Cell 1 and Cell 3 are configured with different resource offsets                |
| T1  | s | 3  | The length of the time interval from the beginning of each test                 |
| T2  | s | [1..28]                                      | The length of the time interval that follows immediately after time interval T1 |

**Table A.6.6.12.2.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

| Parameter  |          | Unit         | Cell 1    | Cell 2    | Cell 3    |
|--|----------|--------------|-----------|-----------|-----------|
| NR RF Channel Number   |          |              | 1         | 1         | 2         |
| Positioning frequency layer  |          |              | 1         | 1         | 2         |
| Correlation Matrix and Antenna Configuration   |          |              | 1x2 Low   | 1x2 Low   | 1x2 Low   |
| OCNG patterns defined in A.3.2.1   |          |              | OP.1      | N/A       | N/A       |
| $N_{oc}$ Note 3  | Config 1 | dBm/SCS      | -98       |           |           |
|  | Config 2 | dBm/SCS      | -98       |           |           |
|  | Config 3 | dBm/SCS      | -95       |           |           |
| $PRS \hat{E}_s / N_{oc}$   |          | dB           | -Infinity | -Infinity | -Infinity |
| $I_o$ Note 4   | Config 1 | dBm/9.36MHz  | -68.63    | -70.05    | -70.05    |
|  | Config 2 | dBm/9.36MHz  | -68.63    | -70.05    | -70.05    |
|  | Config 3 | dBm/38.16MHz | -63.20    | -63.96    | -63.96    |
| SSB RP Note 4  | Config 1 | dBm/SCS      | -88       | -Infinity | -Infinity |
|  | Config 2 | dBm/SCS      | -88       | -Infinity | -Infinity |
|  | Config 3 | dBm/SCS      | -88       | -Infinity | -Infinity |
| Propagation Condition  |          |              | AWGN      |           |           |
| <p>Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 4: SSB RP and <math>I_o</math> levels have been derived from other parameters and are given for information purpose. These are not settable test parameters.</p> |          |              |           |           |           |

**Table A.6.6.12.2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2 and T3**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|-----------|------|--------|--------|--------|
|           |      | T2     | T2     | T2     |

|  |          |              |                           |                           |                           |
|--|----------|--------------|---------------------------|---------------------------|---------------------------|
| NR RF Channel Number   |          |              | 1                         | 1                         | 2                         |
| Positioning frequency layer  |          |              | 1                         | 1                         | 2                         |
| Correlation Matrix and Antenna Configuration   |          |              | 1x2 Low                   | 1x2 Low                   | 1x2 Low                   |
| OCNG patterns defined in A.3.2.1   |          |              | OP.1                      | OP.1                      | OP.1                      |
| PRACH configuration  |          |              | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| $N_{oc}$ Note 3  | Config 1 | dBm/SCS      | -98                       | -98                       | -98                       |
|  | Config 2 | dBm/SCS      | -98                       | -98                       | -98                       |
|  | Config 3 | dBm/SCS      | -95                       | -95                       | -95                       |
| PRS $\hat{E}_s/N_{oc}$   | Config 1 | dB           | -5.45                     | -11.67                    | -11.67                    |
|  | Config 2 | dB           | -5.45                     | -11.67                    | -11.67                    |
|  | Config 3 | dB           | -5.45                     | -11.67                    | -11.67                    |
| $I_0$ Note 4   | Config 1 | dBm/9.36MHz  | -69.59                    | -69.93                    | -69.93                    |
|  | Config 2 | dBm/96.48MHz | -69.59                    | -69.93                    | -69.93                    |
|  | Config 3 | dBm/38.16MHz | -63.72                    | -63.89                    | -63.89                    |
| PRS $\hat{E}_s/I_{ot}$   |          | dB           | -6                        | -13                       | -13                       |
| Propagation Condition  |          |              | AWGN                      |                           |                           |
| <p>Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS.</p> <p>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |          |              |                           |                           |                           |

### A.6.6.12.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.1.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## A.6.6.13 PRS-RSRP measurements

### A.6.6.13.1 PRS-RSRP reporting delay test case for single positioning frequency layer

#### A.6.6.13.1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement meets the delay requirements specified in clause 9.9.3.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.6.13.1.1-1.

**Table A.6.6.13.1.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. The test consists of two consecutive time intervals, with duration of T1 and T2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is  $\Delta T$  after slot #n, where  $\Delta T = 50$  ms is the maximum processing time of the assistance data and location information request.

The general test parameters are listed in Table A.6.6.13.1.1-2, and cell specific test parameters are listed in Table A.6.6.13.1.1-3.

**Table A.6.6.13.1.1-2: General test parameters**

| Parameter   | Unit | Test configuration | Value                           | Comment   |
|---|------|--------------------|---------------------------------|---|
| Reference cell  |      | 1, 2, 3            | Cell 1                          | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell  |      | 1, 2, 3            | Cell 2                          | Cell 2 is a neighbour cell in the positioning assistance data.                        |
| RF Channel Number   |      | 1, 2, 3            | 1: Cell 1 and Cell 2            |   |
| BW <sub>channel</sub>   | MHz  | 1                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 2                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 3                  | 40: N <sub>RB,c</sub> = 106     |   |
| SSB configuration   |      | 1                  | SSB.1 FR1                       |   |
|   |      | 2                  | SSB.1 FR1                       |   |
|   |      | 3                  | SSB.2 FR1                       |   |
| SMTTC configuration   |      | 1                  | SMTTC.2                         |   |
|   |      | 2                  | SMTTC.1                         |   |
|   |      | 3                  | SMTTC.1                         |   |
| Measurement gap   |      | 1, 2, 3            | GP#24 or GP#0 <sup>Note 1</sup> |   |
| CP length   |      | 1, 2, 3            | Normal                          |   |
| DRX   |      | 1, 2, 3            | NA                              | OFF   |
| Time offset between serving and neighbour cells                                 | μs   | 1, 2, 3            | 3                               | Synchronous cells   |
| Expected RSTD   | μs   | 1, 2, 3            | 3                               |   |
| Expected RSTD uncertainty   | μs   | 1, 2, 3            | 5                               |   |
| T1  | s    | 1, 2, 3            | 2                               |   |
| T2  | s    | 1, 2, 3            | [5]                             |   |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. |      |                    |                                 |   |

Table A.6.6.13.1.1-3: Cell specific test parameters

| Parameter  | Unit          | Test configuration | Cell 1                 |        | Cell 2      |        |
|--|---------------|--------------------|------------------------|--------|-------------|--------|
|  |               |                    | T1                     | T2     | T1          | T2     |
| TDD configuration  |               | 1                  | N/A                    |        | N/A         |        |
|  |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1 |        |
|  |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1 |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | SR.1.1 TDD             |        |             |        |
|  |               | 3                  | SR.2.1 TDD             |        |             |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | CR.1.1 TDD             |        |             |        |
|  |               | 3                  | CR.2.1 TDD             |        |             |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | CCR.1.1 TDD            |        |             |        |
|  |               | 3                  | CCR.2.1 TDD            |        |             |        |
| OCNG Patterns  |               | 1, 2, 3            | OP.1                   |        | OP.1        |        |
| TRS Configuration  |               | 1                  | TRS.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | TRS.1.1 TDD            |        |             |        |
|  |               | 3                  | TRS.1.2 TDD            |        |             |        |
| Initial BWP configuration  |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | N/A         |        |
| Active DL BWP configuration  |               | 1, 2, 3            | DLBWP.1.1              |        | N/A         |        |
| Active UL BWP configuration  |               | 1, 2, 3            | ULBWP.1.1              |        | N/A         |        |
| PRS configuration  |               | 1                  | PRS.1.4 FR1            |        | PRS.1.4 FR1 |        |
|  |               | 2                  | PRS.1.4 FR1            |        | PRS.1.4 FR1 |        |
|  |               | 3                  | PRS.2.4 FR1            |        | PRS.2.4 FR1 |        |
| PRS muting info  |               | 1, 2, 3            | '10'                   |        | '01'        |        |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/SCS       | 1                  | -98                    |        |             |        |
|  |               | 2                  | -98                    |        |             |        |
|  |               | 3                  | -95                    |        |             |        |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/15 kHz    | 1                  | -98                    |        |             |        |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/I_{ot}$   | dB            | 1                  | -Infinity              | -3     | -Infinity   | -10    |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/N_{oc}$   | dB            | 1                  | -Infinity              | -3     | -Infinity   | -10    |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1                  | -Infinity              | -101   | -Infinity   | -108   |
|  |               | 2                  | -Infinity              | -101   | -Infinity   | -108   |
|  |               | 3                  | -Infinity              | -98    | -Infinity   | -105   |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS kHz   | 1                  | -88                    | -88    | -88         | -88    |
|  |               | 2                  | -88                    | -88    | -88         | -88    |
|  |               | 3                  | -85                    | -85    | -85         | -85    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | N/A                    | -62.25 | N/A         | -62.25 |
|  | dBm/9.36 MHz  | 2                  |                        | -62.25 |             | -62.25 |
|  | dBm/38.16 MHz | 3                  |                        | -56.16 |             | -56.16 |
| Propagation Condition  |               | 1, 2, 3            | AWGN                   |        |             |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |             |        |

### A.6.6.13.1.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 9.9.3.5, starting from the beginning of time interval T2.

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

### A.6.6.13.2 PRS-RSRP reporting delay test case for dual positioning frequency layer

#### A.6.6.13.2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement meets the delay requirements specified in clause 9.9.3.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.6.13.2.1-1.

**Table A.6.6.13.2.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell on NR RF channel #1 in FR1. Cell 2 is a neighbour cell on a different NR RF channel #2 in FR1. The test consists of two consecutive time intervals, with duration of T1 and T2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is  $\Delta T$  after slot #n, where  $\Delta T = 50$  ms is the maximum processing time of the assistance data and location information request.

The general test parameters are listed in Table A.6.6.13.2.1-2, and cell specific test parameters are listed in Table A.6.6.13.2.1-3.

Table A.6.6.13.2.1-2: General test parameters

| Parameter   | Unit | Test configuration | Value                           | Comment   |
|---|------|--------------------|---------------------------------|---|
| Reference cell  |      | 1, 2, 3            | Cell 1                          | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell  |      | 1, 2, 3            | Cell 2                          | Cell 2 is a neighbour cell in the positioning assistance data.                        |
| RF Channel Number   |      | 1, 2, 3            | 1: Cell 1<br>2: Cell 2          | Cell 1 and Cell 2 are on different positioning frequency layers                       |
| BW <sub>channel</sub>   | MHz  | 1                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 2                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 3                  | 40: N <sub>RB,c</sub> = 106     |   |
| SSB configuration   |      | 1                  | SSB.1 FR1                       |   |
|   |      | 2                  | SSB.1 FR1                       |   |
|   |      | 3                  | SSB.2 FR1                       |   |
| SMTC configuration  |      | 1                  | SMTC.2                          |   |
|   |      | 2                  | SMTC.1                          |   |
|   |      | 3                  | SMTC.1                          |   |
| Measurement gap   |      | 1, 2, 3            | GP#24 or GP#0 <sup>Note 1</sup> |   |
| CP length   |      | 1, 2, 3            | Normal                          |   |
| DRX   |      | 1, 2, 3            | NA                              | OFF   |
| Time offset between serving and neighbour cells                                 | μs   | 1, 2, 3            | 3                               | Synchronous cells   |
| Expected RSTD   | μs   | 1, 2, 3            | 3                               |   |
| Expected RSTD uncertainty   | μs   | 1, 2, 3            | 5                               |   |
| T1  | s    | 1, 2, 3            | 2                               |   |
| T2  | s    | 1, 2, 3            | [10]                            |   |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. |      |                    |                                 |   |

Table A.6.6.13.2.1-3: Cell specific test parameters

| Parameter  | Unit          | Test configuration | Cell 1                 |        | Cell 2      |        |
|--|---------------|--------------------|------------------------|--------|-------------|--------|
|  |               |                    | T1                     | T2     | T1          | T2     |
| TDD configuration  |               | 1                  | N/A                    |        | N/A         |        |
|  |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1 |        |
|  |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1 |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | SR.1.1 TDD             |        |             |        |
|  |               | 3                  | SR.2.1 TDD             |        |             |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | CR.1.1 TDD             |        |             |        |
|  |               | 3                  | CR.2.1 TDD             |        |             |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | CCR.1.1 TDD            |        |             |        |
|  |               | 3                  | CCR.2.1 TDD            |        |             |        |
| OCNG Patterns  |               | 1, 2, 3            | OP.1                   |        | OP.1        |        |
| TRS Configuration  |               | 1                  | TRS.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | TRS.1.1 TDD            |        |             |        |
|  |               | 3                  | TRS.1.2 TDD            |        |             |        |
| Initial BWP configuration  |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | N/A         |        |
| Active DL BWP configuration  |               | 1, 2, 3            | DLBWP.1.1              |        | N/A         |        |
| Active UL BWP configuration  |               | 1, 2, 3            | ULBWP.1.1              |        | N/A         |        |
| PRS configuration  |               | 1                  | PRS.1.4 FR1            |        | PRS.1.4 FR1 |        |
|  |               | 2                  | PRS.1.4 FR1            |        | PRS.1.4 FR1 |        |
|  |               | 3                  | PRS.2.4 FR1            |        | PRS.2.4 FR1 |        |
| PRS muting info  |               | 1, 2, 3            | '10'                   |        | '01'        |        |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/SCS       | 1                  | -98                    |        |             |        |
|  |               | 2                  | -98                    |        |             |        |
|  |               | 3                  | -95                    |        |             |        |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/15 kHz    | 1                  | -98                    |        |             |        |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/I_{ot}$   | dB            | 1                  | -Infinity              | -3     | -Infinity   | -10    |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/N_{oc}$   | dB            | 1                  | -Infinity              | -3     | -Infinity   | -10    |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS-RSRP <sup>Note 3</sup>   | dBm/SCS kHz   | 1                  | -Infinity              | -101   | -Infinity   | -108   |
|  |               | 2                  | -Infinity              | -101   | -Infinity   | -108   |
|  |               | 3                  | -Infinity              | -98    | -Infinity   | -105   |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS kHz   | 1                  | -88                    | -88    | -88         | -88    |
|  |               | 2                  | -88                    | -88    | -88         | -88    |
|  |               | 3                  | -85                    | -85    | -85         | -85    |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | N/A                    | -62.25 | N/A         | -62.25 |
|  | dBm/9.36 MHz  | 2                  |                        | -62.25 |             | -62.25 |
|  | dBm/38.16 MHz | 3                  |                        | -56.16 |             | -56.16 |
| Propagation Condition  |               | 1, 2, 3            | AWGN                   |        |             |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |             |        |



### A.6.6.13.2.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 9.9.3.5, starting from the beginning of time interval T2.

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

## A.6.6.14 UE Rx-Tx time difference measurements

### A.6.6.14.1 UE Rx-Tx time difference measurement for single positioning frequency layer in FR1 SA

#### A.6.6.14.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are listed in Table A.6.6.14.1.1-1.

**Table A.6.6.14.1.1-1: Supported test configurations**

| Configuration   | Description                                       |
|---|---|
| 1   | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2   | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3   | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on the same RF channel in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of T2, where  $\Delta T = 50$  ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #0 or ID #24 before T2.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.1.1-2 and Table A.6.6.14.1.1-3 respectively.

Table A.6.6.14.1.1-2: General test parameters

| Parameter   | Unit | Test configuration | Value                           | Comment   |
|---|------|--------------------|---------------------------------|---|
| Active cell   |      | 1, 2, 3            | Cell 1                          | Cell 1 is the PCell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34].        |
| Neighbour cell  |      | 1, 2, 3            | Cell 2                          | Cell 2 is a neighbour cell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34]. |
| RF Channel Number   |      | 1, 2, 3            | 1                               | For both Cell 1 and Cell 2  |
| BW <sub>channel</sub>   | MHz  | 1                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 2                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 3                  | 40: N <sub>RB,c</sub> = 106     |   |
| SSB configuration   |      | 1                  | SSB.1 FR1                       |   |
|   |      | 2                  | SSB.1 FR1                       |   |
|   |      | 3                  | SSB.2 FR1                       |   |
| SMTC configuration  |      | 1                  | SMTC.2                          |   |
|   |      | 2                  | SMTC.1                          |   |
|   |      | 3                  | SMTC.1                          |   |
| Measurement gap   |      | 1, 2, 3            | GP#24 or GP#0 <sup>Note 1</sup> |   |
| CP length   |      | 1, 2, 3            | Normal                          |   |
| DRX   |      | 1, 2, 3            | OFF                             |   |
| Time offset between serving and neighbour cells                                 | μs   | 1, 2, 3            | 3                               | Synchronous cells   |
| T1  | s    | 1, 2, 3            | 5                               |   |
| T2  | s    | 1, 2, 3            | 10                              |   |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. |      |                    |                                 |   |

Table A.6.6.14.1.1-3: Cell specific test parameters

| Parameter  | Unit          | Test configuration | Cell 1                 |        | Cell 2      |        |
|--|---------------|--------------------|------------------------|--------|-------------|--------|
|  |               |                    | T1                     | T2     | T1          | T2     |
| TDD configuration  |               | 1                  | N/A                    |        | N/A         |        |
|  |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1 |        |
|  |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1 |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | SR.1.1 TDD             |        |             |        |
|  |               | 3                  | SR.2.1 TDD             |        |             |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | CR.1.1 TDD             |        |             |        |
|  |               | 3                  | CR.2.1 TDD             |        |             |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | CCR.1.1 TDD            |        |             |        |
|  |               | 3                  | CCR.2.1 TDD            |        |             |        |
| OCNG Patterns  |               | 1, 2, 3            | OP.1                   |        | OP.1        |        |
| TRS Configuration  |               | 1                  | TRS.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | TRS.1.1 TDD            |        |             |        |
|  |               | 3                  | TRS.1.2 TDD            |        |             |        |
| Initial BWP configuration  |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | N/A         |        |
| Active DL BWP configuration  |               | 1, 2, 3            | DLBWP.1.1              |        | N/A         |        |
| Active UL BWP configuration  |               | 1, 2, 3            | ULBWP.1.1              |        | N/A         |        |
| PRS configuration  |               | 1                  | PRS.1.2 FR1            |        | PRS.1.2 FR1 |        |
|  |               | 2                  | PRS.1.2 FR1            |        | PRS.1.2 FR1 |        |
|  |               | 3                  | PRS.2.2 FR1            |        | PRS.2.2 FR1 |        |
| PRS muting info  |               | 1, 2, 3            | '10'                   |        | '01'        |        |
| SRS configuration  |               | 1                  | POS-SRS.1              |        | N/A         |        |
|  |               | 2                  | POS-SRS.1              |        | N/A         |        |
|  |               | 3                  | POS-SRS.2              |        | N/A         |        |
| $N_{oc}$ Note 2  | dBm/SCS       | 1                  | -98                    |        |             |        |
|  |               | 2                  | -98                    |        |             |        |
|  |               | 3                  | -95                    |        |             |        |
| $N_{oc}$ Note 2  | dBm/15 kHz    | 1                  | -98                    |        |             |        |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/I_{ot}$   | dB            | 1                  | -Infinity              | -2.41  | -Infinity   | -12.12 |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/N_{oc}$   | dB            | 1                  | -Infinity              | -2     | -Infinity   | -10    |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS-RSRP Note 3  | dBm/SCS kHz   | 1                  | -Infinity              | -100   | -Infinity   | -108   |
|  |               | 2                  | -Infinity              | -100   | -Infinity   | -108   |
|  |               | 3                  | -Infinity              | -97    | -Infinity   | -105   |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | N/A                    | -67.67 | N/A         | -67.67 |
|  | dBm/9.36 MHz  | 2                  |                        | -67.67 |             | -67.67 |
|  | dBm/38.16 MHz | 3                  |                        | -61.57 |             | -61.57 |
| Propagation Condition  |               | 1, 2, 3            | AWGN                   |        |             |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |             |        |

Table A.6.6.14.1.1-4: Void

### A.6.6.14.1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

### A.6.6.14.2 UE Rx-Tx time difference measurement for dual positioning frequency layers in FR1 SA

#### A.6.6.14.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR1 in standalone scenario when dual positioning frequency layers are configured.

The supported test configurations are listed in Table A.6.6.14.2.1-1.

**Table A.6.6.14.2.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). Cell 1 and Cell 2 are on different RF channels in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of T2, where  $\Delta T = 50$  ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #0 or ID #24 before T2.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.2.1-2 and Table A.6.6.14.2.1-3 respectively.

Table A.6.6.14.2.1-2: General test parameters

| Parameter   | Unit | Test configuration | Value                           | Comment   |
|---|------|--------------------|---------------------------------|---|
| Active cell   |      | 1, 2, 3            | Cell 1                          | Cell 1 is the PCell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34].        |
| Neighbour cell  |      | 1, 2, 3            | Cell 2                          | Cell 2 is a neighbour cell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34]. |
| RF Channel Number   |      | 1, 2, 3            | 1                               | For Cell 1  |
| RF Channel Number   |      | 1, 2, 3            | 2                               | For Cell 2  |
| BW <sub>channel</sub>   | MHz  | 1                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 2                  | 10: N <sub>RB,c</sub> = 52      |   |
|   |      | 3                  | 40: N <sub>RB,c</sub> = 106     |   |
| SSB configuration   |      | 1                  | SSB.1 FR1                       |   |
|   |      | 2                  | SSB.1 FR1                       |   |
|   |      | 3                  | SSB.2 FR1                       |   |
| SMTC configuration  |      | 1                  | SMTC.2                          |   |
|   |      | 2                  | SMTC.1                          |   |
|   |      | 3                  | SMTC.1                          |   |
| Measurement gap   |      | 1, 2, 3            | GP#24 or GP#0 <sup>Note 1</sup> |   |
| CP length   |      | 1, 2, 3            | Normal                          |   |
| DRX   |      | 1, 2, 3            | OFF                             |   |
| Time offset between serving and neighbour cells                                 | μs   | 1, 2, 3            | 3                               | Synchronous cells   |
| T1  | s    | 1, 2, 3            | 5                               |   |
| T2  | s    | 1, 2, 3            | 10                              |   |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. |      |                    |                                 |   |

Table A.6.6.14.2.1-3: Cell specific test parameters

| Parameter  | Unit          | Test configuration | Cell 1                 |        | Cell 2      |        |
|--|---------------|--------------------|------------------------|--------|-------------|--------|
|  |               |                    | T1                     | T2     | T1          | T2     |
| TDD configuration  |               | 1                  | N/A                    |        | N/A         |        |
|  |               | 2                  | TDDConf.1.1            |        | TDDConf.1.1 |        |
|  |               | 3                  | TDDConf.2.1            |        | TDDConf.2.1 |        |
| PDSCH RMC configuration  |               | 1                  | SR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | SR.1.1 TDD             |        |             |        |
|  |               | 3                  | SR.2.1 TDD             |        |             |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.1.1 FDD             |        | N/A         |        |
|  |               | 2                  | CR.1.1 TDD             |        |             |        |
|  |               | 3                  | CR.2.1 TDD             |        |             |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | CCR.1.1 TDD            |        |             |        |
|  |               | 3                  | CCR.2.1 TDD            |        |             |        |
| OCNG Patterns  |               | 1, 2, 3            | OP.1                   |        | OP.1        |        |
| TRS Configuration  |               | 1                  | TRS.1.1 FDD            |        | N/A         |        |
|  |               | 2                  | TRS.1.1 TDD            |        |             |        |
|  |               | 3                  | TRS.1.2 TDD            |        |             |        |
| Initial BWP configuration  |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | N/A         |        |
| Active DL BWP configuration  |               | 1, 2, 3            | DLBWP.1.1              |        | N/A         |        |
| Active UL BWP configuration  |               | 1, 2, 3            | ULBWP.1.1              |        | N/A         |        |
| PRS configuration  |               | 1                  | PRS.1.2 FR1            |        | PRS.1.2 FR1 |        |
|  |               | 2                  | PRS.1.2 FR1            |        | PRS.1.2 FR1 |        |
|  |               | 3                  | PRS.2.2 FR1            |        | PRS.2.2 FR1 |        |
| PRS muting info  |               | 1, 2, 3            | '10'                   |        | '01'        |        |
| SRS configuration  |               | 1                  | POS-SRS.1              |        | N/A         |        |
|  |               | 2                  | POS-SRS.1              |        | N/A         |        |
|  |               | 3                  | POS-SRS.2              |        | N/A         |        |
| $N_{oc}$ Note 2  | dBm/SCS       | 1                  | -98                    |        |             |        |
|  |               | 2                  | -98                    |        |             |        |
|  |               | 3                  | -95                    |        |             |        |
| $N_{oc}$ Note 2  | dBm/15 kHz    | 1                  | -98                    |        |             |        |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/I_{ot}$   | dB            | 1                  | -Infinity              | -3     | -Infinity   | -13    |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS $\hat{E}_s/N_{oc}$   | dB            | 1                  | -Infinity              | -3     | -Infinity   | -13    |
|  |               | 2                  |                        |        |             |        |
|  |               | 3                  |                        |        |             |        |
| PRS-RSRP Note 3  | dBm/SCS kHz   | 1                  | -Infinity              | -101   | -Infinity   | -111   |
|  |               | 2                  | -Infinity              | -101   | -Infinity   | -111   |
|  |               | 3                  | -Infinity              | -98    | -Infinity   | -108   |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1                  | N/A                    | -68.28 | N/A         | -69.63 |
|  | dBm/9.36 MHz  | 2                  |                        | -68.28 |             | -69.63 |
|  | dBm/38.16 MHz | 3                  |                        | -62.19 |             | -63.54 |
| Propagation Condition  |               | 1, 2, 3            | AWGN                   |        |             |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |                        |        |             |        |

Table A.6.6.14.2.1-4: Void

#### A.6.6.14.2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

### A.6.6.15 Idle Mode measurements of inter-RAT CA candidate cells for early reporting

#### A.6.6.15.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly retains the detected cell status for the idle mode CA measurement when UE transitions from RRC Connected mode to Idle mode, when the UE has entered Idle mode. Additionally, test that the UE performs the required measurements on the serving cell and the configured inter-RAT carrier for idle mode measurement reporting. This test will partly verify the Idle mode CA measurements in clause 4.4. In the test, connected mode DRX configuration is not configured in either PCell or PSCell.

Additionally, the purpose of this test is to verify that the SS-RSRP, SS-RSRQ, RSRP and RSRQ measurement accuracy is within the specified limits. This test will verify the accuracy requirements in Sections 10.1.2B and 10.1.7B for intra-frequency measurements and section 10.2.4 and 10.2.5 for the inter-RAT measurements for the supported test configurations in tables A.6.6.15.1-4 and A.6.6.15.1-5.

The supported test configurations are given in Table A.6.6.15.1-1. The test parameters are given in Tables A.6.6.15.1-2, A.6.6.15.1-3, A.6.6.15.1-4 and A.6.6.15.1-5 below. In the test there are two cells, cell 1, which is the PCell in connected, and serving cell in idle mode, on radio channel 1 in FR1, and cell 2, which is the PSCell in connected, and measured LTE inter-RAT cell in idle mode, on radio channel 2 in LTE.

For the purpose of testing absolute accuracy in idle mode in this set of test cases the cells in idle mode are on different carrier frequencies (NR FR1 and LTE). The absolute accuracy of RSRP and RSRQ inter-RAT measurements are tested by using the parameters in Table A.6.6.15.1-4 and Table A.6.6.15.1-5. In all test cases, Cell 1 is the serving and Cell 2 the target cell.

The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. During T1 cell 2, the PSCell, shall be configured.

Time duration T2 starts when UE has transmitted random access preamble on the PSCell. After T2, the UE is configured with idle mode CA measurements with the PSCell carrier as the target carrier. The connection is released [500]ms after T2 when the UE has sent random access preamble on the PSCell.

T3 starts when the connection is released. During the time periods T3 and T4 the UE is in Idle mode with the serving cell on the FR1 carrier. The UE is configured to perform inter-RAT idle mode CA/DC measurements on Cell 2 carrier. After the connection release and during T3, [1000] ms after T3 is started, the signal level of the inter-RAT carrier configured for idle mode CA/DC measurements is changed at which time T4 starts. T5 starts [65]s after T4, when the UE is paged for connection setup and UE is requested by the network to report idle mode CA/DC measurements.

**Table A.6.6.15.1-1: Supported test configurations for Idle Mode measurements of inter-frequency CA candidate cells for early reporting**

| Config   | Description                                    |
|--|--|
| 1  | FR1 FDD SSB SCS 15kHz BW 10MHz – LTE FDD 10MHz |
| 2  | FR1 FDD SSB SCS 15kHz BW 10MHz – LTE TDD 10MHz |
| 3  | FR1 TDD SSB SCS 30kHz BW 40MHz – LTE FDD 10MHz |
| 4  | FR1 TDD SSB SCS 30kHz BW 40MHz – LTE TDD 10MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.6.6.15.1-2: General test parameters for Idle Mode measurements of inter-frequency CA candidate cells for early reporting**

| Parameter   | Unit | Value       | Comment   |
|---|------|-------------|---|
| RF Channel Number   |      | 1, 2        | Two radio channels are used for this test   |
| Active PCell  |      | Cell 1      | PCell on RF channel number 1 in FR1   |
| PSCell  |      | Cell 2      | PSCell on RF channel number 2 in LTE  |
| DRX   |      | OFF         | For both PCell and PSCell once configured   |
| PRACH configuration in Cell 2                                 |      | [PRACH_2CE] | PRACH configuration as specified in Clause A.3.16 in TS 36.133  |
| CSI reporting periodicity and offset configuration for Cell 2 | ms   | 2           |   |
| T1  | s    | [0.5]       | During this time the PCell is known and PSCell is configured.   |
| T2  | s    | [0.5]       | PSCell access.  |
| T3 + T4   | s    | [66]        | During this time the UE is configured to perform inter-frequency measurements in idle mode on the PSCell carrier. |
| T5  | s    | [0.5]       | UE is paged and connection is setup. Network requests measurement report from the UE.                             |



**Table A.6.6.15.1-3: Cell specific test parameters for NR cell for Idle Mode measurements of inter-frequency CA candidate cells for early reporting**

| Parameter  | Unit             | Config  | Test 1                  |          |          |          |          |
|--|------------------|---------|-------------------------|----------|----------|----------|----------|
|  |                  |         | Cell 1                  |          |          |          |          |
|  |                  |         | T1                      | T2       | T3       | T4       | T5       |
| AoA setup  |                  | 1,2,3,4 | N/A                     |          |          |          |          |
| Assumption for UE beams <sup>Note 5</sup><br>R: Rough                                    |                  | 1,2,3,4 | N/A                     | N/A      | R        | R        | N/A      |
| Frequency Range  |                  | 1,2,3,4 | FR1                     |          |          |          |          |
| Duplex mode  |                  | 1, 2    | FDD                     |          |          |          |          |
|  |                  | 3, 4    | TDD                     |          |          |          |          |
| TDD Configuration<br>1: TDDConf.1.1<br>2: TDDConf.2.1                                    |                  | 1,2     | -                       |          |          |          |          |
|  |                  | 3,4     | 1                       | 1        | 2        | 2        | 1        |
| BW <sub>channel</sub><br>1: 10: N <sub>RB,c</sub> = 52<br>2: 40: N <sub>RB,c</sub> = 106 | MHz              | 1, 2    | 1                       | 1        | -        | -        | 1        |
|  |                  | 3, 4    | 2                       | 2        | -        | -        | 2        |
| Initial Downlink BWP configuration   |                  | 1,2,3,4 | DLBWP.0.1               |          |          |          |          |
| Initial Uplink BWP configuration   |                  | 1,2,3,4 | ULBWP.0.1               |          |          |          |          |
| Dedicated Downlink BWP configuration<br>1: DLBWP.1.1                                     |                  | 1,2,3,4 | 1                       | 1        | -        | -        | 1        |
| Dedicated Uplink BWP configuration<br>1: ULBWP.1.1                                       |                  | 1,2,3,4 | 1                       | 1        | -        | -        | 1        |
| PDSCH Reference Measurement Channel<br>1: SR.1.1 FDD<br>2: SR.2.1 TDD                    | FDD              | 1,2     | 1                       | 1        | 1        | 1        | 1        |
|  | TDD              | 3,4     | 2                       | 2        | 2        | 2        | 2        |
| TRS configuration  |                  | 1,2,3,4 | -                       |          |          |          |          |
| TCI state  |                  | 1,2,3,4 | -                       |          |          |          |          |
| RMSI CORESET parameters  | FDD              | 1,2     | CR.1.1 FDD              |          |          |          |          |
|  | TDD              | 3,4     | CR.2.1 TDD              |          |          |          |          |
| Dedicated CORESET parameters   | FDD              | 1,2     | CCR.1.1 FDD             |          |          |          |          |
|  | TDD              | 3,4     | CCR.2.1 TDD             |          |          |          |          |
| OCNG Patterns <sup>Note1</sup>   |                  | 1,2,3,4 | OP.1 defined in A.3.2.1 |          |          |          |          |
| SSB configuration<br>1: SSB.1 FR1<br>2: SSB.2 FR1  |                  | 1,2     | 1                       |          |          |          |          |
|  |                  | 3,4     | 2                       |          |          |          |          |
| SMTC configuration   |                  | 1,2,3,4 | SMTC.2                  |          |          |          |          |
| Correlation Matrix and Antenna config  |                  | 1,2,3,4 | 1x2 Low                 |          |          |          |          |
| EPRE ratio of PSS to SSS   | dB               | 1,2,3,4 | 0                       | 0        | -        | -        | 0        |
| EPRE ratio of PBCH DMRS to SSS   |                  |         | 0                       | 0        | -        | -        | 0        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |         | 0                       | 0        | -        | -        | 0        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |         | 0                       | 0        | -        | -        | 0        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |         | 0                       | 0        | -        | -        | 0        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |         | 0                       | 0        | -        | -        | 0        |
| EPRE ratio of PDSCH to PDSCH   |                  |         | 0                       | 0        | -        | -        | 0        |
| EPRE ratio of OCNG DMRS to SSS   |                  |         | 0                       | 0        | -        | -        | 0        |
| N <sub>oc</sub> <sup>Note2</sup>   |                  |         | dBm/<br>15kHz           | 1,2      | [-98]    | [-98]    | [-98]    |
|  | 3,4              |         |                         |          |          |          |          |
| N <sub>oc</sub> <sup>Note2</sup>   | dBm/SCS          | 1,2     | [-98]                   | [-98]    | [-98]    | [-98]    | [-98]    |
|  |                  | 3,4     | [-95]                   | [-95]    | [-95]    | [-95]    | [-95]    |
| Ē <sub>s</sub> /I <sub>ot</sub>  | dB               | 1,2,3,4 | [5]                     | [5]      | [5]      | [5]      | [5]      |
| Ē <sub>s</sub> /N <sub>oc</sub>  | dB               | 1,2,3,4 | [5]                     | [5]      | [5]      | [5]      | [5]      |
| SS-RSRP <sup>Note3,4</sup>   | dBm/SCS          | 1,2     | [-93]                   | [-93]    | [-93]    | [-93]    | [-93]    |
|  |                  | 3,4     | [-90]                   | [-90]    | [-90]    | [-90]    | [-90]    |
| I <sub>o</sub> <sup>Note3,4</sup>  | dBm/<br>9.36 MHz | 1,2     | [-63.85]                | [-63.85] | [-63.85] | [-63.85] | [-63.85] |

|  |                      |         |          |          |          |          |          |
|--|----------------------|---------|----------|----------|----------|----------|----------|
|  | dBm/<br>38.16<br>MHz | 3,4     | [-57.76] | [-57.76] | [-57.76] | [-57.76] | [-57.76] |
|  |                      |         |          |          |          |          |          |
| Qrxlevmin  | dBm/SCS              | 1       | -        | -        | [-140]   |          | -        |
|  |                      | 2       | -        | -        | [-137]   |          | -        |
|  |                      | 3       | -        | -        | [TBD]    | [TBD]    | -        |
|  |                      | 4       | -        | -        | [TBD]    | [TBD]    | -        |
| Pcompensation  | dB                   | 1,2,3,4 | -        | -        | 0        | 0        | -        |
| Qhyst <sub>s</sub>                                     | dB                   | 1,2,3,4 | -        | -        | 0        | 0        | -        |
| Qoffset <sub>s, n</sub>                                | dB                   | 1,2,3,4 | -        | -        | 0        | 0        | -        |
| Cell_selection_and_<br>reselection_quality_measurement |                      | 1,2,3,4 | SS-RSRP  |          |          |          |          |
| Treselection   | s                    | 1,2,3,4 | -        | -        | 0        | -        | -        |
| SnonintrasearchP                                       | dB                   | 1,2,3,4 | -        | -        | [TBD]    | -        | -        |
| SnonintrasearchQ                                       | dB                   | 1,2,3,4 | -        | -        | [TBD]    | -        | -        |
| Thresh <sub>x, high</sub>                              | dB                   | 1,2,3,4 | -        | -        | [48]     | -        | -        |
| Thresh <sub>serv, low</sub>                            | dB                   | 1,2,3,4 | -        | -        | [44]     | -        | -        |
| Thresh <sub>x, low</sub>                               | dB                   | 1,2,3,4 | -        | -        | [50]     | -        | -        |
| Propagation Condition                                  | dB                   | 1,2,3,4 | -        | -        | AWGN     | -        | -        |

**Table A.6.6.15.1-4: Cell specific test parameters for LTE cell for Idle Mode measurements of inter-frequency CA candidate cells for early reporting**

| Parameter  | Unit             | Config        | Test 1        |       |        |       |       |
|--|------------------|---------------|---------------|-------|--------|-------|-------|
|  |                  |               | Cell 2        |       |        |       |       |
|  |                  |               | T1            | T2    | T3     | T4    | T5    |
| Frequency Range  |                  | 1,2,3,4       | LTE           |       |        |       |       |
| Duplex mode  |                  | 1, 3          | FDD           |       |        |       |       |
|  |                  | 2, 4          | TDD           |       |        |       |       |
| $BW_{channel}$   | MHz              | 1,2,3,4       | 10            | 10    | -      | -     | 10    |
| Measurement bandwidth  | $n_{PRB}$        | 1,2,3,4       | -             | -     | 22-27  | 22-27 | -     |
| PDSCH Reference Measurement Channel<br>1: R.1 FDD<br>2: R.1 TDD  | FDD              | 1,3           | 1             | 1     | -      | -     | 1     |
|  | TDD              | 2,4           | 2             | 2     | -      | -     | 2     |
| PDCCH/PCFICH/PHICH<br>Reference measurement channel<br>defined in A.3.1.2.1 and A.3.1.2.2<br>in 36.133<br>1: R.6 FDD<br>2: R.6 TDD |                  | 1,3           | 1             | 1     | -      | -     | 1     |
|  |                  | 2,4           | 2             | 2     | -      | -     | 2     |
| OCNG Patterns defined in<br>A.3.2.1.1 (OP.2 FDD) and<br>A.3.2.1.2 (OP.2 TDD) in 36.133<br>1: OP.2 FDD<br>2: OP.2 TDD               |                  | 1,3           | 1             |       |        |       |       |
|  |                  | 2,4           | 2             |       |        |       |       |
| Correlation Matrix and Antenna<br>config   |                  | 1,2,3,4       | 1x2 Low       |       |        |       |       |
| PBCH_RA  | dB               | 1,2,3,4       | N/A           | N/A   | 0      | 0     | N/A   |
| PBCH_RB  |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PSS_RA   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| SSS_RA   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PCFICH_RB  |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PHICH_RA   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PHICH_RB   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PDCCH_RA   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PDCCH_RB   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PDSCH_RA   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| PDSCH_RB   |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| OCNG_RA <sup>Note 1</sup>  |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| OCNG_RB <sup>Note 1</sup>  |                  |               | N/A           | N/A   | 0      | 0     | N/A   |
| $N_{oc}$ <sup>Note 2</sup>   |                  |               | dBm/<br>15kHz | 1,2   | [-98]  | [-98] | [-98] |
|  | 3,4              |               |               |       |        |       |       |
| $\bar{E}_s/I_{ot}$   | dB               | 1,2,3,4       | [5]           | [5]   | [-3]   | [8]   | [5]   |
| $\bar{E}_s/N_{oc}$   | dB               | 1,2,3,4       | [5]           | [5]   | [-3]   | [8]   | [5]   |
| SS-RSRP <sup>Note 3,4</sup>  | dBm/SCS          | 1,2,3,4       | [-93]         | [-93] | [-101] | [-90] | [-93] |
|  |                  |               |               |       |        |       |       |
| $I_o$ <sup>Note 3,4</sup>  | dBm/<br>9.36 MHz | 1, 2, 3,<br>4 | FFS           | FFS   | [FFS]  | [FFS] | FFS   |
|  |                  |               |               |       |        |       |       |
| Qrxlevmin  | dBm/SCS          | 1             | -             | -     | [-140] |       | -     |
|  |                  | 2             | -             | -     | [-137] |       | -     |
|  |                  | 3             | -             | -     | [TBD]  | [TBD] | -     |
|  |                  | 4             | -             | -     | [TBD]  | [TBD] | -     |
| Pcompensation  | dB               | 1,2,3,4       | -             | -     | 0      | 0     | -     |
| Qhyst <sub>s</sub>   | dB               | 1,2,3,4       | -             | -     | 0      | 0     | -     |
| Qoffset <sub>s, n</sub>  | dB               | 1,2,3,4       | -             | -     | 0      | 0     | -     |
| Cell_selection_and_<br>reselection_quality_measurement   |                  | 1,2,3,4       | RSRP and RSRQ |       |        |       |       |
| Treselection   | s                | 1,2,3,4       | -             | -     | 0      |       | -     |
| SnonintrasearchP   | dB               | 1,2,3,4       | -             | -     | [TBD]  |       | -     |
| SnonintrasearchQ   | dB               | 1,2,3,4       | -             | -     | [TBD]  |       | -     |
| Thresh <sub>x, high</sub>  | dB               | 1,2,3,4       | -             | -     | [48]   |       | -     |

|                             |    |         |   |      |   |
|-----------------------------|----|---------|---|------|---|
| Thresh <sub>serv, low</sub> | dB | 1,2,3,4 | - | [44] | - |
| Thresh <sub>x, low</sub>    | dB | 1,2,3,4 | - | [50] | - |
| Propagation Condition       | dB | 1,2,3,4 | - | AWGN | - |

**Table A.6.6.15.1-5: General idle mode test parameters for Idle Mode measurements of inter-frequency CA candidate cells for early reporting**

| Parameter                       | Unit | Test configuration | Value          | Comment   |
|---------------------------------|------|--------------------|----------------|---|
| Serving cell                    |      | 1, 2, 3, 4         | Cell1          | The UE camps on cell 1 which is the former PCell.                                       |
| Neighbour cell                  |      | 1, 2, 3, 4         | Cell2          | The UE shall perform inter-frequency measurements on cell 2 which is the former PSCell. |
| RF Channel Number               |      | 1, 2, 3, 4         | 1, 2           |   |
| Time offset between cells       |      | 1, 2, 3, 4         | 3 $\mu$ s      | Synchronous cells   |
| Access Barring Information      | -    | 1, 2, 3, 4         | Not Sent       | No additional delays in random access procedure.  |
| SSB configuration               |      | 1, 2               | SSB.1 FR1      | Serving cell  |
|                                 |      | 3, 4               | SSB.2 FR1      | Serving cell  |
| SMTC configuration Serving cell |      | 1, 2, 3, 4         | SMTC.2         |   |
| DRX cycle length                | s    | 1, 2, 3, 4         | 1.28           | The value shall be used for all cells in the test.                                      |
| PRACH configuration index       |      | 1, 2, 3, 4         | 190            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                     |
| rangeToBestCell                 |      | 1, 2, 3, 4         | Not configured |   |
| T3                              | s    | 1, 2, 3, 4         | [0.5]          | T3 needs to be defined so that cell measurement time is taken into account.             |
| T4                              | s    | 1, 2, 3, 4         | [65]           | T4 needs to be defined so that cell measurement time is taken into account.             |

### A.6.6.15.2 Test Requirements

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

During time durations T1 the UE shall start transmitting preamble on PSCell. During T2 the UE perform intra-frequency measurements on the PCell and the PSCell.

During the time-period T3 the connection is released, and UE enters idle mode. During the time period T3 and T4 the UE is camped in Idle mode and at T4 the signal level of cell 2 is changed. The UE shall not perform reselection. The UE shall perform Idle Mode CA measurement according to Section 4.4.

At the start of T5 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell including idle mode CA/DC measurement from cell 2.

After receiving the requested early measurement report, the test equipment verifies that the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Sections 10.1.2B and 10.1.7B and Sections 10.2.4 and 10.2.5, respectively and test ends.

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

## A.6.7 Measurement Performance requirements

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in Clause 10 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported

measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in Clause 10 for at least 90% of the reported cases.

- Measurements are performed in RRC\_CONNECTED state.
- The reference channels assume transmission of PDSCH with a maximum number of 5 HARQ transmissions unless otherwise specified.

## A.6.7.1 SS-RSRP

### A.6.7.1.1 SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.1.1 and 10.1.2.1.2 for intra-frequency measurements.

#### A.6.7.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in A.6.7.1.1.2-2. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell.

**Table A.6.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  |
| 3      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

**Table A.6.7.1.1.2-2: SS-RSRP Intra frequency test parameters**



| Parameter                            |            | Unit | Test 1                      |           | Test 2      |           | Test 3      |           |
|--------------------------------------|------------|------|-----------------------------|-----------|-------------|-----------|-------------|-----------|
|                                      |            |      | Cell 1                      | Cell 2    | Cell 1      | Cell 2    | Cell 1      | Cell 2    |
| Cell ID                              |            |      | 489                         | 0         | 489         | 0         | 489         | 0         |
| SSB ARFCN                            |            |      | freq1                       |           | freq1       |           | freq1       |           |
| Duplex mode                          | Config 1   |      | FDD                         |           |             |           |             |           |
|                                      | Config 2,3 |      | TDD                         |           |             |           |             |           |
| TDD configuration                    | Config 1   |      | Not Applicable              |           |             |           |             |           |
|                                      | Config 2   |      | TDDConf.1.1                 |           |             |           |             |           |
|                                      | Config 3   |      | TDDConf.2.1                 |           |             |           |             |           |
| BW <sub>channel</sub>                | Config 1   | MHz  | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |           |             |           |             |           |
| BWP BW                               | Config 1   |      | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |           |             |           |             |           |
| Downlink initial BWP configuration   |            |      | DLBWP.0.1                   |           |             |           |             |           |
| Downlink dedicated BWP configuration |            |      | DLBWP.1.1                   |           |             |           |             |           |
| Uplink initial BWP configuration     |            |      | ULBWP.0.1                   |           |             |           |             |           |
| Uplink dedicated BWP configuration   |            |      | ULBWP.1.1                   |           |             |           |             |           |
| TRS configuration                    | Config 1   |      | TRS.1.1 FDD                 | NA        | TRS.1.1 FDD | NA        | TRS.1.1 FDD | NA        |
|                                      | Config 2   |      | TRS.1.1 TDD                 | NA        | TRS.1.1 TDD | NA        | TRS.1.1 TDD | NA        |
|                                      | Config 3   |      | TRS.1.2 TDD                 | NA        | TRS.1.2 TDD | NA        | TRS.1.2 TDD | NA        |
| DRX Cycle                            |            | ms   | Not Applicable              |           |             |           |             |           |
| PDSCH Reference measurement channel  | Config 1   |      | SR.1.1 FDD                  | -         | SR.1.1 FDD  | -         | SR.1.1 FDD  | -         |
|                                      | Config 2   |      | SR.1.1 TDD                  |           | SR.1.1 TDD  |           | SR.1.1 TDD  |           |
|                                      | Config 3   |      | SR2.1 TDD                   |           | SR2.1 TDD   |           | SR2.1 TDD   |           |
| RMSI CORESET Reference Channel       | Config 1   |      | CR.1.1 FDD                  | -         | CR.1.1 FDD  | -         | CR.1.1 FDD  | -         |
|                                      | Config 2   |      | CR.1.1 TDD                  |           | CR.1.1 TDD  |           | CR.1.1 TDD  |           |
|                                      | Config 3   |      | CR2.1 TDD                   |           | CR2.1 TDD   |           | CR2.1 TDD   |           |
| Control channel RMC                  | Config 1   |      | CCR.1.1 FDD                 | -         | CCR.1.1 FDD | -         | CCR.1.1 FDD | -         |
|                                      | Config 2   |      | CCR.1.1 TDD                 |           | CCR.1.1 TDD |           | CCR.1.1 TDD |           |
|                                      | Config 3   |      | CCR2.1 TDD                  |           | CCR2.1 TDD  |           | CCR2.1 TDD  |           |
| SSB configuration                    | Config 1   |      | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |
|                                      | Config 2   |      | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |
|                                      | Config 3   |      | SSB.2 FR1                   | SSB.2 FR1 | SSB.2 FR1   | SSB.2 FR1 | SSB.2 FR1   | SSB.2 FR1 |
| Time offset with Cell 1              | Config 1   | ms   | -                           | 3         | -           | 3         | -           | 3         |
|                                      | Config 2,3 | µs   | -                           | 3         | -           | 3         | -           | 3         |
| SMTC configuration                   | Config 1   |      | SMTC.2                      |           |             |           |             |           |
|                                      | Config 2,3 |      | SMTC.1                      |           |             |           |             |           |
| OCNG Patterns                        |            |      | OCNG pattern 1              |           |             |           |             |           |
| PDSCH/PDCCH subcarrier spacing       | Config 1,2 | kHz  | 15 kHz                      |           |             |           |             |           |
|                                      | Config 3   |      | 30kHz                       |           |             |           |             |           |
| EPRE ratio of PSS to SSS             |            | dB   | 0                           | 0         | 0           | 0         | 0           | 0         |
| EPRE ratio of PBCH DMRS to SSS       |            |      |                             |           |             |           |             |           |
| EPRE ratio of PBCH to PBCH DMRS      |            |      |                             |           |             |           |             |           |
| EPRE ratio of PDCCH DMRS to SSS      |            |      |                             |           |             |           |             |           |
| EPRE ratio of PDCCH to PDCCH DMRS    |            |      |                             |           |             |           |             |           |
| EPRE ratio of PDSCH DMRS to SSS      |            |      |                             |           |             |           |             |           |
| EPRE ratio of PDSCH to PDSCH         |            |      |                             |           |             |           |             |           |

| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                               |   |                                      |   |         |                      |        |       |       |        |        |
|--|-------------------------------|---|--------------------------------------|---|---------|----------------------|--------|-------|-------|--------|--------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                               |   |                                      |   |         |                      |        |       |       |        |        |
| $N_{oc}$<br>Note2                        | Config 1,2                    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15Kh<br>Z                        | -106                                    | -88     | -114                 |        |       |       |        |        |
|  |                               | NR_FDD_FR1_B                            |                                      |   |         |                      | -113.5 |       |       |        |        |
|  |                               | NR_TDD_FR1_C                            |                                      |   |         |                      | -113   |       |       |        |        |
|  |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                                      |   |         |                      | -112.5 |       |       |        |        |
|  |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                                      |   |         |                      | -112   |       |       |        |        |
|  |                               | NR_FDD_FR1_F                            |                                      |   |         |                      | -111.5 |       |       |        |        |
|  |                               | NR_FDD_FR1_G                            |                                      |   |         |                      | -111   |       |       |        |        |
|  |                               | NR_FDD_FR1_H                            |                                      |   |         |                      | -110.5 |       |       |        |        |
|  | Config 3                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                                      | Not applicable <sup>Note 5</sup>        | -94     | -114                 |        |       |       |        |        |
|  |                               | NR_FDD_FR1_B                            |                                      |   |         |                      | -113.5 |       |       |        |        |
|  |                               | NR_TDD_FR1_C                            |                                      |   |         |                      | -113   |       |       |        |        |
|  |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                                      |   |         |                      | -112.5 |       |       |        |        |
|  |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                                      |   |         |                      | -112   |       |       |        |        |
|  |                               | NR_FDD_FR1_F                            |                                      |   |         |                      | -111.5 |       |       |        |        |
| NR_FDD_FR1_G                             |                               | -111                                    |                                      |   |         |                      |        |       |       |        |        |
| NR_FDD_FR1_H                             |                               | -110.5                                  |                                      |   |         |                      |        |       |       |        |        |
| $N_{oc}$<br>Note2                        | Config 1,2                    |   | dBm/SCS                              | -106                                    | -88     | Same as<br>Noc/15kHz |        |       |       |        |        |
|  |                               |   |                                      |   |         |                      |        |       |       |        |        |
|  | Config 3                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                                      | Not applicable <sup>Note 5</sup>        | -91     | -111                 |        |       |       |        |        |
|  |                               | NR_FDD_FR1_B                            |                                      |   |         |                      | -110.5 |       |       |        |        |
|  |                               | NR_TDD_FR1_C                            |                                      |   |         |                      | -110   |       |       |        |        |
|  |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                                      |   |         |                      | -109.5 |       |       |        |        |
|  |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                                      |   |         |                      | -109   |       |       |        |        |
|  |                               | NR_FDD_FR1_F                            |                                      |   |         |                      | -108.5 |       |       |        |        |
|  |                               | NR_FDD_FR1_G                            |                                      |   |         |                      | -108   |       |       |        |        |
|  |                               | NR_FDD_FR1_H                            |                                      |   |         |                      | -107.5 |       |       |        |        |
|  | $\hat{E}_s/I_{ot}$            |   |                                      | dB                                      | 2.46    | -5.97                | 2.46   | -5.97 | -0.01 | -4.76  |        |
|  | $\hat{E}_s/N_{oc}$            |   |                                      | dB                                      | 6       | 1                    | 6      | 1     | 3     | 0      |        |
|  | SS-<br>RSRP <sup>Note 3</sup> | Config 1,2                              |                                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -100                 | -105   | -82   | -87   | -      | -      |
|  |                               |   |                                      | NR_FDD_FR1_B                            |         |                      |        |       |       | 111.00 | 114.00 |
| NR_TDD_FR1_C                             |                               |   | -                                    | -                                       |         |                      |        |       |       |        |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D            |                               |   | 110.50                               | 113.50                                  |         |                      |        |       |       |        |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E            |                               |   | -                                    | -                                       |         |                      |        |       |       |        |        |
| NR_FDD_FR1_F                             |                               |   | 110.00                               | 113.00                                  |         |                      |        |       |       |        |        |
| NR_FDD_FR1_G                             |                               |   | -                                    | -                                       |         |                      |        |       |       |        |        |
| NR_FDD_FR1_H                             |                               |   | 109.50                               | 112.50                                  |         |                      |        |       |       |        |        |
| Config 3                                 |                               | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | Not applica<br>ble <sup>Note 5</sup> | Not applic<br>able <sup>Note 5</sup>    |         | -85                  | -90    | -     | -     | -      | -      |
|  |                               |   |                                      |   |         |                      |        |       |       | 108.00 | 111.00 |
|  |                               |   |                                      |   |         |                      |        |       |       | -      | -      |
|  |                               |   |                                      |   |         |                      |        |       |       | 107.50 | 110.50 |
|  |                               |   |                                      |   |         |                      |        |       |       | -      | -      |
|  |                               |   |                                      |   |         |                      |        |       |       | 108.00 | 111.00 |

|   |              |   |                  |                                     |        |        |        |        |
|---|--------------|---|------------------|-------------------------------------|--------|--------|--------|--------|
|   |              | NR_FDD_FR1_B                            |                  |                                     |        | -      | -      |        |
|   |              | NR_TDD_FR1_C                            |                  |                                     |        | 107.50 | 110.50 |        |
|   |              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |                                     |        | -      | -      |        |
|   |              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |                                     |        | 106.50 | 109.50 |        |
|   |              | NR_FDD_FR1_F                            |                  |                                     |        | -      | -      |        |
|   |              | NR_FDD_FR1_G                            |                  |                                     |        | 106.00 | 109.00 |        |
|   |              | NR_FDD_FR1_H                            |                  |                                     |        | -      | -      |        |
|   |              | NR_FDD_FR1_H                            |                  |                                     |        | 105.50 | 108.50 |        |
|   |              | NR_FDD_FR1_H                            |                  |                                     |        | -      | -      |        |
|   |              | NR_FDD_FR1_H                            |                  |                                     |        | 105.00 | 108.00 |        |
|   |              | NR_FDD_FR1_H                            |                  |                                     |        | -      | -      |        |
|   |              | NR_FDD_FR1_H                            |                  |                                     |        | 104.50 | 107.50 |        |
| Io <sup>Note3</sup>   | Config 1,2   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz  | -70.09                              | -52.09 | -80.03 |        |        |
|   |              | NR_FDD_FR1_B                            |                  |                                     |        |        |        | -79.53 |
|   |              | NR_TDD_FR1_C                            |                  |                                     |        |        |        | -79.03 |
|   |              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |                                     |        |        |        | -78.53 |
|   |              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |                                     |        |        |        | -78.03 |
|   |              | NR_FDD_FR1_F                            |                  |                                     |        |        |        | -77.53 |
|   |              | NR_FDD_FR1_G                            |                  |                                     |        |        |        | -77.03 |
|   | NR_FDD_FR1_H | -76.53                                  |                  |                                     |        |        |        |        |
|   | Config 3     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MHz | Not<br>applicable <sup>Note 5</sup> | -51.99 | -73.94 |        |        |
|   |              | NR_FDD_FR1_B                            |                  |                                     |        |        |        | -73.44 |
|   |              | NR_TDD_FR1_C                            |                  |                                     |        |        |        | -72.94 |
|   |              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |                                     |        |        |        | -72.44 |
|   |              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |                                     |        |        |        | -71.94 |
|   |              | NR_FDD_FR1_F                            |                  |                                     |        |        |        | -71.44 |
| NR_FDD_FR1_G  |              | -70.94                                  |                  |                                     |        |        |        |        |
| NR_FDD_FR1_H  | -70.44       |   |                  |                                     |        |        |        |        |
| Propagation condition   |              |   | -                | AWGN                                |        |        |        |        |
| Antenna configuration   |              |   |                  | 1x2                                 |        |        |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> |              |   |                  |                                     |        |        |        |        |

### A.6.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.2.1.2.

### A.6.7.1.2 SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.4.1.1 and 10.1.4.1.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.6.7.1.2.1-1.

**Table A.6.7.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  |
| 3             | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:         | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.6.7.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.6.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.6.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.6.7.1.2.2-1: SS-RSRP inter-frequency test parameters**

| Parameter   | Config   | Unit | Test 1                      |        | Test 2                      |                                     |        |
|---|--|------|-----------------------------|--------|-----------------------------|-------------------------------------|--------|
|   |  |      | Cell 1                      | Cell 2 | Cell 1                      | Cell 2                              |        |
| SSB ARFCN   | 1~3  |      | freq1                       | freq2  | freq1                       | freq2                               |        |
| BW <sub>channel</sub>                             | 1  | MHz  | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |                                     |        |
|   | 2  |      | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |                                     |        |
|   | 3  |      | 40: N <sub>RB,c</sub> = 106 |        | 40: N <sub>RB,c</sub> = 106 |                                     |        |
| Duplex mode                                       | 1  |      | FDD                         |        | FDD                         |                                     |        |
|   | 2  |      | TDD                         |        | TDD                         |                                     |        |
|   | 3  |      | TDD                         |        | TDD                         |                                     |        |
| TDD configuration                                 | 1  |      | N/A                         |        | N/A                         |                                     |        |
|   | 2  |      | TDDConf.1.1                 |        | TDDConf.1.1                 |                                     |        |
|   | 3  |      | TDDConf.2.1                 |        | TDDConf.2.1                 |                                     |        |
| PDSCH Reference measurement channel               | 1  |      | SR.1.1 FDD                  | -      | SR.1.1 FDD                  | -                                   |        |
|   | 2  |      | SR.1.1 TDD                  |        | SR.1.1 TDD                  |                                     |        |
|   | 3  |      | SR.2.1 FDD                  |        | SR.2.1 FDD                  |                                     |        |
| RMSI CORESET Reference Channel                    | 1  |      | CR.1.1 FDD                  | -      | CR.1.1 FDD                  | -                                   |        |
|   | 2  |      | CR.1.1 TDD                  | -      | CR.1.1 TDD                  | -                                   |        |
|   | 3  |      | CR.2.1 FDD                  | -      | CR.2.1 FDD                  | -                                   |        |
| Dedicated CORESET Reference Channel               | 1  |      | CCR.1.1 FDD                 | -      | CCR.1.1 FDD                 | -                                   |        |
|   | 2  |      | CCR.1.1 TDD                 | -      | CCR.1.1 TDD                 | -                                   |        |
|   | 3  |      | CCR.2.1 TDD                 | -      | CCR.2.1 TDD                 | -                                   |        |
| SSB configuration                                 | 1  |      | SSB.1 FR1                   |        | SSB.1 FR1                   |                                     |        |
|   | 2  |      | SSB.1 FR1                   |        | SSB.1 FR1                   |                                     |        |
|   | 3  |      | SSB.2 FR1                   |        | SSB.2 FR1                   |                                     |        |
| OCNG Patterns                                     | 1~3  |      | OP.1                        |        | OP.1                        |                                     |        |
| TRS configuration                                 | 1  |      | TRS.1.1 FDD                 | -      | TRS.1.1 FDD                 |                                     |        |
|   | 2  |      | TRS.1.1 TDD                 |        | TRS.1.1 TDD                 |                                     |        |
|   | 3  |      | TRS.1.2 TDD                 |        | TRS.1.2 TDD                 |                                     |        |
| Initial BWP Configuration                         | 1~3  |      | DLBWP.0.1<br>ULBWP.0.1      |        | DLBWP.0.1<br>ULBWP.0.1      |                                     |        |
| Dedicated BWP configuration                       | 1~3  |      | DLBWP.1.1<br>ULBWP.1.1      |        | DLBWP.1.1<br>ULBWP.1.1      |                                     |        |
| Time offset with Cell 1                           | 1  | ms   | -                           | 3      | -                           | 3                                   |        |
|   | 2,3  | µs   | -                           | 3      | -                           | 3                                   |        |
| SMTc configuration                                | 1  |      | SMTc.2                      |        | SMTc.2                      |                                     |        |
|   | 2,3  |      | SMTc.1                      |        | SMTc.1                      |                                     |        |
| EPRE ratio of PSS to SSS                          | 1~3  | dB   | 0                           | 0      | 0                           | 0                                   |        |
| EPRE ratio of PBCH DMRS to SSS                    |  |      |                             |        |                             |                                     |        |
| EPRE ratio of PBCH to PBCH DMRS                   |  |      |                             |        |                             |                                     |        |
| EPRE ratio of PDCCH DMRS to SSS                   |  |      |                             |        |                             |                                     |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |  |      |                             |        |                             |                                     |        |
| EPRE ratio of PDSCH DMRS to SSS                   |  |      |                             |        |                             |                                     |        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |      |                             |        |                             |                                     |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |      |                             |        |                             |                                     |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |      |                             |        |                             |                                     |        |
| $N_{oc}$ <sup>Note 2</sup>                        | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5</small> | 1~3  | dBm/15<br>kHz               | -94.65 |                             | $(N_{oc}$ for<br>Channel 2<br>+8dB) | -115   |
|   | NR_FDD_FR1_B   |      |                             |        |                             |                                     | -114.5 |
|   | NR_TDD_FR1_C   |      |                             |        |                             |                                     | -114   |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                          |      |                             |        |                             |                                     | -113.5 |

|                              |   |         |                     |        |                                      |         |                                     |         |
|------------------------------|---|---------|---------------------|--------|--------------------------------------|---------|-------------------------------------|---------|
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |                                      | -113    |                                     |         |
|                              | NR_FDD_FR1_F  |         |                     |        |                                      | -112.5  |                                     |         |
|                              | NR_FDD_FR1_G  |         |                     |        |                                      | -112    |                                     |         |
|                              | NR_FDD_FR1_H  |         |                     |        |                                      | -111.5  |                                     |         |
| $N_{oc}$ <sup>Note2</sup>    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 1,2,4,5 | dBm/SS<br>B SCS     | -94.65 | $(N_{oc}$ for<br>Channel 2<br>+8dB)  | -115    |                                     |         |
|                              | NR_FDD_FR1_B  |         |                     |        |                                      | -114.5  |                                     |         |
|                              | NR_TDD_FR1_C  |         |                     |        |                                      | -114    |                                     |         |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |                                      | -113.5  |                                     |         |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |                                      | -113    |                                     |         |
|                              | NR_FDD_FR1_F  |         |                     |        |                                      | -112.5  |                                     |         |
|                              | NR_FDD_FR1_G  |         |                     |        |                                      | -112    |                                     |         |
|                              | NR_FDD_FR1_H  |         |                     |        |                                      | -111.5  |                                     |         |
|                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 3       |                     |        |                                      | -91.65  | $(N_{oc}$ for<br>Channel 2<br>+8dB) | -112.00 |
|                              | NR_FDD_FR1_B  |         |                     |        |                                      |         |                                     | -111.50 |
|                              | NR_TDD_FR1_C  |         |                     |        |                                      |         |                                     | -111.00 |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |                                      |         |                                     | -110.50 |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |                                      |         |                                     | -110.00 |
|                              | NR_FDD_FR1_F  |         |                     |        |                                      |         |                                     | -109.50 |
|                              | NR_FDD_FR1_G  |         |                     |        |                                      |         |                                     | -109.00 |
|                              | NR_FDD_FR1_H  |         |                     |        |                                      |         |                                     | -108.50 |
| $\hat{E}_s/I_{ot}$           |   | 1~3     | dB                  | 10     | 10                                   | 13      | -3                                  |         |
| SS-<br>RSRP <sup>Note3</sup> | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 1,2,4,5 | dBm/SC<br>S         | -84.65 | (RSRP for<br>Cell 2<br>+25dB)        | -118.00 |                                     |         |
|                              | NR_FDD_FR1_B  |         |                     |        |                                      | -117.50 |                                     |         |
|                              | NR_TDD_FR1_C  |         |                     |        |                                      | -117.00 |                                     |         |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |                                      | -116.50 |                                     |         |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |                                      | -116.00 |                                     |         |
|                              | NR_FDD_FR1_F  |         |                     |        |                                      | -115.50 |                                     |         |
|                              | NR_FDD_FR1_G  |         |                     |        |                                      | -115.00 |                                     |         |
|                              | NR_FDD_FR1_H  |         |                     |        |                                      | -114.50 |                                     |         |
|                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 3       |                     |        |                                      | -81.65  | (RSRP for<br>Cell 2<br>+25dB)       | -115.00 |
|                              | NR_FDD_FR1_B  |         |                     |        |                                      |         |                                     | -114.50 |
|                              | NR_TDD_FR1_C  |         |                     |        |                                      |         |                                     | -114.00 |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |                                      |         |                                     | -113.50 |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |                                      |         |                                     | -113.00 |
|                              | NR_FDD_FR1_F  |         |                     |        |                                      |         |                                     | -112.50 |
|                              | NR_FDD_FR1_G  |         |                     |        |                                      |         |                                     | -112.00 |
|                              | NR_FDD_FR1_H  |         |                     |        |                                      |         |                                     | -111.50 |
| $I_o$ <sup>Note3</sup>       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br><small>NOTE 5,</small> | 1,2,4,5 | dBm/<br>9.36MH<br>z | -56.28 | $I_o$ for<br>Channel 2<br>+19.75dB)T | -85.28  |                                     |         |
|                              | NR_FDD_FR1_B  |         |                     |        |                                      | -84.78  |                                     |         |
|                              | NR_TDD_FR1_C  |         |                     |        |                                      | -84.28  |                                     |         |
|                              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                           |         |                     |        |                                      | -83.78  |                                     |         |
|                              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                           |         |                     |        |                                      | -83.28  |                                     |         |
|                              | NR_FDD_FR1_F  |         |                     |        |                                      | -82.78  |                                     |         |
|                              | NR_FDD_FR1_G  |         |                     |        |                                      | -82.28  |                                     |         |
|                              | NR_FDD_FR1_H  |         |                     |        |                                      | -81.78  |                                     |         |

|   |                               |                      |        |    |   |        |
|---|-------------------------------|----------------------|--------|----|---|--------|
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5   | 3                             | dBm/<br>38.16M<br>Hz | -50.19 |    | I <sub>o</sub> for<br>Channel 2<br>+19.75dB)T | -79.19 |
|   | NR_FDD_FR1_B                  |                      |        |    |   | -78.69 |
|   | NR_TDD_FR1_C                  |                      |        |    |   | -78.19 |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |                      |        |    |   | -77.69 |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |                      |        |    |   | -77.19 |
|   | NR_FDD_FR1_F                  |                      |        |    |   | -76.69 |
|   | NR_FDD_FR1_G                  |                      |        |    |   | -76.19 |
|   | NR_FDD_FR1_H                  |                      |        |    |   | -75.69 |
| $\hat{E}_s / N_{oc}$  | 1~3                           | dB                   | 10     | 10 | 13  | -3     |
| Propagation condition   | 1~3                           | -                    | AWGN   |    | AWGN  |        |
| Antenna configuration   | 1~3                           |                      | 1x2    |    | 1x2   |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |                               |                      |        |    |   |        |

A.6.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirement in clause 10.1.4.1.1 and relative requirement in clause 10.1.4.1.2.

A.6.7.1.3 Void

A.6.7.2 SS-RSRQ

A.6.7.2.1 SA: Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

A.6.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.1.1.

A.6.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is tested by using the parameters in Table A.6.7.2.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

**Table A.6.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note:  | The UE is only required to be tested in one of the supported test configurations |



**Table A.6.7.2.1.2-2: SS-RSRQ Intra frequency test parameters**

| Parameter                                |                  | Unit | Test 1                      |        | Test 2      |        | Test 3      |        |
|--|------------------|------|-----------------------------|--------|-------------|--------|-------------|--------|
|  |                  |      | Cell 1                      | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |
| SSB ARFCN                                |                  |      | freq1                       |        | freq1       |        | freq1       |        |
| Duplex mode                              | Config 1         |      | FDD                         |        |             |        |             |        |
|  | Config 2,3       |      | TDD                         |        |             |        |             |        |
| TDD configuration                        | Config 1         |      | Not Applicable              |        |             |        |             |        |
|  | Config 2         |      | TDDConf.1.1                 |        |             |        |             |        |
|  | Config 3         |      | TDDConf.2.1                 |        |             |        |             |        |
| BW <sub>channel</sub>                    | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| Gap Pattern ID                           |                  |      | 0                           |        |             |        |             |        |
| BWP configuration                        | Initial DL BWP   |      | DLBWP.0.1                   |        |             |        |             |        |
|  | Dedicated DL BWP |      | DLBWP.1.1                   |        |             |        |             |        |
|  | Initial UL BWP   |      | ULBWP.0.1                   |        |             |        |             |        |
|  | Dedicated UL BWP |      | ULBWP.1.1                   |        |             |        |             |        |
| DRX Cycle                                |                  | ms   | Not Applicable              |        |             |        |             |        |
| PDSCH Reference measurement channel      | Config 1         |      | SR.1.1 FDD                  | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|  | Config 2         |      | SR.1.1 TDD                  |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|  | Config 3         |      | SR.2.1 TDD                  |        | SR.2.1 TDD  |        | SR.2.1 TDD  |        |
| RMSI CORESET Reference Channel           | Config 1         |      | CR.1.1 FDD                  | -      | CR.1.1 FDD  | -      | CR.1.1 FDD  |        |
|  | Config 2         |      | CR.1.1 TDD                  |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|  | Config 3         |      | CR.2.1 TDD                  |        | CR.2.1 TDD  |        | CR.2.1 TDD  |        |
| Control Channel RMC                      | Config 1         |      | CCR.1.1 FDD                 | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|  | Config 2         |      | CCR.1.1 TDD                 |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|  | Config 3         |      | CCR.2.1 TDD                 |        | CCR.2.1 TDD |        | CCR.2.1 TDD |        |
| TRS Configuration                        | Config 1         |      | TRS.1.1 FDD                 | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD | -      |
|  | Config 2         |      | TRS.1.1 TDD                 |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|  | Config 3         |      | TRS.1.2 TDD                 |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns                            |                  |      | OP. 1                       |        |             |        |             |        |
| SS-RSSI-Measurement                      |                  |      | Not Applicable              |        |             |        |             |        |
| Time offset with Cell 1                  | Config 1         | ms   | -                           | 3      | -           | 3      | -           | 3      |
|  | Config 2,3       | µs   | -                           | 3      | -           | 3      | -           | 3      |
| SMTC configuration                       | Config 1         |      | SMTC.2                      |        |             |        |             |        |
|  | Config 2,3       |      | SMTC.1                      |        |             |        |             |        |
| SSB configuration                        | Config 1,2       |      | SSB.1 FR1                   |        |             |        |             |        |
|  | Config 3         |      | SSB.2 FR1                   |        |             |        |             |        |
| CSI-RS for tracking                      | Config 1         |      | TRS.1.1 FDD                 |        |             |        |             |        |
|  | Config 2         |      | TRS.1.1 TDD                 |        |             |        |             |        |
|  | Config 3         |      | TRS.1.2 TDD                 |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz  | 15 kHz                      |        |             |        |             |        |
|  | Config 3         |      | 30kHz                       |        |             |        |             |        |
| EPRE ratio of PSS to SSS                 |                  | dB   | 0                           | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS           |                  |      |                             |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS          |                  |      |                             |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS          |                  |      |                             |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |      |                             |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS          |                  |      |                             |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH             |                  |      |                             |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |      |                             |        |             |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |      |                             |        |             |        |             |        |

|                           |            |   |                |        |        |        |        |  |       |        |
|---------------------------|------------|---|----------------|--------|--------|--------|--------|--|-------|--------|
| $N_{oc}$ <sup>Note2</sup> | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz<br>z | -85    |        | -101   |        | -114   |       |        |
|                           |            | NR_FDD_FR1_B                            |                |        |        |        |        |  |       | -113.5 |
|                           |            | NR_TDD_FR1_C                            |                |        |        |        |        |  |       | -113   |
|                           |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                |        |        |        |        |  |       | -112.5 |
|                           |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                |        |        |        |        |  |       | -112   |
|                           |            | NR_FDD_FR1_F                            |                |        |        |        |        |  |       | -111.5 |
|                           |            | NR_FDD_FR1_G                            |                |        |        |        |        |  |       | -111   |
|                           |            | NR_FDD_FR1_H                            |                |        |        |        |        |  |       | -110.5 |
|                           | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                | -91    |        | -      |        | -114   |       |        |
|                           |            | NR_FDD_FR1_B                            |                |        |        |        |        |  |       | -113.5 |
|                           |            | NR_TDD_FR1_C                            |                |        |        |        |        |  |       | -113   |
|                           |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                |        |        |        |        |  |       | -112.5 |
|                           |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                |        |        |        |        |  |       | -112   |
|                           |            | NR_FDD_FR1_F                            |                |        |        |        |        |  |       | -111.5 |
|                           |            | NR_FDD_FR1_G                            |                |        |        |        |        |  |       | -111   |
|                           |            | NR_FDD_FR1_H                            |                |        |        |        |        |  |       | -110.5 |
| $N_{oc}$ <sup>Note2</sup> | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS        | -85    |        | -101   |        | -114<br>-113.5<br>-113<br>-112.5<br>-112<br>-111.5<br>-111<br>-110.5 |       |        |
|                           |            | NR_FDD_FR1_B                            |                |        |        |        |        |  |       |        |
|                           |            | NR_TDD_FR1_C                            |                |        |        |        |        |  |       |        |
|                           |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                |        |        |        |        |  |       |        |
|                           |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                |        |        |        |        |  |       |        |
|                           |            | NR_FDD_FR1_F                            |                |        |        |        |        |  |       |        |
|                           |            | NR_FDD_FR1_G                            |                |        |        |        |        |  |       |        |
|                           |            | NR_FDD_FR1_H                            |                |        |        |        |        |  |       |        |
|                           | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                | -88    |        | -      |        | -111   |       |        |
|                           |            | NR_FDD_FR1_B                            |                |        |        |        |        |  |       | -110.5 |
|                           |            | NR_TDD_FR1_C                            |                |        |        |        |        |  |       | -110   |
|                           |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                |        |        |        |        |  |       | -109.5 |
|                           |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                |        |        |        |        |  |       | -109   |
|                           |            | NR_FDD_FR1_F                            |                |        |        |        |        |  |       | -108.5 |
|                           |            | NR_FDD_FR1_G                            |                |        |        |        |        |  |       | -108   |
|                           |            | NR_FDD_FR1_H                            |                |        |        |        |        |  |       | -107.5 |
| $\hat{E}_s/I_{ot}$        |            |   | dB             | -1.76  |        | -4.7   |        | -5.46  | -5.46 |        |
| $\hat{E}_s/N_{oc}$        |            |   | dB             | 3      | 3      | -2.9   | -2.9   | -4   | -4    |        |
| SS-RSRP <sup>Note 3</sup> | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS        | -82    | -82    | -103.9 | -103.9 | -118<br>-117.5<br>-117<br>-116.5<br>-116<br>-115.5<br>-115<br>-114.5 |       |        |
|                           |            | NR_FDD_FR1_B                            |                |        |        |        |        |  |       | -117.5 |
|                           |            | NR_TDD_FR1_C                            |                |        |        |        |        |  |       | -117   |
|                           |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                |        |        |        |        |  |       | -116.5 |
|                           |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                |        |        |        |        |  |       | -116   |
|                           |            | NR_FDD_FR1_F                            |                |        |        |        |        |  |       | -115.5 |
|                           |            | NR_FDD_FR1_G                            |                |        |        |        |        |  |       | -115   |
|                           |            | NR_FDD_FR1_H                            |                |        |        |        |        |  |       | -114.5 |
|                           | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                | -85    | -85    | -      | -      | -115   | -115  |        |
|                           |            | NR_FDD_FR1_B                            |                | -114.5 | -114.5 |        |        |  |       |        |

|   |       |   |                  |        |        |        |        |        |        |
|---|-------|---|------------------|--------|--------|--------|--------|--------|--------|
|   |       | NR_TDD_FR1_C                            |                  |        |        |        |        | -114   | -114   |
|   |       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |        | -113.5 | -113.5 |
|   |       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |        | -113   | -113   |
|   |       | NR_FDD_FR1_F                            |                  |        |        |        |        | -112.5 | -112.5 |
|   |       | NR_FDD_FR1_G                            |                  |        |        |        |        | -112   | -112   |
|   |       | NR_FDD_FR1_H                            |                  |        |        |        |        | -111.5 | -111.5 |
| SS-RSRQ   | Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dB               | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
|   |       | NR_FDD_FR1_B                            |                  |        |        |        |        |        |        |
|   |       | NR_TDD_FR1_C                            |                  |        |        |        |        |        |        |
|   |       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |        |        |        |
|   |       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |        |        |        |
|   |       | NR_FDD_FR1_F                            |                  |        |        |        |        |        |        |
|   |       | NR_FDD_FR1_G                            |                  |        |        |        |        |        |        |
|   |       | NR_FDD_FR1_H                            |                  |        |        |        |        |        |        |
| Io  | Note3 | Config 1,2                              | dBm/<br>9.36MHz  | -50    |        | -70    |        | -83.5  |        |
|   |       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                  |        |        |        |        |        |        |
|   |       | NR_FDD_FR1_B                            |                  |        |        |        |        | -83    |        |
|   |       | NR_TDD_FR1_C                            |                  |        |        |        |        | -82.5  |        |
|   |       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |        | -82    |        |
|   |       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |        | -81.5  |        |
|   |       | NR_FDD_FR1_F                            |                  |        |        |        |        | -81    |        |
|   |       | NR_FDD_FR1_G                            |                  |        |        |        |        | -80.5  |        |
|   |       | NR_FDD_FR1_H                            |                  |        |        |        |        | -80    |        |
|   |       | Config 3                                | dBm/<br>38.16MHz | -50    |        | -      |        | -77.4  |        |
|   |       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                  |        |        |        |        |        |        |
|   |       | NR_FDD_FR1_B                            |                  |        |        |        |        | -76.9  |        |
|   |       | NR_TDD_FR1_C                            |                  |        |        |        |        | -76.4  |        |
|   |       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |        | -75.9  |        |
|   |       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |        | -75.4  |        |
|   |       | NR_FDD_FR1_F                            |                  |        |        |        |        | -74.9  |        |
|   |       | NR_FDD_FR1_G                            |                  |        |        |        |        | -74.4  |        |
|   |       | NR_FDD_FR1_H                            |                  |        |        |        |        | -73.9  |        |
| Propagation condition   |       |   | -                | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   |
| Antenna configuration   |       |   |                  | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |       |   |                  |        |        |        |        |        |        |

### A.6.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.1.1.

## A.6.7.2.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

### A.6.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.9.1.1 and 10.1.9.1.2.

### A.6.7.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.6.7.2.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A.6.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                              |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.2.2-2: SS-RSRQ Inter frequency test parameters**

| Parameter                                |              | Unit         | Test 1                      |        | Test 2      |        | Test 3      |        |
|--|--------------|--------------|-----------------------------|--------|-------------|--------|-------------|--------|
|  |              |              | Cell 1                      | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |
| SSB ARFCN                                |              |              | freq1                       | freq2  | freq1       | freq2  | freq1       | freq2  |
| Duplex mode                              | Config 1     |              | FDD                         |        |             |        |             |        |
|  | Config 2,3   |              | TDD                         |        |             |        |             |        |
| TDD configuration                        | Config 1     |              | Not Applicable              |        |             |        |             |        |
|  | Config 2     |              | TDDConf.1.1                 |        |             |        |             |        |
|  | Config 3     |              | TDDConf.2.1                 |        |             |        |             |        |
| BW <sub>channel</sub>                    | Config 1     | MHz          | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 2     |              | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 3     |              | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| Gap pattern ID                           | Config 1,2,3 |              | 0                           |        |             |        |             |        |
| BWP BW                                   | Config 1     |              | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 2     |              | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|  | Config 3     |              | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| DRX Cycle                                |              | ms           | Not Applicable              |        |             |        |             |        |
| PDSCH Reference measurement channel      | Config 1,4   |              | SR.1.1 FDD                  | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|  | Config 2,5   |              | SR.1.1 TDD                  |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|  | Config 3,6   |              | SR2.1 TDD                   |        | SR2.1 TDD   |        | SR2.1 TDD   |        |
| RMSI CORESET Reference Channel           | Config 1     |              | CR.1.1 FDD                  | -      | R.1.1 FDD   | -      | CR.1.1 FDD  |        |
|  | Config 2     |              | CR.1.1 TDD                  |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|  | Config 3     |              | CR2.1 TDD                   |        | CR2.1 TDD   |        | CR2.1 TDD   |        |
| Dedicated CORESET Reference Channel      | Config 1     |              | CCR.1.1 FDD                 | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|  | Config 2     |              | CCR.1.1 TDD                 |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|  | Config 3     |              | CCR2.1 TDD                  |        | CCR2.1 TDD  |        | CCR2.1 TDD  |        |
| TRS Configuration                        | Config 1     |              | TRS.1.1 FDD                 | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD | -      |
|  | Config 2     |              | TRS.1.1 TDD                 |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|  | Config 3     |              | TRS.1.2 TDD                 |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns                            |              |              | OCNG pattern 1              |        |             |        |             |        |
| Time offset with Cell 1                  | Config 1     | ms           | -                           | 3      | -           | 3      | -           | 3      |
|  | Config 2,3   | µs           | -                           | 3      | -           | 3      | -           | 3      |
| SMTC configuration                       | Config 1     |              | SMTC pattern 2              |        |             |        |             |        |
|  | Config 2,3   |              | SMTC pattern 1              |        |             |        |             |        |
| SSB configuration                        | Config 1,2   |              | SSB pattern 1 in FR1        |        |             |        |             |        |
|  | Config 3     |              | SSB pattern 2 in FR1        |        |             |        |             |        |
| CSI-RS for tracking                      | Config 1     |              | TRS.1.1 FDD                 |        |             |        |             |        |
|  | Config 2     |              | TRS.1.1 TDD                 |        |             |        |             |        |
|  | Config 3     |              | TRS.1.2 TDD                 |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2   | kHz          | 15 kHz                      |        |             |        |             |        |
|  | Config 3     |              | 30 kHz                      |        |             |        |             |        |
| EPRE ratio of PSS to SSS                 |              | dB           | 0                           | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS           |              |              |                             |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS          |              |              |                             |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS          |              |              |                             |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |              |              |                             |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS          |              |              |                             |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH             |              |              |                             |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |              |              |                             |        |             |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |              |              |                             |        |             |        |             |        |
| N <sub>oc</sub><br>Note2                 | Config 1,2   |              | NR_FDD_FR1_A                | -80.18 |             | -106   |             | -116   |
|  |              | NR_TDD_FR1_A |                             |        |             |        |             |        |
|  |              | NR_FDD_FR1_B |                             |        |             |        | -115.5      |        |
|  |              | NR_TDD_FR1_C |                             |        |             |        | -115        |        |

|                           |            |  |           |        |        |   |   |        |        |        |   |
|---------------------------|------------|--|-----------|--------|--------|---|---|--------|--------|--------|---|
|                           |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   |        | -114.5 |        |   |
|                           |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   |        | -114   |        |   |
|                           |            | NR_FDD_FR1_F                           |           |        |        |   |   |        | -113.5 |        |   |
|                           |            | NR_FDD_FR1_G                           |           |        |        |   |   |        | -113   |        |   |
|                           |            | NR_FDD_FR1_H                           |           |        |        |   |   |        | -112.5 |        |   |
| $N_{oc}$<br>Note2         | Config 3   | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz | -86.27 | -113   |   |   |        | -116   |        |   |
|                           |            | NR_FDD_FR1_B                           |           |        |        |   |   |        | -115.5 |        |   |
|                           |            | NR_TDD_FR1_C                           |           |        |        |   |   |        | -115   |        |   |
|                           |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   |        | -114.5 |        |   |
|                           |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   |        | -114   |        |   |
|                           |            | NR_FDD_FR1_F                           |           |        |        |   |   |        | -113.5 |        |   |
|                           |            | NR_FDD_FR1_G                           |           |        |        |   |   |        | -113   |        |   |
|                           |            | NR_FDD_FR1_H                           |           |        |        |   |   |        | -112.5 |        |   |
| $N_{oc}$<br>Note2         | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz | -80.18 | -106   |   |   |        | -116   |        |   |
|                           |            | NR_FDD_FR1_B                           |           |        |        |   |   |        | -115.5 |        |   |
|                           |            | NR_TDD_FR1_C                           |           |        |        |   |   |        | -115   |        |   |
|                           |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   |        | -114.5 |        |   |
|                           |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   |        | -114   |        |   |
|                           |            | NR_FDD_FR1_F                           |           |        |        |   |   |        | -113.5 |        |   |
|                           |            | NR_FDD_FR1_G                           |           |        |        |   |   |        | -113   |        |   |
|                           |            | NR_FDD_FR1_H                           |           |        |        |   |   |        | -112.5 |        |   |
|                           | Config 3   | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |           | -83.27 | -110   |   |   |        |        | -113   |   |
|                           |            | NR_FDD_FR1_B                           |           |        |        |   |   |        |        | -112.5 |   |
|                           |            | NR_TDD_FR1_C                           |           |        |        |   |   |        |        | -112   |   |
|                           |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   |        |        | -111.5 |   |
|                           |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   |        |        | -111   |   |
|                           |            | NR_FDD_FR1_F                           |           |        |        |   |   |        |        | -110.5 |   |
|                           |            | NR_FDD_FR1_G                           |           |        |        |   |   |        |        | -110   |   |
|                           |            | NR_FDD_FR1_H                           |           |        |        |   |   |        |        | -109.5 |   |
| $\hat{E}_s / I_{ot}$      |            |  | dB        | -1.75  | -1.75  |   |   | 3      | -1.75  |        |   |
| $\hat{E}_s / N_{oc}$      |            |  | dB        | -1.75  | -1.75  |   |   | 3      | -1.75  |        |   |
| SS-RSRP <sup>Not e3</sup> | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS   | -81.93 | -81.93 | - | - | 107.75 | 107.75 | -113   | - |
|                           |            | NR_FDD_FR1_B                           |           |        |        |   |   |        |        | -112.5 | - |
|                           |            | NR_TDD_FR1_C                           |           |        |        |   |   |        |        | -112   | - |
|                           |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   |        |        | -111.5 | - |
|                           |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   |        |        | -111   | - |
|                           |            | NR_FDD_FR1_F                           |           |        |        |   |   |        |        | -110.5 | - |
|                           |            | NR_FDD_FR1_G                           |           |        |        |   |   |        |        | -110   | - |
|                           |            |  |           |        |        |   |   |        | 117.75 | 117.25 |   |
|                           |            |  |           |        |        |   |   |        | 117.25 | 116.75 |   |
|                           |            |  |           |        |        |   |   |        | 116.25 | 115.75 |   |
|                           |            |  |           |        |        |   |   |        | 115.2  | 114.75 |   |



|                          |                              |  |  |        |        |        |        |        |  |                 |       |
|--------------------------|------------------------------|--|--|--------|--------|--------|--------|--------|--|-----------------|-------|
|                          |                              | NR_FDD_FR1_H                           |  |        |        |        |        | -109.5 | -<br>114.2<br>5                        |                 |       |
|                          | Config 3                     | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |  | -85.02 | -85.02 | -      | 111.75 | 111.75 | -110                                   | -<br>114.7<br>5 |       |
|                          |                              | NR_FDD_FR1_B                           |  |        |        |        |        |        | -109.5                                 | -<br>114.2<br>5 |       |
|                          |                              | NR_TDD_FR1_C                           |  |        |        |        |        |        | -109                                   | -<br>113.7<br>5 |       |
|                          |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |  |        |        |        |        |        | -108.5                                 | -<br>113.2<br>5 |       |
|                          |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |  |        |        |        |        |        | -108                                   | -<br>112.7<br>5 |       |
|                          |                              | NR_FDD_FR1_F                           |  |        |        |        |        |        | -107.5                                 | -<br>112.2      |       |
|                          |                              | NR_FDD_FR1_G                           |  |        |        |        |        |        | -107                                   | -<br>111.7<br>5 |       |
|                          |                              | NR_FDD_FR1_H                           |  |        |        |        |        |        | -106.5                                 | -<br>111.2<br>5 |       |
| SS-RSRQ <sup>Note3</sup> |                              |  | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dB     | -14.77 | -14.77 | -40.59 | -40.59 | 12.56T                                 | 14.76<br>T      |       |
|                          |                              | NR_FDD_FR1_B                           |  |        |        |        |        |        |  |                 |       |
|                          |                              | NR_TDD_FR1_C                           |  |        |        |        |        |        |  |                 |       |
|                          |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |  |        |        |        |        |        |  |                 |       |
|                          |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |  |        |        |        |        |        |  |                 |       |
|                          |                              | NR_FDD_FR1_F                           |  |        |        |        |        |        |  |                 |       |
|                          |                              | NR_FDD_FR1_G                           |  |        |        |        |        |        |  |                 |       |
|                          |                              | NR_FDD_FR1_H                           |  |        |        |        |        |        |  |                 |       |
| Io <sup>Note3</sup>      | Config 1,2                   | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS                                | -50    |        | -75.83 |        | -83.28 | -                                      | 85.83           |       |
|                          |                              | NR_FDD_FR1_B                           |  |        |        |        |        |        | -82.78                                 | -               | 85.33 |
|                          |                              | NR_TDD_FR1_C                           |  |        |        |        |        |        | -82.28                                 | -               | 84.83 |
|                          |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |  |        |        |        |        |        | -81.78                                 | -               | 84.33 |
|                          |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |  |        |        |        |        |        | -81.28                                 | -               | 83.83 |
|                          |                              | NR_FDD_FR1_F                           |  |        |        |        |        |        | -80.78                                 | -               | 83.33 |
|                          |                              | NR_FDD_FR1_G                           |  |        |        |        |        |        | -80.28                                 | -               | 82.83 |
|                          |                              | NR_FDD_FR1_H                           |  |        |        |        |        |        | -79.78                                 | -               | 82.33 |
|                          |                              | Config 3                               |  |        |        |        |        |        | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | -50             |       |
|                          | NR_FDD_FR1_B                 |  | -76.69                                 | -      | 79.23  |        |        |        |  |                 |       |
|                          | NR_TDD_FR1_C                 |  | -76.19                                 | -      | 78.73  |        |        |        |  |                 |       |
|                          | NR_FDD_FR1_D<br>NR_TDD_FR1_D |  | -75.69                                 | -      | 78.23  |        |        |        |  |                 |       |
|                          | NR_FDD_FR1_E                 |  | -75.19                                 | -      | 77.73  |        |        |        |  |                 |       |
|                          | NR_TDD_FR1_E                 |  |  |        |        |        |        |        |  |                 |       |

|   |  |              |   |          |      |      |      |          |          |
|---|--|--------------|---|----------|------|------|------|----------|----------|
|   |  | NR_FDD_FR1_F |   |          |      |      |      | -74.69   | -        |
|   |  | NR_FDD_FR1_G |   |          |      |      |      | -74.19   | -        |
|   |  | NR_FDD_FR1_H |   |          |      |      |      | -73.69   | -        |
|   |  |              |   |          |      |      |      |          | 77.23    |
|   |  |              |   |          |      |      |      |          | 76.73    |
|   |  |              |   |          |      |      |      |          | 76.53    |
| Propagation condition   |  |              | - | AWG<br>N | AWGN | AWGN | AWGN | AWG<br>N | AWG<br>N |
| Antenna configuration   |  |              |   | 1x2      | 1x2  | 1x2  | 1x2  | 1x2      | 1x2      |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |  |              |   |          |      |      |      |          |          |

### A.6.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.1.1 and 10.1.9.1.2.

## A.6.7.3 SS-SINR

### A.6.7.3.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

#### A.6.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.6.7.3.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

**Table A.6.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.3.1.2-2: SS-SINR Intra frequency test parameters**

| Parameter                                |   | Unit           | Test 1           |        | Test 2         |        |
|--|---|----------------|------------------|--------|----------------|--------|
|  |   |                | Cell 1           | Cell 2 | Cell 1         | Cell 2 |
| SSB ARFCN                                |   |                | freq1            |        | freq1          |        |
| Duplex mode                              | Config 1                                |                | FDD              |        |                |        |
|  | Config 2,3                              |                | TDD              |        |                |        |
| TDD configuration                        | Config 1                                |                | Not Applicable   |        |                |        |
|  | Config 2                                |                | TDDConf.1.1      |        |                |        |
|  | Config 3                                |                | TDDConf.2.1      |        |                |        |
| Downlink initial BWP configuration       |   |                | DLBWP.0.1        |        |                |        |
| Downlink dedicated BWP configuration     |   |                | DLBWP.1.1        |        |                |        |
| Uplink initial BWP configuration         |   |                | ULBWP.0.1        |        |                |        |
| Uplink dedicated BWP configuration       |   |                | ULBWP.1.1        |        |                |        |
| DRX Cycle configuration                  |   | ms             | Not Applicable   |        |                |        |
| TRS configuration                        | Config 1                                |                | TRS.1.1<br>FDD   |        | TRS.1.1<br>FDD |        |
|  | Config 2                                |                | TRS.1.1<br>TDD   |        | TRS.1.1<br>TDD |        |
|  | Config 3                                |                | TRS.1.2<br>TDD   |        | TRS.1.2<br>TDD |        |
| PDSCH Reference measurement channel      | Config 1                                |                | SR.1.1<br>FDD    | -      | SR.1.1<br>FDD  | -      |
|  | Config 2                                |                | SR.1.1<br>TDD    |        | SR.1.1<br>TDD  |        |
|  | Config 3                                |                | SR.2.1<br>TDD    |        | SR.2.1<br>TDD  |        |
| RMSI CORESET Reference Channel           | Config 1                                |                | CR.1.1<br>FDD    | -      | CR.1.1<br>FDD  |        |
|  | Config 2                                |                | CR.1.1<br>TDD    |        | CR.1.1<br>TDD  |        |
|  | Config 3                                |                | CR.2.1<br>TDD    |        | CR.2.1<br>TDD  |        |
| Dedicated CORESET Reference Channel      | Config 1                                |                | CCR.1.1<br>1 FDD | -      | CCR.1.1<br>FDD | -      |
|  | Config 2                                |                | CCR.1.1<br>1 TDD |        | CCR.1.1<br>TDD |        |
|  | Config 3                                |                | CCR.2.1<br>1 TDD |        | CCR.2.1<br>TDD |        |
| OCNG Patterns                            |   |                | OP.1             |        |                |        |
| SS-RSSI-Measurement                      |   |                | Not Applicable   |        |                |        |
| SMTC configuration                       | Config 1                                |                | SMTC.2           |        |                |        |
|  | Config 2,3                              |                | SMTC.1           |        |                |        |
| Time offset with Cell 1                  | Config 1                                | ms             | -                | 3      | -              | 3      |
|  | Config 2,3                              | µs             | -                | 3      | -              | 3      |
| SSB configuration                        | Config 1,2                              |                | SSB.1 FR1        |        |                |        |
|  | Config 3                                |                | SSB.2 FR1        |        |                |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2                              | kHz            | 15               |        |                |        |
|  | Config 3                                |                | 30               |        |                |        |
| EPRE ratio of PSS to SSS                 |   | dB             | 0                | 0      | 0              | 0      |
| EPRE ratio of PBCH DMRS to SSS           |   |                |                  |        |                |        |
| EPRE ratio of PBCH to PBCH DMRS          |   |                |                  |        |                |        |
| EPRE ratio of PDCCH DMRS to SSS          |   |                |                  |        |                |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |   |                |                  |        |                |        |
| EPRE ratio of PDSCH DMRS to SSS          |   |                |                  |        |                |        |
| EPRE ratio of PDSCH to PDSCH             |   |                |                  |        |                |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |   |                |                  |        |                |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |   |                |                  |        |                |        |
| $N_{oc}$ <sup>Note2</sup>                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz<br>z | -93              |        | -116           |        |
|  | NR_FDD_FR1_B                            |                |                  |        |                |        |
|  | NR_TDD_FR1_C                            |                | -115             |        |                |        |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                | -114.5           |        |                |        |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                | -114             |        |                |        |

|                               |                               |   |   |                 |                             |   |        |        |
|-------------------------------|-------------------------------|---|---|-----------------|-----------------------------|---|--------|--------|
|                               |                               | NR_FDD_FR1_F                            |   |                 |                             | -113.5                                  |        |        |
|                               |                               | NR_FDD_FR1_G                            |   |                 |                             | -113                                    |        |        |
|                               |                               | NR_FDD_FR1_H                            |   |                 |                             | -112.5                                  |        |        |
| $N_{oc}$<br>Note2             | Config 1,2                    |   | dBm/SCS                                 | -93             | Same as $N_{oc}$ for 15 kHz |   |        |        |
|                               |                               |   |   |                 |                             |   |        |        |
|                               | Config 3                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |   | -90             | -113                        |   |        |        |
|                               |                               | NR_FDD_FR1_B                            |   |                 | -112.5                      |   |        |        |
|                               |                               | NR_TDD_FR1_C                            |   |                 | -112                        |   |        |        |
|                               |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                 | -111.5                      |   |        |        |
|                               |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                 | -111                        |   |        |        |
|                               |                               | NR_FDD_FR1_F                            |   |                 | -110.5                      |   |        |        |
|                               |                               | NR_FDD_FR1_G                            |   |                 | -110                        |   |        |        |
|                               |                               | NR_FDD_FR1_H                            |   |                 | -109.5                      |   |        |        |
| $\hat{E}_s / I_{ot}$          |                               |   | dB                                      | 0               | -3.19                       | -5.46                                   | -5.46  |        |
| $\hat{E}_s / N_{oc}$          |                               |   | dB                                      | 4.54            | 2.66                        | -4                                      | -4     |        |
| SS-RSRP <sup>Not e3</sup>     | Config 1,2                    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS                                 | -88.46          | -90.34                      | -120                                    | -120   |        |
|                               |                               | NR_FDD_FR1_B                            |   |                 |                             | -119.5                                  | -119.5 |        |
|                               |                               | NR_TDD_FR1_C                            |   |                 |                             | -119                                    | -119   |        |
|                               |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                 |                             | -118.5                                  | -118.5 |        |
|                               |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                 |                             | -118                                    | -118   |        |
|                               |                               | NR_FDD_FR1_F                            |   |                 |                             | -117.5                                  | -117.5 |        |
|                               |                               | NR_FDD_FR1_G                            |   |                 |                             | -117                                    | -117   |        |
|                               |                               | NR_FDD_FR1_H                            |   |                 |                             | -116.5                                  | -116.5 |        |
|                               |                               | Config 3                                |   |                 |                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | -85.46 | -87.34 |
|                               | NR_FDD_FR1_B                  |   | -116.5                                  | -116.5          |                             |   |        |        |
|                               | NR_TDD_FR1_C                  |   | -116                                    | -116            |                             |   |        |        |
|                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |   | -115.5                                  | -115.5          |                             |   |        |        |
|                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |   | -115                                    | -115            |                             |   |        |        |
|                               | NR_FDD_FR1_F                  |   | -114.5                                  | -114.5          |                             |   |        |        |
|                               | NR_FDD_FR1_G                  |   | -114                                    | -114            |                             |   |        |        |
|                               | NR_FDD_FR1_H                  |   | -113.5                                  | -113.5          |                             |   |        |        |
|                               | SS-SINR <sup>Note3</sup>      |   |   | dB              | 0                           | -3.19                                   |        |        |
|                               | $I_o$ <sup>Note3</sup>        | Config 1,2                              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz | -57.5                       | -85.51                                  |        |        |
| NR_FDD_FR1_B                  |                               |   | -85.01                                  |                 |                             |   |        |        |
| NR_TDD_FR1_C                  |                               |   | -84.51                                  |                 |                             |   |        |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D |                               |   | -84.01                                  |                 |                             |   |        |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E |                               |   | -83.51                                  |                 |                             |   |        |        |
| NR_FDD_FR1_F                  |                               |   | -83.01                                  |                 |                             |   |        |        |

|   |   |                  |        |        |
|---|---|------------------|--------|--------|
| Config 3  | NR_FDD_FR1_G                            | dBm/<br>38.16MHz | -51.41 | -82.51 |
|   | NR_FDD_FR1_H                            |                  |        | -82.01 |
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                  |        | -79.41 |
|   | NR_FDD_FR1_B                            |                  |        | -78.91 |
|   | NR_TDD_FR1_C                            |                  |        | -78.41 |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        | -77.91 |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        | -77.41 |
|   | NR_FDD_FR1_F                            |                  |        | -76.91 |
|   | NR_FDD_FR1_G                            |                  |        | -76.41 |
|   | NR_FDD_FR1_H                            |                  |        | -75.91 |
| Propagation condition   |   | -                | AWGN   |        |
| Antenna configuration   |   | -                | 1x2    |        |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |   |                  |        |        |

**A.6.7.3.1.3 Test Requirements**

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.1.1.

**A.6.7.3.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell**

**A.6.7.3.2.1 Test Purpose and Environment**

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.14.1.1 and 10.1.14.1.2.

**A.6.7.3.2.2 Test Parameters**

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.6.7.3.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A.6.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.3.2.2-2: SS-SINR Inter frequency test parameters**

| Parameter                                |            | Unit                | Test 1         |        | Test 2      |        | Test 3      |        |
|--|------------|---------------------|----------------|--------|-------------|--------|-------------|--------|
|  |            |                     | Cell 1         | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |
| SSB ARFCN                                |            |                     | freq1          | freq2  | freq1       | freq2  | freq1       | freq2  |
| Duplex mode                              | Config 1   |                     | FDD            |        |             |        |             |        |
|  | Config 2,3 |                     | TDD            |        |             |        |             |        |
| TDD configuration                        | Config 1   |                     | Not Applicable |        |             |        |             |        |
|  | Config 2   |                     | TDDConf.1.1    |        |             |        |             |        |
|  | Config 3   |                     | TDDConf.2.1    |        |             |        |             |        |
| Downlink initial BWP configuration       |            |                     | DLBWP.0.1      |        |             |        |             |        |
| Downlink dedicated BWP configuration     |            |                     | DLBWP.1.1      |        |             |        |             |        |
| Uplink initial BWP configuration         |            |                     | ULBWP.0.1      |        |             |        |             |        |
| Uplink dedicated BWP configuration       |            |                     | ULBWP.1.1      |        |             |        |             |        |
| DRX Cycle configuration                  |            | ms                  | Not Applicable |        |             |        |             |        |
| Gap pattern ID                           |            |                     | 0              | -      | 0           | -      | 0           | -      |
| TRS configuration                        | Config 1   |                     | TRS.1.1 FDD    |        | TRS.1.1 FDD |        | TRS.1.1 FDD |        |
|  | Config 2   |                     | TRS.1.1 TDD    |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|  | Config 3   |                     | TRS.1.2 TDD    |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| PDSCH Reference measurement channel      | Config 1   |                     | SR.1.1 FDD     | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|  | Config 2   |                     | SR.1.1 TDD     |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|  | Config 3   |                     | SR2.1 TDD      |        | SR2.1 TDD   |        | SR2.1 TDD   |        |
| RMSI CORESET Reference Channel           | Config 1   |                     | CR.1.1 FDD     | -      | CR.1.1 FDD  | -      | CR.1.1 FDD  |        |
|  | Config 2   |                     | CR.1.1 TDD     |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|  | Config 3   |                     | CR2.1 TDD      |        | CR2.1 TDD   |        | CR2.1 TDD   |        |
| Dedicated CORESET Reference Channel      | Config 1   |                     | CCR.1.1 FDD    | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|  | Config 2   |                     | CCR.1.1 TDD    |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|  | Config 3   |                     | CCR2.1 TDD     |        | CCR2.1 TDD  |        | CCR2.1 TDD  |        |
| OCNG Patterns                            |            |                     | OP.1           |        |             |        |             |        |
| SS-RSSI-Measurement                      |            |                     | Not Applicable |        |             |        |             |        |
| Time offset with Cell 1                  | Config 1   | ms                  | -              | 3      | -           | 3      | -           | 3      |
|  | Config 2,3 | µs                  | -              | 3      | -           | 3      | -           | 3      |
| SMTC configuration                       | Config 1   |                     | SMTC pattern 2 |        |             |        |             |        |
|  | Config 2,3 |                     | SMTC pattern 1 |        |             |        |             |        |
| SSB configuration                        | Config 1,2 |                     | SSB.1 FR1      |        |             |        |             |        |
|  | Config 3   |                     | SSB.2 FR1      |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2 | kHz                 | 15             |        |             |        |             |        |
|  | Config 3   |                     | 30             |        |             |        |             |        |
| EPRE ratio of PSS to SSS                 |            | dB                  | 0              | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS           |            |                     |                |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS          |            |                     |                |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS          |            |                     |                |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |                     |                |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS          |            |                     |                |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH             |            |                     |                |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |                     |                |        |             |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |                     |                |        |             |        |             |        |
| $N_{oc}$<br>Note2                        | Config 1,2 | NR_FDD_FR1_A        | -88            |        | -108.5      |        | -119.5      |        |
|  |            | NR_TDD_FR1_A NOTE 6 |                |        |             |        |             |        |
|  |            | NR_FDD_FR1_B        |                |        |             |        | -119        |        |
|  |            | NR_TDD_FR1_C        |                |        | -118.5      |        |             |        |



|                      |            |                        |         |        |        |                            |    |        |        |        |  |  |  |
|----------------------|------------|------------------------|---------|--------|--------|----------------------------|----|--------|--------|--------|--|--|--|
|                      |            | NR_FDD_FR1_D           |         |        |        |                            |    |        | -118   |        |  |  |  |
|                      |            | NR_TDD_FR1_D           |         |        |        |                            |    |        | -117.5 |        |  |  |  |
|                      |            | NR_FDD_FR1_E           |         |        |        |                            |    |        | -117   |        |  |  |  |
|                      |            | NR_TDD_FR1_E           |         |        |        |                            |    |        | -116.5 |        |  |  |  |
|                      |            | NR_FDD_FR1_F           |         |        |        |                            |    |        | -116   |        |  |  |  |
|                      |            | NR_FDD_FR1_G           |         |        |        |                            |    |        | -116   |        |  |  |  |
|                      |            | NR_FDD_FR1_H           |         |        |        |                            |    |        | -116   |        |  |  |  |
| $N_{oc}$<br>Note2    | Config 1,2 |                        | dBm/SCS | -88    | -108.5 | Same as $N_{oc}$ for 15kHz |    |        |        |        |  |  |  |
|                      |            |                        |         |        |        |                            |    |        |        |        |  |  |  |
|                      | Config 3   | NR_FDD_FR1_A           |         | -85    | -105.5 | -116.5                     |    |        |        |        |  |  |  |
|                      |            | NR_TDD_FR1_A<br>NOTE 6 |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            | NR_FDD_FR1_B           |         |        |        |                            |    |        |        | -116   |  |  |  |
|                      |            | NR_TDD_FR1_C           |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            | NR_FDD_FR1_D           |         |        |        |                            |    |        |        | -115   |  |  |  |
|                      |            | NR_TDD_FR1_D           |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            | NR_FDD_FR1_E           |         |        |        |                            |    |        |        | -114.5 |  |  |  |
|                      |            | NR_TDD_FR1_E           |         |        |        |                            |    |        |        |        |  |  |  |
| NR_FDD_FR1_F         | -114       |                        |         |        |        |                            |    |        |        |        |  |  |  |
| NR_FDD_FR1_G         |            |                        |         |        |        |                            |    |        |        |        |  |  |  |
| NR_FDD_FR1_H         | -113       |                        |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            |                        |         |        |        |                            |    |        |        |        |  |  |  |
| $\hat{E}_s / I_{ot}$ |            |                        | dB      | -1.75  | -1.75  | 20                         | 20 | -4.0   | -4.0   |        |  |  |  |
| $\hat{E}_s / N_{oc}$ |            |                        | dB      | -1.75  |        | 20                         |    | -4.0   |        |        |  |  |  |
| SS-RSRP<br>Note3     | Config 1,2 | NR_FDD_FR1_A           | dBm/SCS | -89.75 | -88.5  | -123.5                     |    |        |        |        |  |  |  |
|                      |            | NR_TDD_FR1_A<br>NOTE 6 |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            | NR_FDD_FR1_B           |         |        |        |                            |    |        |        | -123   |  |  |  |
|                      |            | NR_TDD_FR1_C           |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            | NR_FDD_FR1_D           |         |        |        |                            |    |        |        | -122.5 |  |  |  |
|                      |            | NR_TDD_FR1_D           |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            | NR_FDD_FR1_E           |         |        |        |                            |    |        |        | -122   |  |  |  |
|                      |            | NR_TDD_FR1_E           |         |        |        |                            |    |        |        |        |  |  |  |
| NR_FDD_FR1_F         | -121.5     |                        |         |        |        |                            |    |        |        |        |  |  |  |
| NR_FDD_FR1_G         |            |                        |         |        |        |                            |    |        |        |        |  |  |  |
|                      |            |                        |         |        |        |                            |    | -121   |        |        |  |  |  |
|                      |            |                        |         |        |        |                            |    | -120.5 |        |        |  |  |  |

|                          |            |                                     |                                     |        |       |        |
|--------------------------|------------|-------------------------------------|-------------------------------------|--------|-------|--------|
|                          |            | NR_FDD_FR1_H                        |                                     |        |       | -120   |
|                          | Config 3   | NR_FDD_FR1_A<br>NR_TDD_FR1_A NOTE 6 |                                     | -86.75 | -85.5 | -120.5 |
|                          |            | NR_FDD_FR1_B                        |                                     |        |       | -120   |
|                          |            | NR_TDD_FR1_C                        |                                     |        |       | -119.5 |
|                          |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D        |                                     |        |       | -119   |
|                          |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E        |                                     |        |       | -118.5 |
|                          |            | NR_FDD_FR1_F                        |                                     |        |       | -118   |
|                          |            | NR_FDD_FR1_G                        |                                     |        |       | -117.5 |
|                          |            | NR_FDD_FR1_H                        |                                     |        |       | -117   |
| SS-SINR <sup>Note3</sup> |            |                                     | NR_FDD_FR1_A<br>NR_TDD_FR1_A NOTE 6 | dB     | -1.75 | 20     |
|                          |            | NR_FDD_FR1_B                        |                                     |        |       |        |
|                          |            | NR_TDD_FR1_C                        |                                     |        |       |        |
|                          |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D        |                                     |        |       |        |
|                          |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E        |                                     |        |       |        |
|                          |            | NR_FDD_FR1_F                        |                                     |        |       |        |
|                          |            | NR_FDD_FR1_G                        |                                     |        |       |        |
|                          |            | NR_FDD_FR1_H                        |                                     |        |       |        |
| Io <sup>Note3</sup>      | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A NOTE 6 | dBm/<br>9.36MHz                     | -57.83 | -60.5 | -90.09 |
|                          |            | NR_FDD_FR1_B                        |                                     |        |       | -89.59 |
|                          |            | NR_TDD_FR1_C                        |                                     |        |       | -89.09 |
|                          |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D        |                                     |        |       | -88.59 |
|                          |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E        |                                     |        |       | -88.09 |
|                          |            | NR_FDD_FR1_F                        |                                     |        |       | -87.59 |
|                          |            | NR_FDD_FR1_G                        |                                     |        |       | -87.09 |
|                          |            | NR_FDD_FR1_H                        |                                     |        |       | -86.59 |

|   |   |                  |        |        |       |
|---|---|------------------|--------|--------|-------|
| Config 3  | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br><small>NOTE 6</small> | dBm/<br>38.16MHz | -51.73 | -54.41 | -84   |
|   | NR_FDD_FR1_B  |                  |        |        | -83.5 |
|   | NR_TDD_FR1_C  |                  |        |        | -83   |
|   | NR_FDD_FR1_D<br>NR_TDD_FR1_D                          |                  |        |        | -82.5 |
|   | NR_FDD_FR1_E<br>NR_TDD_FR1_E                          |                  |        |        | -82   |
|   | NR_FDD_FR1_F  |                  |        |        | -81.5 |
|   | NR_FDD_FR1_G  |                  |        |        | -81   |
|   | NR_FDD_FR1_H  |                  |        |        | -80.5 |
|   | Propagation condition                                 |                  |        |        | -     |
| Antenna configuration   |   | -                | 1x2    |        |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |   |                  |        |        |       |

### A.6.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.1.1 and 10.1.14.1.2.

## A.6.7.4 L1-RSRP measurement for beam reporting

### A.6.7.4.1 SSB based L1-RSRP measurement

#### A.6.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.5.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.6.7.4.1.1-1.

**Table A.6.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  |
| 3      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.6.7.4.1.2 Test parameters

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

**Table A.6.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters**

| Parameter   | Config                        | Unit   | Test 1                      | Test 2                      |   |
|---|-------------------------------|--------|-----------------------------|-----------------------------|---|
| SSB GSCN  | 1~3                           |        | freq1                       | freq1                       |   |
| Duplex mode                                       | 1                             |        | FDD                         | FDD                         |   |
|   | 2                             |        | TDD                         | TDD                         |   |
|   | 3                             |        | TDD                         | TDD                         |   |
| TDD Configuration                                 | 1                             |        | N/A                         | N/A                         |   |
|   | 2                             |        | TDDConf.1.1                 | TDDConf.1.1                 |   |
|   | 3                             |        | TDDConf.2.1                 | TDDConf.2.1                 |   |
| BW <sub>channel</sub>                             | 1                             | MHz    | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |   |
|   | 2                             |        | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |   |
|   | 3                             |        | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |   |
| PDSCH Reference measurement channel               | 1                             |        | SR.1.1 FDD                  | SR.1.1 FDD                  |   |
|   | 2                             |        | SR.1.1 TDD                  | SR.1.1 TDD                  |   |
|   | 3                             |        | SR.2.1 TDD                  | SR.2.1 TDD                  |   |
| RMSI CORESET Reference Channel                    | 1                             |        | CR.1.1 FDD                  | CR.1.1 FDD                  |   |
|   | 2                             |        | CR.1.1 TDD                  | CR.1.1 TDD                  |   |
|   | 3                             |        | CR.2.1 TDD                  | CR.2.1 TDD                  |   |
| Dedicated CORESET Reference Channel               | 1                             |        | CCR.1.1 FDD                 | CCR.1.1 FDD                 |   |
|   | 2                             |        | CCR.1.1 TDD                 | CCR.1.1 TDD                 |   |
|   | 3                             |        | CCR.2.1 TDD                 | CCR.2.1 TDD                 |   |
| SSB configuration                                 | 1                             |        | SSB.3 FR1                   | SSB.3 FR1                   |   |
|   | 2                             |        | SSB.3 FR1                   | SSB.3 FR1                   |   |
|   | 3                             |        | SSB.4 FR1                   | SSB.4 FR1                   |   |
| OCNG Patterns                                     | 1~3                           |        | OP.1                        | OP.1                        |   |
| Initial BWP Configuration                         | 1~3                           |        | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |   |
| TRS configuration                                 | 1                             |        | TRS.1.1 FDD                 | TRS.1.1 FDD                 |   |
|   | 2                             |        | TRS.1.1 TDD                 | TRS.1.1 TDD                 |   |
|   | 3                             |        | TRS.1.2 TDD                 | TRS.1.2 TDD                 |   |
| Dedicated BWP configuration                       | 1~3                           |        | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |   |
| SMTC configuration                                | 1~3                           |        | SMTC.1                      | SMTC.1                      |   |
| reportConfigType                                  | 1~3                           |        | periodic                    | periodic                    |   |
| reportQuantity                                    | 1~3                           |        | ssb-Index-RSRP              | ssb-Index-RSRP              |   |
| Number of reported RS                             | 1~3                           |        | 2                           | 2                           |   |
| L1-RSRP reporting period                          | 1~3                           |        | slot80                      | slot80                      |   |
| EPRE ratio of PSS to SSS                          | 1~3                           | dB     | 0                           | 0                           |   |
| EPRE ratio of PBCH DMRS to SSS                    |                               |        |                             |                             |   |
| EPRE ratio of PBCH to PBCH DMRS                   |                               |        |                             |                             |   |
| EPRE ratio of PDCCH DMRS to SSS                   |                               |        |                             |                             |   |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                               |        |                             |                             |   |
| EPRE ratio of PDSCH DMRS to SSS                   |                               |        |                             |                             |   |
| EPRE ratio of PDSCH to PDSCH DMRS                 |                               |        |                             |                             |   |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                               |        |                             |                             |   |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |                               |        |                             |                             |   |
| $N_{oc}$<br>Note2                                 |                               |        |                             |                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |
|   | NR_FDD_FR1_B                  | -116.5 |                             |                             |   |
|   | NR_TDD_FR1_C                  | -116   |                             |                             |   |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D | -115.5 |                             |                             |   |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E | -115   |                             |                             |   |
|   | NR_FDD_FR1_F                  | -114.5 |                             |                             |   |

|   |   |   |                |        |                |                 |        |
|---|---|---|----------------|--------|----------------|-----------------|--------|
|   | NR_FDD_FR1_G                            |   |                |        | -114           |                 |        |
|   | NR_FDD_FR1_H                            |   |                |        | -113.5         |                 |        |
| $N_{oc}$<br>Note2                       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2                                     | dBm/SSB<br>SCS | -94.65 | -117           |                 |        |
|   | NR_FDD_FR1_B                            |   |                |        | -116.5         |                 |        |
|   | NR_TDD_FR1_C                            |   |                |        | -116           |                 |        |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                |        | -115.5         |                 |        |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                |        | -115           |                 |        |
|   | NR_FDD_FR1_F                            |   |                |        | -114.5         |                 |        |
|   | NR_FDD_FR1_G                            |   |                |        | -114           |                 |        |
|   | NR_FDD_FR1_H                            |   |                |        | -113.5         |                 |        |
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3                                       |                |        | -91.65         | -114            |        |
|   | NR_FDD_FR1_B                            |   |                | -113.5 |                |                 |        |
|   | NR_TDD_FR1_C                            |   |                | -114   |                |                 |        |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                | -112.5 |                |                 |        |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                | -112   |                |                 |        |
|   | NR_FDD_FR1_F                            |   |                | -111.5 |                |                 |        |
|   | NR_FDD_FR1_G                            |   |                | -111   |                |                 |        |
|   | NR_FDD_FR1_H                            |   |                | -110.5 |                |                 |        |
|   | $\hat{E}_s/I_{ot}$                      |   |                | 1~3    |                | dB              | 10     |
|   | SSB<br>RSRP<br>Note3                    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |                | 1,2    | dBm/SSB<br>SCS | -84.65          | -120   |
| NR_FDD_FR1_B                            |   |   | -119.5         |        |                |                 |        |
| NR_TDD_FR1_C                            |   |   | -119           |        |                |                 |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |   | -118.5         |        |                |                 |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |   | -118           |        |                |                 |        |
| NR_FDD_FR1_F                            |   |   | -117.5         |        |                |                 |        |
| NR_FDD_FR1_G                            |   |   | -117           |        |                |                 |        |
| NR_FDD_FR1_H                            |   |   | -116.5         |        |                |                 |        |
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |   | 3                                       | -81.65         | -117   |                |                 |        |
| NR_FDD_FR1_B                            |   |   |                | -116.5 |                |                 |        |
| NR_TDD_FR1_C                            |   |   |                | -116   |                |                 |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |   |                | -115.5 |                |                 |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |   |                | -115   |                |                 |        |
| NR_FDD_FR1_F                            |   |   |                | -114.5 |                |                 |        |
| NR_FDD_FR1_G                            |   |   |                | -114   |                |                 |        |
| NR_FDD_FR1_H                            |   |   |                | -113.5 |                |                 |        |
| $I_o$ Note3                             |   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |                | 1,2    |                | dBm/9.36<br>MHz | -56.28 |
|   |   | NR_FDD_FR1_B                            |                | -86.78 |                |                 |        |
|   | NR_TDD_FR1_C                            |   | -86.28         |        |                |                 |        |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   | -85.78         |        |                |                 |        |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   | -85.28         |        |                |                 |        |
|   | NR_FDD_FR1_F                            |   | -84.78         |        |                |                 |        |
|   | NR_FDD_FR1_G                            |   | -84.28         |        |                |                 |        |
|   | NR_FDD_FR1_H                            |   | -83.78         |        |                |                 |        |

|  |     |                  |        |        |
|--|-----|------------------|--------|--------|
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5  | 3   | dBm/38.16<br>MHz | -50.19 | -81.19 |
| NR_FDD_FR1_B   |     |                  |        | -80.69 |
| NR_TDD_FR1_C   |     |                  |        | -80.19 |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D  |     |                  |        | -79.69 |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E  |     |                  |        | -79.19 |
| NR_FDD_FR1_F   |     |                  |        | -78.69 |
| NR_FDD_FR1_G   |     |                  |        | -78.19 |
| NR_FDD_FR1_H   |     |                  |        | -77.69 |
| $\hat{E}_s / N_{oc}$   | 1~3 | dB               | 10     | -3     |
| Propagation condition  | 1~3 |                  | AWGN   | AWGN   |
| Antenna configuration  | 1~3 |                  | 1x2    | 1x2    |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |     |                  |        |        |

A.6.7.4.1.3 Test Requirements

The L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.19.1.

A.6.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

A.6.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.5.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.6.7.4.2.1-1.

**Table A.6.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test**

| Config  | Description   |
|---|---|
| 1   | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2   | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3   | NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band |   |

A.6.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.



**Table A.6.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters**

| Parameter   | Config                                  | Unit   | Test 1                      | Test 2                      |     |
|---|---|--------|-----------------------------|-----------------------------|-----|
| SSB GSCN  | 1~3                                     |        | freq1                       | freq1                       |     |
| Duplex mode                                       | 1                                       |        | FDD                         | FDD                         |     |
|   | 2                                       |        | TDD                         | TDD                         |     |
|   | 3                                       |        | TDD                         | TDD                         |     |
| TDD Configuration                                 | 1                                       |        | N/A                         | N/A                         |     |
|   | 2                                       |        | TDDConf.1.1                 | TDDConf.1.1                 |     |
|   | 3                                       |        | TDDConf.2.1                 | TDDConf.2.1                 |     |
| BW <sub>channel</sub>                             | 1                                       | MHz    | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |     |
|   | 2                                       |        | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |     |
|   | 3                                       |        | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |     |
| PDSCH Reference measurement channel               | 1                                       |        | SR.1.1 FDD                  | SR.1.1 FDD                  |     |
|   | 2                                       |        | SR.1.1 TDD                  | SR.1.1 TDD                  |     |
|   | 3                                       |        | SR.2.1 TDD                  | SR.2.1 TDD                  |     |
| RMSI CORESET Reference Channel                    | 1                                       |        | CR.1.1 FDD                  | CR.1.1 FDD                  |     |
|   | 2                                       |        | CR.1.1 TDD                  | CR.1.1 TDD                  |     |
|   | 3                                       |        | CR.2.1 TDD                  | CR.2.1 TDD                  |     |
| Dedicated CORESET Reference Channel               | 1                                       |        | CCR.1.1 FDD                 | CCR.1.1 FDD                 |     |
|   | 2                                       |        | CCR.1.1 TDD                 | CCR.1.1 TDD                 |     |
|   | 3                                       |        | CCR.2.1 TDD                 | CCR.2.1 TDD                 |     |
| SSB configuration                                 | 1                                       |        | SSB.3 FR1                   | SSB.3 FR1                   |     |
|   | 2                                       |        | SSB.3 FR1                   | SSB.3 FR1                   |     |
|   | 3                                       |        | SSB.4 FR1                   | SSB.4 FR1                   |     |
| OCNG Patterns                                     | 1~3                                     |        | OP.1                        | OP.1                        |     |
| TRS configuration                                 | 1                                       |        | TRS.1.1 FDD                 | TRS.1.1 FDD                 |     |
|   | 2                                       |        | TRS.1.1 TDD                 | TRS.1.1 TDD                 |     |
|   | 3                                       |        | TRS.1.2 TDD                 | TRS.1.2 TDD                 |     |
| Initial BWP Configuration                         | 1~3                                     |        | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |     |
| Dedicated BWP configuration                       | 1~3                                     |        | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |     |
| SMTc configuration                                | 1~3                                     |        | SMTc.1                      | SMTc.1                      |     |
| CSI-RS  | 1                                       |        | CSI-RS 1.2 FDD              | CSI-RS 1.2 FDD              |     |
|   | 2                                       |        | CSI-RS 1.2 TDD              | CSI-RS 1.2 TDD              |     |
|   | 3                                       |        | CSI-RS 2.2 TDD              | CSI-RS 2.2 FDD              |     |
| reportConfigType                                  | 1~3                                     |        | periodic                    | periodic                    |     |
| reportQuantity                                    | 1~3                                     |        | cri-RSRP                    | cri-RSRP                    |     |
| Number of reported RS                             | 1~3                                     |        | 2                           | 2                           |     |
| L1-RSRP reporting period                          | 1~3                                     |        | slot80                      | slot80                      |     |
| EPRE ratio of PSS to SSS                          | 1~3                                     | dB     | 0                           | 0                           |     |
| EPRE ratio of PBCH DMRS to SSS                    |   |        |                             |                             |     |
| EPRE ratio of PBCH to PBCH DMRS                   |   |        |                             |                             |     |
| EPRE ratio of PDCCH DMRS to SSS                   |   |        |                             |                             |     |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |        |                             |                             |     |
| EPRE ratio of PDSCH DMRS to SSS                   |   |        |                             |                             |     |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |        |                             |                             |     |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |        |                             |                             |     |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |        |                             |                             |     |
| N <sub>oc</sub><br>Note2                          |   |        |                             |                             | 1~3 |
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | -116.5 |                             |                             |     |
|   | NR_FDD_FR1_B                            | -116   |                             |                             |     |
|   | NR_TDD_FR1_C                            | -115.5 |                             |                             |     |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D                     |   |        |                             |                             |     |

|                         |   |     |                   |        |        |
|-------------------------|---|-----|-------------------|--------|--------|
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -113.5 |
| $N_{oc}$<br>Note2       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/CSI-RS<br>SCS | -94.65 | -117   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -113.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3   |                   | -91.65 | -114   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -113.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -112.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -112   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -111.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -111   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -110.5 |
| $\hat{E}_s/I_{\alpha}$  |   | 1~3 | dB                | 10     | -3     |
| CSI-RS<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/CSI-RS<br>SCS | -84.65 | -120   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -119.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -119   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -118.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -118   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -117.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -117   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -116.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3   |                   | -81.65 | -117   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -113.5 |
| $I_o$ Note3             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/9.36<br>MHz   | -56.28 | -87.28 |
|                         | NR_FDD_FR1_B                            |     |                   |        | -86.78 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -86.28 |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -85.78 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -85.28 |
|                         | NR_FDD_FR1_F                            |     |                   |        | -84.78 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -84.28 |
|                         | NR_FDD_FR1_H                            |     |                   |        | -83.78 |

|  |                               |                  |        |        |
|--|-------------------------------|------------------|--------|--------|
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5  | 3                             | dBm/38.16<br>MHz | -50.19 | -81.19 |
|  | NR_FDD_FR1_B                  |                  |        | -80.69 |
|  | NR_TDD_FR1_C                  |                  |        | -80.19 |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |                  |        | -79.69 |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |                  |        | -79.19 |
|  | NR_FDD_FR1_F                  |                  |        | -78.69 |
|  | NR_FDD_FR1_G                  |                  |        | -78.19 |
|  | NR_FDD_FR1_H                  |                  |        | -77.69 |
| $\hat{E}_s/N_{oc}$   | 1~3                           | dB               | 10     | -3     |
| Propagation condition  | 1~3                           |                  | AWGN   | AWGN   |
| Antenna configuration  | 1~3                           |                  | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |                               |                  |        |        |

#### A.6.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.19.2.

### A.6.7.5 E-UTRAN RSRP

#### A.6.7.5.1 SA: inter-RAT measurement accuracy with FR1 serving cell

##### A.6.7.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.2 for SA inter-RAT E-UTRAN RSRP measurements.

##### A.6.7.5.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.5.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRP are tested by using the parameters in A.6.7.5.1.2-2 and A.6.7.5.1.2-3.

**Table A.6.7.5.1.2-1: Inter-RAT E-UTRAN RSRP supported test configurations with FR1 serving cell**

| Configuration | Description  |
|---------------|--|
| 1             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD                |
| 2             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD                |
| 3             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN FDD                |
| 4             | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD                |
| 5             | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD                |
| 6             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN TDD                |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.5.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters**

| Parameter  |                   | Unit          | Cell 1                     |
|--|-------------------|---------------|----------------------------|
| NR RF channel number   |                   |               | 1                          |
| Duplex mode  | Config 1, 4       |               | FDD                        |
|  | Config 2, 3, 5, 6 |               | TDD                        |
| TDD Configuration  | Config 1, 4       |               | N/A                        |
|  | Config 2, 5       |               | TDDConf.1.1                |
|  | Config 3, 6       |               | TDDConf.2.1                |
| $BW_{\text{channel}}$  | Config 1, 4       | MHz           | 10: $N_{RB,c} = 52$ (FDD)  |
|  | Config 2, 5       |               | 10: $N_{RB,c} = 52$ (TDD)  |
|  | Config 3, 6       |               | 40: $N_{RB,c} = 106$ (TDD) |
| Gap pattern Id   |                   |               | 0                          |
| PDSCH reference measurement channel  | Config 1, 4       |               | SR.1.1 FDD                 |
|  | Config 2, 5       |               | SR.1.1 TDD                 |
|  | Config 3, 6       |               | SR.2.1 TDD                 |
| RMSI CORSET reference channel  | Config 1, 4       |               | CR.1.1 FDD                 |
|  | Config 2, 5       |               | CR.1.1 TDD                 |
|  | Config 3, 6       |               | CR.2.1 TDD                 |
| Dedicated CORSET reference channel   | Config 1, 4       |               | CCR.1.1 FDD                |
|  | Config 2, 5       |               | CCR.1.1 TDD                |
|  | Config 3, 6       |               | CCR.2.1 TDD                |
| CSI-RS for tracking  | Config 1, 4       |               | TRS.1.1 FDD                |
|  | Config 2, 5       |               | TRS.1.1 TDD                |
|  | Config 3, 6       |               | TRS.1.2 TDD                |
| BWP configurations   | Initial DL BWP    |               | DLBWP.0.1                  |
|  | Dedicated DL BWP  |               | DLBWP.1.1                  |
|  | Initial UL BWP    |               | ULBWP.0.1                  |
|  | Dedicated UL BWP  |               | ULBWP.1.1                  |
| OCNG pattern <sup>Note1</sup>  |                   |               | OP.1                       |
| SMTc configuration   |                   |               | SMTc.1                     |
| SSB configuration  | Config 1, 2, 4, 5 |               | SSB.1 FR1                  |
|  | Config 3, 6       |               | SSB.2 FR1                  |
| EPRE ratio of PSS to SSS   |                   | dB            | 0                          |
| EPRE ratio of PBCH_DMRS to SSS   |                   |               |                            |
| EPRE ratio of PBCH to PBCH_DMRS  |                   |               |                            |
| EPRE ratio of PDCCH_DMRS to SSS  |                   |               |                            |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                   |               |                            |
| EPRE ratio of PDSCH_DMRS to SSS  |                   |               |                            |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                   |               |                            |
| EPRE ratio of OCNG DMRS to SSS   |                   |               |                            |
| EPRE ratio of OCNG to OCNG DMRS  |                   |               |                            |
| $N_{oc}$ <sup>Note2</sup>  |                   | dBm/15 kHz    | -104                       |
| $N_{oc}$ <sup>Note2</sup>  | Config 1, 2, 4, 5 | dBm/SCS       | -104                       |
|  | Config 3, 6       |               | -101                       |
| $\hat{E}_s/N_{oc}$   |                   | dB            | 17                         |
| $\hat{E}_s/I_{ot}$ <sup>Note3</sup>  |                   | dB            | 17                         |
| SS-RSRP <sup>Note3</sup>   | Config 1, 2, 4, 5 | dBm/SCS       | -87                        |
|  | Config 3, 6       |               | -84                        |
| SSB_RP <sup>Note3</sup>  | Config 1, 2, 4, 5 | dBm/SCS       | -87                        |
|  | Config 3, 6       |               | -84                        |
| $I_o$ <sup>Note3</sup>   | Config 1, 2, 4, 5 | dBm/9.36 MHz  | -58.96                     |
|  | Config 3, 6       | dBm/38.16 MHz | -52.87                     |
| Propagation condition  |                   |               | AWGN                       |
| Antenna Configuration and Correlation Matrix   |                   |               | 1x2                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                   |               |                            |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                   |               |                            |
| Note 3: $\hat{E}_s/I_{ot}$ , SS-RSRP, SSB_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                   |               |                            |



**Table A.6.7.5.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters**

| Parameter   |   | Unit           | Cell 2   |                |
|---|---|----------------|--|----------------|
|   |   |                | Test 1   | Test 2         |
| E-UTRA RF channel number  |   |                | 1  |                |
| Duplex mode   | Config 1, 2, 3                                  |                | FDD  |                |
|   | Config 4, 5, 6                                  |                | TDD  |                |
| TDD special subframe configuration <sup>Note1</sup>                                 | Config 1, 2, 3                                  |                | N/A  |                |
|   | Config 4, 5, 6                                  |                | 6  |                |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  | Config 1, 2, 3                                  |                | N/A  |                |
|   | Config 4, 5, 6                                  |                | 1  |                |
| BW <sub>channel</sub>   |   | MHz            | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |   |                | -  |                |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> | Config 1, 2, 3                                  |                | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                |
|   | Config 4, 5, 6                                  |                | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                |
| OCNG Patterns <sup>Note2</sup>  | Config 1, 2, 3                                  |                | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD  |                |
|   | Config 4, 5, 6                                  |                | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD   |                |
| PBCH_RA   |   | dB             | 0  |                |
| PBCH_RB   |   |                |  |                |
| PSS_RA  |   |                |  |                |
| SSS_RA  |   |                |  |                |
| PCFICH_RB   |   |                |  |                |
| PHICH_RA  |   |                |  |                |
| PHICH_RB  |   |                |  |                |
| PDCCH_RA  |   |                |  |                |
| PDCCH_RB  |   |                |  |                |
| PDSCH_RA  |   |                |  |                |
| PDSCH_RB  |   |                |  |                |
| OCNG_RA <sup>Note3</sup>  |   |                |  |                |
| OCNG_RB <sup>Note3</sup>  |   |                |  |                |
| N <sub>oc</sub> <sup>Note4</sup>  | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        |                |  |                |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      | -116.5         |  |                |
|   | Bands FDD_C, TDD_C                              | -116           |  |                |
|   | Bands FDD_D                                     | -115.5         |  |                |
|   | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E | -115           |  |                |
|   | Bands FDD_G <sup>Note 8</sup><br>Bands FDD_H    | -114<br>-113.5 |  |                |
| $\bar{E}_s/N_{oc}$  |   | dB             | 10   | -4             |
| $\bar{E}_s/I_{ot}$ <sup>Note5</sup>   |   | dB             | 10   | -4             |
| RSRP <sup>Note5</sup>   | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        | dBm/15kHz      | -81.65   | -121           |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      |                |  | -120.5         |
|   | Bands FDD_C, TDD_C                              |                |  | -120           |
|   | Bands FDD_D                                     |                |  | -119.5         |
|   | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E |                |  | -119           |
|   | Bands FDD_G <sup>Note 8</sup><br>Bands FDD_H    |                |  | -118<br>-117.5 |



|   |   |           |  |  |
|---|---|-----------|--|--|
| SCH_RP <sup>Note5</sup>   | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        | dBm/15kHz | -81.65                                   | -121                                     |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      |           |  | -120.5                                   |
|   | Bands FDD_C, TDD_C                              |           |  | -120                                     |
|   | Bands FDD_D                                     |           |  | -119.5                                   |
|   | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E |           |  | -119                                     |
|   | Bands FDD_G <sup>Note 8</sup>                   |           |  | -118                                     |
|   | Bands FDD_H                                     |           |  | -117.5                                   |
| I <sub>o</sub> <sup>Note5</sup>   | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        | dBm/Ch BW | -53.45 +<br>10log(N <sub>RB,c</sub> /50) | -87.76 +<br>10log(N <sub>RB,c</sub> /50) |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      |           |  | -87.26 +<br>10log(N <sub>RB,c</sub> /50) |
|   | Bands FDD_C, TDD_C                              |           |  | -86.76 +<br>10log(N <sub>RB,c</sub> /50) |
|   | Bands FDD_D                                     |           |  | -86.26 +<br>10log(N <sub>RB,c</sub> /50) |
|   | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E |           |  | -85.76 +<br>10log(N <sub>RB,c</sub> /50) |
|   | Bands FDD_G <sup>Note 8</sup>                   |           |  | -84.76 +<br>10log(N <sub>RB,c</sub> /50) |
|   | Bands FDD_H                                     |           |  | -84.26 +<br>10log(N <sub>RB,c</sub> /50) |
| Propagation Condition   |   |           | AWGN                                     |  |
| Antenna Configuration and Correlation Matrix  |   |           | 1x2                                      |  |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].</p> <p>Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.</p> <p>Note 8: Except Band 29.</p> <p>Note 9: Except Band 32, Band 75 and Band 76.</p> <p>Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.</p> |   |           |  |  |

### A.6.7.5.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRP measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.2.

## A.6.7.6 E-UTRAN RSRQ

### A.6.7.6.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.3 for SA inter-RAT E-UTRAN RSRQ measurements.

#### A.6.7.6.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.6.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRQ are tested by using the parameters in A.6.7.6.1.2-2 and A.6.7.6.1.2-3.

**Table A.6.7.6.1.2-1: Inter-RAT E-UTRAN RSRQ supported test configurations with FR1 serving cell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD                |
| 2                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD                |
| 3                    | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN FDD                |
| 4                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD                |
| 5                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD                |
| 6                    | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN TDD                |
| Note:                | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.6.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters**

| Parameter  |                   | Unit          | Cell 1                     |
|--|-------------------|---------------|----------------------------|
| NR RF channel number   |                   |               | 1                          |
| Duplex mode  | Config 1, 4       |               | FDD                        |
|  | Config 2, 3, 5, 6 |               | TDD                        |
| TDD Configuration  | Config 1, 4       |               | N/A                        |
|  | Config 2, 5       |               | TDDConf.1.1                |
|  | Config 3, 6       |               | TDDConf.2.1                |
| $BW_{\text{channel}}$  | Config 1, 4       | MHz           | 10: $N_{RB,c} = 52$ (FDD)  |
|  | Config 2, 5       |               | 10: $N_{RB,c} = 52$ (TDD)  |
|  | Config 3, 6       |               | 40: $N_{RB,c} = 106$ (TDD) |
| Gap pattern Id   |                   |               | 0                          |
| PDSCH reference measurement channel  | Config 1, 4       |               | SR.1.1 FDD                 |
|  | Config 2, 5       |               | SR.1.1 TDD                 |
|  | Config 3, 6       |               | SR.2.1 TDD                 |
| RMSI CORSET reference channel  | Config 1, 4       |               | CR.1.1 FDD                 |
|  | Config 2, 5       |               | CR.1.1 TDD                 |
|  | Config 3, 6       |               | CR.2.1 TDD                 |
| Dedicated CORSET reference channel   | Config 1, 4       |               | CCR.1.1 FDD                |
|  | Config 2, 5       |               | CCR.1.1 TDD                |
|  | Config 3, 6       |               | CCR.2.1 TDD                |
| CSI-RS for tracking  | Config 1, 4       |               | TRS.1.1 FDD                |
|  | Config 2, 5       |               | TRS.1.1 TDD                |
|  | Config 3, 6       |               | TRS.1.2 TDD                |
| BWP configurations   | Initial DL BWP    |               | DLBWP.0.1                  |
|  | Dedicated DL BWP  |               | DLBWP.1.1                  |
|  | Initial UL BWP    |               | ULBWP.0.1                  |
|  | Dedicated UL BWP  |               | ULBWP.1.1                  |
| OCNG pattern <sup>Note1</sup>  |                   |               | OP.1                       |
| SMTC configuration   |                   |               | SMTC.1                     |
| SSB configuration  | Config 1, 2, 4, 5 |               | SSB.1 FR1                  |
|  | Config 3, 6       |               | SSB.2 FR1                  |
| EPRE ratio of PSS to SSS   |                   | dB            | 0                          |
| EPRE ratio of PBCH_DMRS to SSS   |                   |               |                            |
| EPRE ratio of PBCH to PBCH_DMRS  |                   |               |                            |
| EPRE ratio of PDCCH_DMRS to SSS  |                   |               |                            |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                   |               |                            |
| EPRE ratio of PDSCH_DMRS to SSS  |                   |               |                            |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                   |               |                            |
| EPRE ratio of OCNG DMRS to SSS   |                   |               |                            |
| EPRE ratio of OCNG to OCNG DMRS  |                   |               |                            |
| $N_{oc}$ <sup>Note2</sup>  |                   | dBm/15 kHz    | -104                       |
| $N_{oc}$ <sup>Note2</sup>  | Config 1, 2, 4, 5 | dBm/SCS       | -104                       |
|  | Config 3, 6       |               | -101                       |
| $\hat{E}_s/N_{oc}$   |                   | dB            | dB                         |
| $\hat{E}_s/I_{ot}$ <sup>Note3</sup>  |                   | dB            | dB                         |
| SS-RSRQ <sup>Note3</sup>   | Config 1, 2, 4, 5 | dBm/SCS       | -87                        |
|  | Config 3, 6       |               | -84                        |
| SSB_RP <sup>Note3</sup>  | Config 1, 2, 4, 5 | dBm/SCS       | -87                        |
|  | Config 3, 6       |               | -84                        |
| $I_o$ <sup>Note3</sup>   | Config 1, 2, 4, 5 | dBm/9.36 MHz  | -58.96                     |
|  | Config 3, 6       | dBm/38.16 MHz | -52.87                     |
| Propagation condition  |                   |               | AWGN                       |
| Antenna Configuration and Correlation Matrix   |                   |               | 1x2                        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                   |               |                            |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                   |               |                            |
| Note 3: $\hat{E}_s/I_{ot}$ , SS-RSRQ, SSB_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                   |               |                            |

**Table A.6.7.6.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters**

| Parameter | Unit | Cell 2 |        |        |
|-----------|------|--------|--------|--------|
|           |      | Test 1 | Test 2 | Test 3 |

|   |  |           |  |         |        |           |     |         |        |
|---|--|-----------|--|---------|--------|-----------|-----|---------|--------|
| E-UTRA RF channel number  |  |           | 1  |         |        |           |     |         |        |
| Duplex mode   | Config 1, 2, 3                               |           | FDD  |         |        |           |     |         |        |
|   | Config 4, 5, 6                               |           | TDD  |         |        |           |     |         |        |
| TDD special subframe configuration <sup>Note1</sup>                                 | Config 1, 2, 3                               |           | N/A  |         |        |           |     |         |        |
|   | Config 4, 5, 6                               |           | 6  |         |        |           |     |         |        |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  | Config 1, 2, 3                               |           | N/A  |         |        |           |     |         |        |
|   | Config 4, 5, 6                               |           | 1  |         |        |           |     |         |        |
| BW <sub>channel</sub>   |  | MHz       | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |         |        |           |     |         |        |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |  |           | -  |         |        |           |     |         |        |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> | Config 1, 2, 3                               |           | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |         |        |           |     |         |        |
|   | Config 4, 5, 6                               |           | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |         |        |           |     |         |        |
| OCNG Patterns <sup>Note2</sup>  | Config 1, 2, 3                               |           | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD  |         |        |           |     |         |        |
|   | Config 4, 5, 6                               |           | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD   |         |        |           |     |         |        |
| PBCH_RA   |  | dB        | 0  |         |        |           |     |         |        |
| PBCH_RB   |  |           |  |         |        |           |     |         |        |
| PSS_RA  |  |           |  |         |        |           |     |         |        |
| SSS_RA  |  |           |  |         |        |           |     |         |        |
| PCFICH_RB   |  |           |  |         |        |           |     |         |        |
| PHICH_RA  |  |           |  |         |        |           |     |         |        |
| PHICH_RB  |  |           |  |         |        |           |     |         |        |
| PDCCH_RA  |  |           |  |         |        |           |     |         |        |
| PDCCH_RB  |  |           |  |         |        |           |     |         |        |
| PDSCH_RA  |  |           |  |         |        |           |     |         |        |
| PDSCH_RB  |  |           |  |         |        |           |     |         |        |
| OCNG_RA <sup>Note3</sup>  |  |           |  |         |        |           |     |         |        |
| OCNG_RB <sup>Note3</sup>  |  |           |  |         |        |           |     |         |        |
| N <sub>oc</sub> <sup>Note4</sup>  | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A     |           |  |         |        | dBm/15kHz | -83 | -104.70 | -119.5 |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>   |           |  |         |        |           |     |         | -119   |
|   | Bands FDD_C, TDD_C                           | -118.5    |  |         |        |           |     |         |        |
|   | Bands FDD_D                                  | -118      |  |         |        |           |     |         |        |
|   | Bands FDD_E, FDD_F <sup>Note 7</sup> , TDD_E | -117.5    |  |         |        |           |     |         |        |
|   | Bands FDD_G <sup>Note 8</sup>                | -116.5    |  |         |        |           |     |         |        |
|   | Bands FDD_H                                  | -116      |  |         |        |           |     |         |        |
| E <sub>s</sub> /N <sub>oc</sub>   |  | dB        | -1.75  | -4.0    | -4.0   |           |     |         |        |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note5</sup>                                    |  | dB        | -1.75  | -4.0    | -4.0   |           |     |         |        |
| RSRP <sup>Note5</sup>   | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A     | dBm/15kHz | -84.75   | -108.70 | -123.5 |           |     |         |        |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>   |           |  |         | -123   |           |     |         |        |
|   | Bands FDD_C, TDD_C                           |           |  |         | -122.5 |           |     |         |        |
|   | Bands FDD_D                                  |           |  |         | -122   |           |     |         |        |
|   | Bands FDD_E, FDD_F <sup>Note 7</sup> , TDD_E |           |  |         | -121.5 |           |     |         |        |
|   | Bands FDD_G <sup>Note 8</sup>                |           |  |         | -120.5 |           |     |         |        |
|   | Bands FDD_H                                  |           |  |         | -120   |           |     |         |        |
| RSRQ <sup>Note5</sup>   | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A     | dB        | -14.76   | -16.25  | -16.25 |           |     |         |        |

|   |  |              |                               |                                  |                                  |
|---|--|--------------|-------------------------------|----------------------------------|----------------------------------|
|   | Bands FDD_B1, FDD_B2 <sup>Note 10</sup>      |              |                               |                                  |                                  |
|   | Bands FDD_C, TDD_C                           |              |                               |                                  |                                  |
|   | Bands FDD_D                                  |              |                               |                                  |                                  |
|   | Bands FDD_E, FDD_F <sup>Note 7</sup> , TDD_E |              |                               |                                  |                                  |
|   | Bands FDD_G <sup>Note 8</sup>                |              |                               |                                  |                                  |
|   | Bands FDD_H                                  |              |                               |                                  |                                  |
| $I_o$ <sup>Note 5</sup>   | Bands FDD_A <sup>Note 9</sup> , TDD_A        | dBm/Ch<br>BW | $-53 + 10\log(N_{RB,c} / 50)$ | $-75.46 + 10\log(N_{RB,c} / 50)$ | $-90.26 + 10\log(N_{RB,c} / 50)$ |
|   | Bands FDD_B1, FDD_B2 <sup>Note 10</sup>      |              |                               |                                  | $-89.76 + 10\log(N_{RB,c} / 50)$ |
|   | Bands FDD_C, TDD_C                           |              |                               |                                  | $-89.26 + 10\log(N_{RB,c} / 50)$ |
|   | Bands FDD_D                                  |              |                               |                                  | $-88.76 + 10\log(N_{RB,c} / 50)$ |
|   | Bands FDD_E, FDD_F <sup>Note 7</sup> , TDD_E |              |                               |                                  | $-88.26 + 10\log(N_{RB,c} / 50)$ |
|   | Bands FDD_G <sup>Note 8</sup>                |              |                               |                                  | $-87.26 + 10\log(N_{RB,c} / 50)$ |
|   | Bands FDD_H                                  |              |                               |                                  | $-86.76 + 10\log(N_{RB,c} / 50)$ |
| Propagation Condition   |  |              | AWGN                          |                                  |                                  |
| Antenna Configuration and Correlation Matrix  |  |              | 1x2                           |                                  |                                  |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>\bar{E}_s/I_{ot}</math>, RSRP, RSRQ and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].</p> <p>Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.</p> <p>Note 8: Except Band 29.</p> <p>Note 9: Except Band 32, Band 75 and Band 76.</p> <p>Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.</p> |  |              |                               |                                  |                                  |

### A.6.7.6.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRQ measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.3.

## A.6.7.7 E-UTRAN RS-SINR

### A.6.7.7.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.4 for SA inter-RAT E-UTRAN RS-SINR measurements.

#### A.6.7.7.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.7.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RS-SINR are tested by using the parameters in A.6.7.7.1.2-2 and A.6.7.7.1.2-3.

**Table A.6.7.7.1.2-1: Inter-RAT E-UTRAN RS-SINR supported test configurations with FR1 serving cell**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD                |
| 2                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD                |
| 3                    | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN FDD                |
| 4                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD                |
| 5                    | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD                |
| 6                    | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, E-UTRAN TDD                |
| Note:                | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters**

| Parameter   |                   | Unit          | Cell 1                     |
|---|-------------------|---------------|----------------------------|
| NR RF channel number  |                   |               | 1                          |
| Duplex mode   | Config 1, 4       |               | FDD                        |
|   | Config 2, 3, 5, 6 |               | TDD                        |
| TDD Configuration   | Config 1, 4       |               | N/A                        |
|   | Config 2, 5       |               | TDDConf.1.1                |
|   | Config 3, 6       |               | TDDConf.2.1                |
| $BW_{\text{channel}}$   | Config 1, 4       | MHz           | 10: $N_{RB,c} = 52$ (FDD)  |
|   | Config 2, 5       |               | 10: $N_{RB,c} = 52$ (TDD)  |
|   | Config 3, 6       |               | 40: $N_{RB,c} = 106$ (TDD) |
| Gap pattern Id  |                   |               | 0                          |
| PDSCH reference measurement channel   | Config 1, 4       |               | SR.1.1 FDD                 |
|   | Config 2, 5       |               | SR.1.1 TDD                 |
|   | Config 3, 6       |               | SR.2.1 TDD                 |
| RMSI CORSET reference channel   | Config 1, 4       |               | CR.1.1 FDD                 |
|   | Config 2, 5       |               | CR.1.1 TDD                 |
|   | Config 3, 6       |               | CR.2.1 TDD                 |
| Dedicated CORSET reference channel  | Config 1, 4       |               | CCR.1.1 FDD                |
|   | Config 2, 5       |               | CCR.1.1 TDD                |
|   | Config 3, 6       |               | CCR.2.1 TDD                |
| CSI-RS for tracking   | Config 1, 4       |               | TRS.1.1 FDD                |
|   | Config 2, 5       |               | TRS.1.1 TDD                |
|   | Config 3, 6       |               | TRS.1.2 TDD                |
| BWP configurations  | Initial DL BWP    |               | DLBWP.0.1                  |
|   | Dedicated DL BWP  |               | DLBWP.1.1                  |
|   | Initial UL BWP    |               | ULBWP.0.1                  |
|   | Dedicated UL BWP  |               | ULBWP.1.1                  |
| OCNG pattern <sup>Note1</sup>   |                   |               | OP.1                       |
| SMTc configuration  |                   |               | SMTc.1                     |
| SSB configuration   | Config 1, 2, 4, 5 |               | SSB.1 FR1                  |
|   | Config 3, 6       |               | SSB.2 FR1                  |
| EPRE ratio of PSS to SSS  |                   | dB            | 0                          |
| EPRE ratio of PBCH_DMRS to SSS  |                   |               |                            |
| EPRE ratio of PBCH to PBCH_DMRS   |                   |               |                            |
| EPRE ratio of PDCCH_DMRS to SSS   |                   |               |                            |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                   |               |                            |
| EPRE ratio of PDSCH_DMRS to SSS   |                   |               |                            |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                   |               |                            |
| EPRE ratio of OCNG DMRS to SSS  |                   |               |                            |
| EPRE ratio of OCNG to OCNG DMRS   |                   |               |                            |
| $N_{oc}$ <sup>Note2</sup>   |                   | dBm/15 kHz    | -104                       |
| $N_{oc}$ <sup>Note2</sup>   | Config 1, 2, 4, 5 | dBm/SCS       | -104                       |
|   | Config 3, 6       |               | -101                       |
| $\hat{E}_s/N_{oc}$  |                   | dB            | 17                         |
| $\hat{E}_s/I_{ot}$ <sup>Note3</sup>   |                   | dB            | 17                         |
| SS-RS-SINR <sup>Note3</sup>   | Config 1, 2, 4, 5 | dBm/SCS       | -87                        |
|   | Config 3, 6       |               | -84                        |
| SSB_RP <sup>Note3</sup>   | Config 1, 2, 4, 5 | dBm/SCS       | -87                        |
|   | Config 3, 6       |               | -84                        |
| $I_o$ <sup>Note3</sup>  | Config 1, 2, 4, 5 | dBm/9.36 MHz  | -58.96                     |
|   | Config 3, 6       | dBm/38.16 MHz | -52.87                     |
| Propagation condition   |                   |               | AWGN                       |
| Antenna Configuration and Correlation Matrix  |                   |               | 1x2                        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>\hat{E}_s/I_{ot}</math>, SS-RS-SINR, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                   |               |                            |





**Table A.6.7.7.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters**

| Parameter   |   | Unit      | Cell 2   |        |        |
|---|---|-----------|--|--------|--------|
|   |   |           | Test 1   | Test 2 | Test 3 |
| E-UTRA RF channel number  |   |           | 1  |        |        |
| Duplex mode   | Config 1, 2, 3                                  |           | FDD  |        |        |
|   | Config 4, 5, 6                                  |           | TDD  |        |        |
| TDD special subframe configuration <sup>Note1</sup>                                 | Config 1, 2, 3                                  |           | N/A  |        |        |
|   | Config 4, 5, 6                                  |           | 6  |        |        |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  | Config 1, 2, 3                                  |           | N/A  |        |        |
|   | Config 4, 5, 6                                  |           | 1  |        |        |
| BW <sub>channel</sub>   |   | MHz       | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |        |        |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |   |           | -  |        |        |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> | Config 1, 2, 3                                  |           | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |        |        |
|   | Config 4, 5, 6                                  |           | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |        |        |
| OCNG Patterns <sup>Note2</sup>  | Config 1, 2, 3                                  |           | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD  |        |        |
|   | Config 4, 5, 6                                  |           | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD   |        |        |
| PBCH_RA   |   | dB        | 0  |        |        |
| PBCH_RB   |   |           |  |        |        |
| PSS_RA  |   |           |  |        |        |
| SSS_RA  |   |           |  |        |        |
| PCFICH_RB   |   |           |  |        |        |
| PHICH_RA  |   |           |  |        |        |
| PHICH_RB  |   |           |  |        |        |
| PDCCH_RA  |   |           |  |        |        |
| PDCCH_RB  |   |           |  |        |        |
| PDSCH_RA  |   |           |  |        |        |
| PDSCH_RB  |   |           |  |        |        |
| OCNG_RA <sup>Note3</sup>  |   |           |  |        |        |
| OCNG_RB <sup>Note3</sup>  |   |           |  |        |        |
| N <sub>oc</sub> <sup>Note4</sup>  | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        |           |  |        |        |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      | -119      |  |        |        |
|   | Bands FDD_C, TDD_C                              | -118.5    |  |        |        |
|   | Bands FDD_D                                     | -118      |  |        |        |
|   | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E | -117.5    |  |        |        |
|   | Bands FDD_G <sup>Note 8</sup>                   | -116.5    |  |        |        |
|   | Bands FDD_H                                     | -116      |  |        |        |
| CRS E <sub>s</sub> /N <sub>oc</sub> <sup>1</sup>                                    |   | dB        | -1.75  | 20.0   | -4.0   |
| CRS E <sub>s</sub> /I <sub>ot</sub> <sup>Note5</sup>                                |   | dB        | -1.75  | 20.0   | -4.0   |
| RSRP <sup>Note5</sup>   | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        | dBm/15kHz | -89.75   | -88.50 | -123.5 |
|   | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      |           |  |        | -123   |
|   | Bands FDD_C, TDD_C                              |           |  |        | -122.5 |
|   | Bands FDD_D                                     |           |  |        | -122   |
|   | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E |           |  |        | -121.5 |
|   | Bands FDD_G <sup>Note 8</sup>                   |           |  |        | -120.5 |
|   | Bands FDD_H                                     |           |  |        | -120   |

|  |   |              |   |   |   |
|--|---|--------------|---|---|---|
| RS-SINR <sup>Note5</sup>   | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        | dB           | -1.75                                       | 20  | -4.0  |
|  | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      |              |   |   |   |
|  | Bands FDD_C, TDD_C                              |              |   |   |   |
|  | Bands FDD_D                                     |              |   |   |   |
|  | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E |              |   |   |   |
|  | Bands FDD_G <sup>Note 8</sup>                   |              |   |   |   |
|  | Bands FDD_H                                     |              |   |   |   |
| I <sub>o</sub> <sup>Note5</sup>  | Bands FDD_A <sup>Note 9</sup> ,<br>TDD_A        | dBm/Ch<br>BW | -53.79 +<br>10log(N <sub>RB,c</sub><br>/50) | -60.56 +<br>10log(N <sub>RB,c</sub><br>/50) | -93.48 +<br>10log(N <sub>RB,c</sub><br>/50) |
|  | Bands FDD_B1,<br>FDD_B2 <sup>Note 10</sup>      |              |   |   | -92.98 +<br>10log(N <sub>RB,c</sub><br>/50) |
|  | Bands FDD_C, TDD_C                              |              |   |   | -92.48 +<br>10log(N <sub>RB,c</sub><br>/50) |
|  | Bands FDD_D                                     |              |   |   | -91.98 +<br>10log(N <sub>RB,c</sub><br>/50) |
|  | Bands FDD_E, FDD_F<br><sup>Note 7</sup> , TDD_E |              |   |   | -91.48 +<br>10log(N <sub>RB,c</sub><br>/50) |
|  | Bands FDD_G <sup>Note 8</sup>                   |              |   |   | -90.48 +<br>10log(N <sub>RB,c</sub><br>/50) |
|  | Bands FDD_H                                     |              |   |   | -89.98 +<br>10log(N <sub>RB,c</sub><br>/50) |
| Propagation Condition  |   | AWGN         |   |   |   |
| Antenna Configuration and Correlation Matrix   |   | 1x2          |   |   |   |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 4a: Void.</p> <p>Note 5: CRS <math>\hat{E}_s/I_{ot}</math>, RSRP, RS-SINR and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].</p> <p>Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.</p> <p>Note 8: Except Band 29.</p> <p>Note 9: Except Band 32, Band 75 and Band 76.</p> <p>Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.</p> |   |              |   |   |   |

### A.6.7.7.1.3 Test Requirements

The SA inter-RAT E-UTRAN RS-SINR measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.4.

## A.6.7.8 CLI measurements

### A.6.7.8.1 SA SRS-RSRP measurement accuracy with FR1 serving cell

#### A.6.7.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.1.1 with the testing configurations for NR cells in Table A.6.7.8.1.1-1.

**Table A.6.7.8.1.1-1: Applicable NR configurations for FR1 SRS-RSRP accuracy test**

| <b>Config</b>   | <b>Description</b>                               |
|---|--|
| 1   | 15kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 2   | 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band |  |

#### A.6.7.8.1.2 Test parameters

In this set of test cases there is one cell in the test, FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.8.1.2-1 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table A.6.7.8.1.2-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table A.6.7.8.1.2-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

**Table A.6.7.8.1.2-1: FR1 test parameters for SRS-RSRP accuracy for PCell**

| Parameter   |                        | Config | Unit           | Test 1                           | Test 2                      | Test 3                      |        |
|---|------------------------|--------|----------------|----------------------------------|-----------------------------|-----------------------------|--------|
| SSB GSCN  |                        | 1~2    |                | freq1                            | freq1                       | freq1                       |        |
| Duplex mode   |                        | 1~2    |                | TDD                              | TDD                         | TDD                         |        |
| TDD configuration   |                        | 1      |                | TDDConf.1.1                      | TDDConf.1.1                 | TDDConf.1.1                 |        |
|   |                        | 2      |                | TDDConf.2.1                      | TDDConf.2.1                 | TDDConf.2.1                 |        |
| BW <sub>channel</sub>   |                        | 1      | MHz            | 10: N <sub>RB,c</sub> = 52       | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |        |
|   |                        | 2      |                | 40: N <sub>RB,c</sub> = 106      | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |        |
| PDSCH Reference measurement channel                               |                        | 1      |                | SR.1.1 TDD                       | SR.1.1 TDD                  | SR.1.1 TDD                  |        |
|   |                        | 2      |                | SR.2.1 TDD                       | SR.2.1 TDD                  | SR.2.1 TDD                  |        |
| RMSI CORESET Reference Channel                                    |                        | 1      |                | CR.1.1 TDD                       | CR.1.1 TDD                  | CR.1.1 TDD                  |        |
|   |                        | 2      |                | CR.2.1 TDD                       | CR.2.1 TDD                  | CR.2.1 TDD                  |        |
| Dedicated CORESET Reference Channel                               |                        | 1      |                | CCR.1.1 TDD                      | CCR.1.1 TDD                 | CCR.1.1 TDD                 |        |
|   |                        | 2      |                | CCR.2.1 TDD                      | CCR.2.1 TDD                 | CCR.2.1 TDD                 |        |
| SSB configuration   |                        | 1      |                | SSB.1 FR1                        | SSB.1 FR1                   | SSB.1 FR1                   |        |
|   |                        | 2      |                | SSB.2 FR1                        | SSB.2 FR1                   | SSB.2 FR1                   |        |
| OCNG Patterns   |                        | 1~2    |                | OP.1                             | OP.1                        | OP.1                        |        |
| TRS configuration   |                        | 1      |                | TRS.1.1 TDD                      | TRS.1.1 TDD                 | TRS.1.1 TDD                 |        |
|   |                        | 2      |                | TRS.1.2 TDD                      | TRS.1.2 TDD                 | TRS.1.2 TDD                 |        |
| Initial BWP Configuration   |                        | 1~2    |                | DLBWP.0.1<br>ULBWP.0.1           | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |        |
| Dedicated BWP configuration                                       |                        | 1~2    |                | DLBWP.1.1<br>ULBWP.1.1           | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |        |
| SMTC configuration  |                        | 1~2    |                | SMTC.1                           | SMTC.1                      | SMTC.1                      |        |
| Time offset between DL from serving cell and SRS from test system |                        | 1~2    | µs             | 17.67                            | 17.67                       | 17.67                       |        |
| EPRE ratio of PSS to SSS  |                        | 1~2    | dB             | 0                                | 0                           | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS                                    |                        |        |                |                                  |                             |                             |        |
| EPRE ratio of PBCH to PBCH DMRS                                   |                        |        |                |                                  |                             |                             |        |
| EPRE ratio of PDCCH DMRS to SSS                                   |                        |        |                |                                  |                             |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS                                 |                        |        |                |                                  |                             |                             |        |
| EPRE ratio of PDSCH DMRS to SSS                                   |                        |        |                |                                  |                             |                             |        |
| EPRE ratio of PDSCH to PDSCH DMRS                                 |                        |        |                |                                  |                             |                             |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>                  |                        |        |                |                                  |                             |                             |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>                 |                        |        |                |                                  |                             |                             |        |
| $N_{oc}$<br>Note2   | NR_TDD_FR1_A<br>NOTE 3 | 1      | dBm/15kHz      | -106                             | -88                         | -114                        |        |
|   | NR_TDD_FR1_C           |        |                |                                  |                             |                             | -113   |
|   | NR_TDD_FR1_D           |        |                |                                  |                             |                             | -112.5 |
|   | NR_TDD_FR1_E           | -112   |                |                                  |                             |                             |        |
|   | NR_TDD_FR1_A<br>NOTE 5 | 2      |                | Not applicable <sup>Note 4</sup> | -91                         | -114                        |        |
|   | NR_TDD_FR1_C           |        |                |                                  |                             |                             | -113   |
|   | NR_TDD_FR1_D           |        |                |                                  |                             |                             | -112.5 |
| NR_TDD_FR1_E  | -112                   |        |                |                                  |                             |                             |        |
| $N_{oc}$<br>Note2   | NR_TDD_FR1_A<br>NOTE 3 | 1      | dBm/SRS<br>SCS | -106                             | -88                         | -114                        |        |
|   | NR_TDD_FR1_C           |        |                |                                  |                             |                             | -113   |
|   | NR_TDD_FR1_D           |        |                |                                  |                             |                             | -112.5 |
|   | NR_TDD_FR1_E           | -112   |                |                                  |                             |                             |        |
|   | NR_TDD_FR1_A<br>NOTE 3 | 2      |                | Not applicable <sup>Note 4</sup> | -88                         | -111                        |        |
| NR_TDD_FR1_C  | -110                   |        |                |                                  |                             |                             |        |

|         | NR_TDD_FR1_D   |  |  |  | -109.5 |
|---------|--|--|--|--|--------|
|         | NR_TDD_FR1_E   |  |  |  | -109   |
| Note 1: | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.   |  |  |  |        |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |  |  |  |        |
| Note 3: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |  |  |  |        |
| Note 4: | Test 1 is not used when testing with 30kHz SSB SCS   |  |  |  |        |



**Table A.6.7.8.1.2-2: FR1 test parameters for SRS-RSRP accuracy for neighbour cell UE**

| Parameter                   |                        | Config | Unit            | Test 1                           | Test 2                           | Test 3     |        |        |      |
|-----------------------------|------------------------|--------|-----------------|----------------------------------|----------------------------------|------------|--------|--------|------|
| $N_{oc}$<br>Note2           | NR_TDD_FR1_A<br>NOTE 5 | 1      | dBm/15kHz       | -106                             | -88                              | -114       |        |        |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  | -113       |        |        |      |
|                             | NR_TDD_FR1_D           |        |                 |                                  |                                  | -112.5     |        |        |      |
|                             | NR_TDD_FR1_E           |        |                 |                                  |                                  | -112       |        |        |      |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2      |                 | Not applicable <sup>Note 6</sup> | -91                              | -114       |        |        |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  | -113       |        |        |      |
|                             | NR_TDD_FR1_D           |        |                 |                                  |                                  | -112.5     |        |        |      |
| NR_TDD_FR1_E                | -112                   |        |                 |                                  |                                  |            |        |        |      |
| $N_{oc}$<br>Note2           | NR_TDD_FR1_A<br>NOTE 5 | 1      | dBm/SRS<br>SCS  |                                  |                                  | -106       | -88    | -114   |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  |            |        | -113   |      |
|                             | NR_TDD_FR1_D           |        |                 |                                  |                                  |            |        | -112.5 |      |
|                             | NR_TDD_FR1_E           |        |                 | -112                             |                                  |            |        |        |      |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2      |                 | Not applicable <sup>Note 6</sup> | -88                              | -111       |        |        |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  | -110       |        |        |      |
|                             | NR_TDD_FR1_D           |        |                 |                                  |                                  | -109.5     |        |        |      |
| NR_TDD_FR1_E                | -109                   |        |                 |                                  |                                  |            |        |        |      |
| $\hat{E}_s / I_{ot}$ on SRS |                        | 1~2    | dB              |                                  |                                  | 1          | 1      | 1      |      |
| SRS<br>RSRP<br>Note3        | NR_TDD_FR1_A<br>NOTE 5 | 1      | dBm/SRS<br>SCS  |                                  |                                  | -105       | -87    | -113   |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  |            |        | -112   |      |
|                             | NR_TDD_FR1_D           |        |                 | -111.5                           |                                  |            |        |        |      |
|                             | NR_TDD_FR1_E           |        |                 | -111                             |                                  |            |        |        |      |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2      |                 | Not applicable <sup>Note 6</sup> | -87                              | -110       |        |        |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  | -109       |        |        |      |
|                             | NR_TDD_FR1_D           |        |                 |                                  |                                  | -108.5     |        |        |      |
| NR_TDD_FR1_E                | -108                   |        |                 |                                  |                                  |            |        |        |      |
| $I_o$ Note3                 | NR_TDD_FR1_A<br>NOTE 5 | 1      | dBm/9.36<br>MHz |                                  |                                  | -74.51     | -56.51 | -82.51 |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  |            |        | -81.51 |      |
|                             | NR_TDD_FR1_D           |        |                 |                                  |                                  |            |        | -81.01 |      |
|                             | NR_TDD_FR1_E           |        |                 | -79.51                           |                                  |            |        |        |      |
|                             | NR_TDD_FR1_A<br>NOTE 5 | 2      |                 | dBm/38.16<br>MHz                 | Not applicable <sup>Note 6</sup> | -53.42     | -76.42 |        |      |
|                             | NR_TDD_FR1_C           |        |                 |                                  |                                  |            | -75.42 |        |      |
|                             | NR_TDD_FR1_D           |        |                 |                                  |                                  |            | -74.92 |        |      |
| NR_TDD_FR1_E                | -74.42                 |        |                 |                                  |                                  |            |        |        |      |
| $\hat{E}_s / N_{oc}$ on SRS |                        | 1~2    | dB              |                                  |                                  |            | 1      | 1      | 1    |
| Propagation condition       |                        | 1~2    |                 |                                  |                                  |            | AWGN   | AWGN   | AWGN |
| Antenna configuration       |                        | 1~2    |                 |                                  |                                  |            | 1x2    | 1x2    | 1x2  |
| SRS configuration           |                        | 1      |                 | SRSCConf.1                       | SRSCConf.1                       | SRSCConf.1 |        |        |      |
|                             |                        | 2      |                 | SRSCConf.2                       | SRSCConf.2                       | SRSCConf.2 |        |        |      |

- Note 1: The resources for uplink transmission are assigned to the UE prior to the start of the test.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: RSRP and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification
- Note 6: Test 1 is not used when testing with 30kHz SSB SCS

**Table A.6.7.8.1.2-3: SRS configuration parameters for FR1 SRS-RSRP accuracy**

|                 | Field                               | SRSCConf.1 | SRSCConf.2 |
|-----------------|-------------------------------------|------------|------------|
| SRS-ResourceSet | srs-ResourceSetId                   | 0          | 0          |
|                 | srs-ResourceIdList                  | 0          | 0          |
|                 | resourceType                        | Periodic   | Periodic   |
|                 | Usage                               | Codebook   | Codebook   |
| SRS-Resource    | SRS-ResourceId                      | 0          | 0          |
|                 | nrofSRS-Ports                       | Port1      | Port1      |
|                 | transmissionComb                    | n2         | n2         |
|                 | combOffset-n2                       | 0          | 0          |
|                 | cyclicShift-n2                      | 0          | 0          |
|                 | resourceMapping<br>startPosition    | 0          | 0          |
|                 | resourceMapping<br>nrofSymbols      | n1         | n1         |
|                 | resourceMapping<br>repetitionFactor | n1         | n1         |
|                 | freqDomainPosition                  | 0          | 0          |
|                 | freqDomainShift                     | 0          | 0          |
|                 | freqHopping<br>c-SRS                | 12         | 12         |
|                 | freqHopping<br>b-SRS                | 0          | 0          |
|                 | freqHopping<br>b-hop                | 0          | 0          |
|                 | groupOrSequenceHopping              | Neither    | Neither    |
|                 | resourceType                        | Periodic   | Periodic   |
|                 | periodicityAndOffset-p              | sl20, 9    | sl40, 19   |
|                 | sequencId                           | 0          | 0          |

### A.6.7.8.1.3 Test Requirements

The SRS-RSRP measurement accuracy shall fulfil the requirements in clauses 10.1.22.1.1.

## A.6.7.8.2 SA CLI-RSSI measurement accuracy with FR1 serving cell

### A.6.7.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.2.1 with the testing configurations for NR cells in Table A.6.7.8.2.1-1.

**Table A.6.7.8.2.1-1: Applicable NR configurations for FR1 CLI-RSSI accuracy test**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode  |
| 2      | NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

### A.6.7.8.2.2 Test parameters

In this set of test cases there is one cell in the test, the FR1 PSCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.8.2.2-1 below.

Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 1 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.6.7.8.2.2-2.

**Table A.6.7.8.2.2-1: FR1 test parameters for CLI-RSSI accuracy**

| Parameter  | Config | Unit         | Value                       |
|--|--------|--------------|-----------------------------|
| SSB GSCN   | 1~2    |              | freq1                       |
| Duplex mode  | 1~2    |              | TDD                         |
| TDD configuration  | 1      |              | TDDConf.1.1                 |
|  | 2      |              | TDDConf.2.1                 |
| BW <sub>channel</sub>  | 1      | MHz          | 10: N <sub>RB,c</sub> = 52  |
|  | 2      |              | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel                                | 1      |              | SR.1.1 TDD                  |
|  | 2      |              | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel                                     | 1      |              | CR.1.1 TDD                  |
|  | 2      |              | CR.2.1 TDD                  |
| Dedicated CORESET Reference Channel                                | 1      |              | CCR.1.1 TDD                 |
|  | 2      |              | CCR.2.1 TDD                 |
| SSB configuration  | 1      |              | SSB.1 FR1                   |
|  | 2      |              | SSB.2 FR1                   |
| OCNG Patterns <sup>Note6</sup>                                     | 1~2    |              | OP.1                        |
| TRS configuration  | 1      |              | TRS.1.1 TDD                 |
|  | 2      |              | TRS.1.2 TDD                 |
| Initial BWP Configuration  | 1~2    |              | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~2    |              | DLBWP.1.1<br>ULBWP.1.1      |
| SMTC configuration   | 1~2    |              | SMTC.1                      |
| Time offset between DL from serving cell and OCNG from test system | 1~2    | μs           | 17.67                       |
| EPRE ratio of PSS to SSS   | 1~2    | dB           | 0                           |
| EPRE ratio of PBCH DMRS to SSS                                     |        |              |                             |
| EPRE ratio of PBCH to PBCH DMRS                                    |        |              |                             |
| EPRE ratio of PDCCH DMRS to SSS                                    |        |              |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                                  |        |              |                             |
| EPRE ratio of PDSCH DMRS to SSS                                    |        |              |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                                  |        |              |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>                   |        |              |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>                  |        |              |                             |
| N <sub>oc</sub> on CLI-RSSI measurement resource <sup>Note2</sup>  | 1      | dBm/15kHz    | -106                        |
|  | 2      |              | -106                        |
| N <sub>oc</sub> on CLI-RSSI measurement resource <sup>Note2</sup>  | 1      | dBm/ BWP SCS | -106                        |
|  | 2      |              | -103                        |
| Ê <sub>s</sub> /I <sub>ot</sub> on CLI-RSSI measurement resource   | 1~2    | dB           | -Infinity                   |
| RSRP on CLI-RSSI measurement resource <sup>Note3</sup>             | 1~2    | dBm/ BWP SCS | -Infinity                   |
| Io on CLI-RSSI measurement resource <sup>Note3</sup>               | 1      | dBm/9.36 MHz | -78.05                      |

|  |     |               |           |
|--|-----|---------------|-----------|
|  | 2   | dBm/38.16 MHz | -71.96    |
| Io on CLI-RSSI measurement resource <sup>Note3</sup>   | 1   | dBm/1.08 MHz  | -87.43    |
|  | 2   |               | -87.44    |
| $\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource  | 1~2 | dB            | -Infinity |
| Propagation condition  | 1~2 |               | AWGN      |
| Antenna configuration  | 1~2 |               | 1x2       |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> <p>Note 6: OCNG is not transmitted in the CLI-RSSI measurement resources.</p> |     |               |           |

**Table A.6.7.8.2.2-2: CLI-RSSI measurement resource configuration for FR1 CLI-RSSI accuracy**

|                               | Field          | Config   | SRSSConf.1 |
|-------------------------------|----------------|----------|------------|
| CLI-RSSI measurement resource | rss-ResourceId | 1~2      | 0          |
|                               | rss-SCS        | 1        | 15kHz      |
|                               |                | 2        | 30kHz      |
|                               | startPRB       | 1~2      | 0          |
|                               | nrofPRBs       | 1        | 52         |
|                               |                | 2        | 106        |
|                               | startPosition  | 1~2      | 3          |
|                               | nrofSymbols    | 1~2      | 11         |
| rss-PeriodicityAndOffset      | 1              | sl20, 9  |            |
|                               | 2              | sl40, 19 |            |

### A.6.7.8.2.3 Test Requirements

The CLI-RSSI measurement accuracy shall fulfil the requirements in clauses 10.1.22.2.1.

## A.6.7.9 L1-SINR measurement for beam reporting

### A.6.7.9.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

#### A.6.7.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.8.4.1 and clause 10.1.27.1 for L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.6.7.9.1.1-1.

**Table A.6.7.9.1.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2             | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3             | NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:         | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.6.7.9.1.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.9.1.2-1 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.6.7.9.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

**Table A.6.7.9.1.2-1: FR1 CSI-RS based L1-SINR test parameters**

| Parameter   | Config                                  | Unit | Test 1                      | Test 2                      |        |
|---|---|------|-----------------------------|-----------------------------|--------|
| SSB GSCN  | 1~3                                     |      | freq1                       | freq1                       |        |
| Duplex mode                                       | 1                                       |      | FDD                         | FDD                         |        |
|   | 2                                       |      | TDD                         | TDD                         |        |
|   | 3                                       |      | TDD                         | TDD                         |        |
| TDD Configuration                                 | 1                                       |      | N/A                         | N/A                         |        |
|   | 2                                       |      | TDDConf.1.1                 | TDDConf.1.1                 |        |
|   | 3                                       |      | TDDConf.2.1                 | TDDConf.2.1                 |        |
| BW <sub>channel</sub>                             | 1                                       | MHz  | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |        |
|   | 2                                       |      | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |        |
|   | 3                                       |      | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |        |
| PDSCH Reference measurement channel               | 1                                       |      | SR.1.1 FDD                  | SR.1.1 FDD                  |        |
|   | 2                                       |      | SR.1.1 TDD                  | SR.1.1 TDD                  |        |
|   | 3                                       |      | SR.2.1 TDD                  | SR.2.1 TDD                  |        |
| RMSI CORESET Reference Channel                    | 1                                       |      | CR.1.1 FDD                  | CR.1.1 FDD                  |        |
|   | 2                                       |      | CR.1.1 TDD                  | CR.1.1 TDD                  |        |
|   | 3                                       |      | CR.2.1 TDD                  | CR.2.1 TDD                  |        |
| Dedicated CORESET Reference Channel               | 1                                       |      | CCR.1.1 FDD                 | CCR.1.1 FDD                 |        |
|   | 2                                       |      | CCR.1.1 TDD                 | CCR.1.1 TDD                 |        |
|   | 3                                       |      | CCR.2.1 TDD                 | CCR.2.1 TDD                 |        |
| SSB configuration                                 | 1                                       |      | SSB.1 FR1                   | SSB.1 FR1                   |        |
|   | 2                                       |      | SSB.1 FR1                   | SSB.1 FR1                   |        |
|   | 3                                       |      | SSB.2 FR1                   | SSB.2 FR1                   |        |
| OCNG Patterns                                     | 1~3                                     |      | OP.1                        | OP.1                        |        |
| TRS configuration                                 | 1                                       |      | TRS.1.1 FDD                 | TRS.1.1 FDD                 |        |
|   | 2                                       |      | TRS.1.1 TDD                 | TRS.1.1 TDD                 |        |
|   | 3                                       |      | TRS.1.2 TDD                 | TRS.1.2 TDD                 |        |
| Initial BWP Configuration                         | 1~3                                     |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |        |
| Dedicated BWP configuration                       | 1~3                                     |      | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |        |
| SMTTC configuration                               | 1~3                                     |      | SMTTC.1                     | SMTTC.1                     |        |
| CSI-RS  | 1                                       |      | CSI-RS 1.2 FDD              | CSI-RS 1.2 FDD              |        |
|   | 2                                       |      | CSI-RS 1.2 TDD              | CSI-RS 1.2 TDD              |        |
|   | 3                                       |      | CSI-RS 2.2 TDD              | CSI-RS 2.2 FDD              |        |
| reportConfigType                                  | 1~3                                     |      | periodic                    | periodic                    |        |
| reportQuantity-r16                                | 1~3                                     |      | cri-SINR-r16                | cri-SINR-r16                |        |
| nrofReportedRS                                    | 1~3                                     |      | 2                           | 2                           |        |
| L1-SINR reporting period                          | 1~3                                     |      | slot80                      | slot80                      |        |
| EPRE ratio of PSS to SSS                          | 1~3                                     | dB   | 0                           | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS                    |   |      |                             |                             |        |
| EPRE ratio of PBCH to PBCH DMRS                   |   |      |                             |                             |        |
| EPRE ratio of PDCCH DMRS to SSS                   |   |      |                             |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |      |                             |                             |        |
| EPRE ratio of PDSCH DMRS to SSS                   |   |      |                             |                             |        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |      |                             |                             |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |      |                             |                             |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |      |                             |                             |        |
| N <sub>oc</sub><br>Note2                          | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1~3  | dBm/15kHz                   | -94.65                      | -117   |
|   | NR_FDD_FR1_B                            |      |                             |                             | -116.5 |
|   | NR_TDD_FR1_C                            |      |                             |                             | -116   |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |      |                             |                             | -115.5 |



|                         |   |     |                   |        |        |
|-------------------------|---|-----|-------------------|--------|--------|
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -113.5 |
| $N_{oc}$<br>Note2       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/CSI-RS<br>SCS | -94.65 | -117   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -113.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3   |                   | -91.65 | -114   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -113.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -112.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -112   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -111.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -111   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -110.5 |
| $\hat{E}_s/I_{\alpha}$  | 1~3                                     | dB  | 10                | -3     |        |
| CSI-RS<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/CSI-RS<br>SCS | -84.65 | -120   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -119.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -119   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -118.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -118   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -117.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -117   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -116.5 |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3   |                   | -81.65 | -117   |
|                         | NR_FDD_FR1_B                            |     |                   |        | -116.5 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -116   |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -115.5 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -115   |
|                         | NR_FDD_FR1_F                            |     |                   |        | -114.5 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -114   |
|                         | NR_FDD_FR1_H                            |     |                   |        | -113.5 |
| $I_o$ Note3             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/9.36<br>MHz   | -56.28 | -87.28 |
|                         | NR_FDD_FR1_B                            |     |                   |        | -86.78 |
|                         | NR_TDD_FR1_C                            |     |                   |        | -86.28 |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |        | -85.78 |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |        | -85.28 |
|                         | NR_FDD_FR1_F                            |     |                   |        | -84.78 |
|                         | NR_FDD_FR1_G                            |     |                   |        | -84.28 |
|                         | NR_FDD_FR1_H                            |     |                   |        | -83.78 |

|  |   |    |                  |        |        |
|--|---|----|------------------|--------|--------|
|  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3  | dBm/38.16<br>MHz | -50.19 | -81.19 |
|  | NR_FDD_FR1_B                            |    |                  |        | -80.69 |
|  | NR_TDD_FR1_C                            |    |                  |        | -80.19 |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |    |                  |        | -79.69 |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |    |                  |        | -79.19 |
|  | NR_FDD_FR1_F                            |    |                  |        | -78.69 |
|  | NR_FDD_FR1_G                            |    |                  |        | -78.19 |
|  | NR_FDD_FR1_H                            |    |                  |        | -77.69 |
| $\hat{E}_s/N_{oc}$   | 1~3                                     | dB | 10               | -3     |        |
| Propagation condition  | 1~3                                     |    | AWGN             | AWGN   |        |
| Antenna configuration  | 1~3                                     |    | 1x2              | 1x2    |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |   |    |                  |        |        |

#### A.6.7.9.1.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.27.1.

#### A.6.7.9.2 L1-SINR measurement with SSB based CMR and dedicated IMR

##### A.6.7.9.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.8.4.2 and clause 10.1.27.2 for L1-SINR measurements with SSB based CMR and dedicated CSI-RS based IMR, with the testing configurations for NR cells in Table A.6.7.9.2.1-1.

**Table A.6.7.9.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  |
| 3      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

##### A.6.7.9.2.2 Test parameters

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.9.2.2-1 below. The absolute accuracy of L1-SINR measurements are tested by using the parameters in Table A.6.7.9.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-RS resource set with two CSI-RS resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

**Table A.6.7.9.2.2-1: FR1 SSB based L1-SINR test parameters**

| Parameter   | Config                                  | Unit | Test 1                 | Test 2                 |
|---|---|------|------------------------|------------------------|
| SSB GSCN  | 1~3                                     |      | freq1                  | freq1                  |
| Duplex mode                                       | 1                                       |      | FDD                    | FDD                    |
|   | 2                                       |      | TDD                    | TDD                    |
|   | 3                                       |      | TDD                    | TDD                    |
| TDD Configuration                                 | 1                                       |      | N/A                    | N/A                    |
|   | 2                                       |      | TDDConf.1.1            | TDDConf.1.1            |
|   | 3                                       |      | TDDConf.2.1            | TDDConf.2.1            |
| $BW_{\text{channel}}$                             | 1                                       | MHz  | 10: $N_{RB,c} = 52$    | 10: $N_{RB,c} = 52$    |
|   | 2                                       |      | 10: $N_{RB,c} = 52$    | 10: $N_{RB,c} = 52$    |
|   | 3                                       |      | 40: $N_{RB,c} = 106$   | 40: $N_{RB,c} = 106$   |
| PDSCH Reference measurement channel               | 1                                       |      | SR.1.1 FDD             | SR.1.1 FDD             |
|   | 2                                       |      | SR.1.1 TDD             | SR.1.1 TDD             |
|   | 3                                       |      | SR.2.1 TDD             | SR.2.1 TDD             |
| RMSI CORESET Reference Channel                    | 1                                       |      | CR.1.1 FDD             | CR.1.1 FDD             |
|   | 2                                       |      | CR.1.1 TDD             | CR.1.1 TDD             |
|   | 3                                       |      | CR.2.1 TDD             | CR.2.1 TDD             |
| Dedicated CORESET Reference Channel               | 1                                       |      | CCR.1.1 FDD            | CCR.1.1 FDD            |
|   | 2                                       |      | CCR.1.1 TDD            | CCR.1.1 TDD            |
|   | 3                                       |      | CCR.2.1 TDD            | CCR.2.1 TDD            |
| SSB configuration                                 | 1                                       |      | SSB.3 FR1              | SSB.3 FR1              |
|   | 2                                       |      | SSB.3 FR1              | SSB.3 FR1              |
|   | 3                                       |      | SSB.4 FR1              | SSB.4 FR1              |
| CSI-RS configuration                              | 1                                       |      | CSI-RS 1.1A FDD        | CSI-RS 1.1A FDD        |
|   | 2                                       |      | CSI-RS 1.1A TDD        | CSI-RS 1.1A TDD        |
|   | 3                                       |      | CSI-RS 2.1A TDD        | CSI-RS 2.1A TDD        |
| OCNG Patterns                                     | 1~3                                     |      | OP.1                   | OP.1                   |
| Initial BWP Configuration                         | 1~3                                     |      | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| TRS configuration                                 | 1                                       |      | TRS.1.1 FDD            | TRS.1.1 FDD            |
|   | 2                                       |      | TRS.1.1 TDD            | TRS.1.1 TDD            |
|   | 3                                       |      | TRS.1.2 TDD            | TRS.1.2 TDD            |
| Dedicated BWP configuration                       | 1~3                                     |      | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration                                | 1~3                                     |      | SMTC.1                 | SMTC.1                 |
| reportConfigType                                  | 1~3                                     |      | periodic               | periodic               |
| reportQuantity-r16                                | 1~3                                     |      | ssb-Index-SINR-r16     | ssb-Index-SINR-r16     |
| Number of reported RS                             | 1~3                                     |      | 2                      | 2                      |
| L1-SINR reporting period                          | 1~3                                     |      | slot80                 | slot80                 |
| EPRE ratio of PSS to SSS                          | 1~3                                     | dB   | 0                      | 0                      |
| EPRE ratio of PBCH DMRS to SSS                    |   |      |                        |                        |
| EPRE ratio of PBCH to PBCH DMRS                   |   |      |                        |                        |
| EPRE ratio of PDCCH DMRS to SSS                   |   |      |                        |                        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |      |                        |                        |
| EPRE ratio of PDSCH DMRS to SSS                   |   |      |                        |                        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |      |                        |                        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |      |                        |                        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |      |                        |                        |
| $N_{oc}$<br>Note2                                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1~3  | dBm/15kHz              | -94.65                 |
|   | NR_FDD_FR1_B                            |      |                        |                        |
|   |   |      |                        | -116.5                 |

|                   |   |        |                |        |        |   |
|-------------------|---|--------|----------------|--------|--------|---|
|                   | NR_TDD_FR1_C                            |        |                |        | -116   |   |
|                   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |        |                |        | -115.5 |   |
|                   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |        |                |        | -115   |   |
|                   | NR_FDD_FR1_F                            |        |                |        | -114.5 |   |
|                   | NR_FDD_FR1_G                            |        |                |        | -114   |   |
|                   | NR_FDD_FR1_H                            |        |                |        | -113.5 |   |
| $N_{oc}$<br>Note2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2    | dBm/SSB<br>SCS | -94.65 | -117   |   |
|                   | NR_FDD_FR1_B                            |        |                |        | -116.5 |   |
|                   | NR_TDD_FR1_C                            |        |                |        | -116   |   |
|                   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |        |                |        | -115.5 |   |
|                   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |        |                |        | -115   |   |
|                   | NR_FDD_FR1_F                            |        |                |        | -114.5 |   |
|                   | NR_FDD_FR1_G                            | -114   |                |        |        |   |
|                   | NR_FDD_FR1_H                            | -113.5 |                |        |        |   |
|                   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3      |                | -91.65 | -114   |   |
|                   | NR_FDD_FR1_B                            |        |                |        | -113.5 |   |
|                   | NR_TDD_FR1_C                            |        |                |        | -114   |   |
|                   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |        |                |        | -112.5 |   |
|                   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |        |                |        | -112   |   |
|                   | NR_FDD_FR1_F                            |        |                |        | -111.5 |   |
|                   | NR_FDD_FR1_G                            | -111   |                |        |        |   |
|                   | NR_FDD_FR1_H                            | -110.5 |                |        |        |   |
|                   | $\hat{E}_s/I_{ot}$                      | 1~3    |                | dB     | 10     | 0 |
|                   | $\hat{E}_s/N_{oc}$                      | 1~6    |                | dB     | 10     | 0 |

|                         |   |     |                   |                  |        |        |
|-------------------------|---|-----|-------------------|------------------|--------|--------|
| SSB<br>RSRP<br>Note3    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/SSB<br>SCS    | -84.65           | -117   |        |
|                         | NR_FDD_FR1_B                            |     |                   |                  | -116.5 |        |
|                         | NR_TDD_FR1_C                            |     |                   |                  | -116   |        |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |                  | -115.5 |        |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |                  | -115   |        |
|                         | NR_FDD_FR1_F                            |     |                   |                  | -114.5 |        |
|                         | NR_FDD_FR1_G                            |     |                   |                  | -114   |        |
|                         | NR_FDD_FR1_H                            |     |                   |                  | -113.5 |        |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3   |                   | -81.65           | -114   |        |
|                         | NR_FDD_FR1_B                            |     |                   |                  | -113.5 |        |
|                         | NR_TDD_FR1_C                            |     |                   |                  | -114   |        |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |                  | -112.5 |        |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |                  | -112   |        |
|                         | NR_FDD_FR1_F                            |     |                   |                  | -111.5 |        |
|                         | NR_FDD_FR1_G                            |     |                   |                  | -111   |        |
|                         | NR_FDD_FR1_H                            |     |                   |                  | -110.5 |        |
| CSI-RS<br>RSRP<br>Note3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/CSI-RS<br>SCS | -84.65           | -117   |        |
|                         | NR_FDD_FR1_B                            |     |                   |                  | -116.5 |        |
|                         | NR_TDD_FR1_C                            |     |                   |                  | -116   |        |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |                  | -115.5 |        |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |                  | -115   |        |
|                         | NR_FDD_FR1_F                            |     |                   |                  | -114.5 |        |
|                         | NR_FDD_FR1_G                            |     |                   |                  | -114   |        |
|                         | NR_FDD_FR1_H                            |     |                   |                  | -113.5 |        |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3   |                   | -81.65           | -114   |        |
|                         | NR_FDD_FR1_B                            |     |                   |                  | -113.5 |        |
|                         | NR_TDD_FR1_C                            |     |                   |                  | -113   |        |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |                  | -112.5 |        |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |                  | -112   |        |
|                         | NR_FDD_FR1_F                            |     |                   |                  | -111.5 |        |
|                         | NR_FDD_FR1_G                            |     |                   |                  | -111   |        |
|                         | NR_FDD_FR1_H                            |     |                   |                  | -110.5 |        |
| I <sub>o</sub> Note3    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2 | dBm/9.36<br>MHz   | -56.28           | -86.04 |        |
|                         | NR_FDD_FR1_B                            |     |                   |                  | -85.54 |        |
|                         | NR_TDD_FR1_C                            |     |                   |                  | -85.04 |        |
|                         | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                   |                  | -84.54 |        |
|                         | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                   |                  | -84.04 |        |
|                         | NR_FDD_FR1_F                            |     |                   |                  | -83.54 |        |
|                         | NR_FDD_FR1_G                            |     |                   |                  | -83.04 |        |
|                         | NR_FDD_FR1_H                            |     |                   |                  | -82.54 |        |
|                         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3   |                   | dBm/38.16<br>MHz | -50.19 | -79.94 |
|                         | NR_FDD_FR1_B                            |     |                   |                  |        | -79.44 |
|                         | NR_TDD_FR1_C                            |     |                   |                  |        | -78.94 |

|                       |  |     |  |      |        |
|-----------------------|--|-----|--|------|--------|
|                       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D  |     |  |      | -78.44 |
|                       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E  |     |  |      | -77.94 |
|                       | NR_FDD_FR1_F   |     |  |      | -77.44 |
|                       | NR_FDD_FR1_G   |     |  |      | -76.94 |
|                       | NR_FDD_FR1_H   |     |  |      | -76.44 |
| Propagation condition |  | 1~3 |  | AWGN | AWGN   |
| Antenna configuration |  | 1~3 |  | 1x2  | 1x2    |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |     |  |      |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |     |  |      |        |
| Note 3:               | RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |     |  |      |        |
| Note 4:               | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |     |  |      |        |
| Note 5:               | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.   |     |  |      |        |

A.6.7.9.2.3 Test Requirements

The L1-SINR measurement accuracy for SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 of Cell 1 shall fulfil the requirements in clauses 10.1.27.2.

A.6.7.9.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

A.6.7.9.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8.4.3 and clause 10.1.27.3 for L1-SINR measurements based on CSI-RS as CMR and CSI-IM as IMR with the testing configurations for NR cells in Table A.6.7.9.3.1-1.

**Table A.6.7.9.3.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3      | NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

A.6.7.9.3.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.9.3.2-1 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.6.7.9.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR.

**Table A.6.7.9.3.2-1: FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**



| Parameter   | Config       | Unit   | Test 1                      | Test 2                      |   |
|---|--------------|--------|-----------------------------|-----------------------------|---|
| SSB GSCN  | 1~3          |        | freq1                       | freq1                       |   |
| Duplex mode                                       | 1            |        | FDD                         | FDD                         |   |
|   | 2            |        | TDD                         | TDD                         |   |
|   | 3            |        | TDD                         | TDD                         |   |
| TDD Configuration                                 | 1            |        | N/A                         | N/A                         |   |
|   | 2            |        | TDDConf.1.1                 | TDDConf.1.1                 |   |
|   | 3            |        | TDDConf.2.1                 | TDDConf.2.1                 |   |
| BW <sub>channel</sub>                             | 1            | MHz    | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |   |
|   | 2            |        | 10: N <sub>RB,c</sub> = 52  | 10: N <sub>RB,c</sub> = 52  |   |
|   | 3            |        | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |   |
| PDSCH Reference measurement channel               | 1            |        | SR.1.1 FDD                  | SR.1.1 FDD                  |   |
|   | 2            |        | SR.1.1 TDD                  | SR.1.1 TDD                  |   |
|   | 3            |        | SR.2.1 TDD                  | SR.2.1 TDD                  |   |
| RMSI CORESET Reference Channel                    | 1            |        | CR.1.1 FDD                  | CR.1.1 FDD                  |   |
|   | 2            |        | CR.1.1 TDD                  | CR.1.1 TDD                  |   |
|   | 3            |        | CR.2.1 TDD                  | CR.2.1 TDD                  |   |
| Dedicated CORESET Reference Channel               | 1            |        | CCR.1.1 FDD                 | CCR.1.1 FDD                 |   |
|   | 2            |        | CCR.1.1 TDD                 | CCR.1.1 TDD                 |   |
|   | 3            |        | CCR.2.1 TDD                 | CCR.2.1 TDD                 |   |
| SSB configuration                                 | 1            |        | SSB.1 FR1                   | SSB.1 FR1                   |   |
|   | 2            |        | SSB.1 FR1                   | SSB.1 FR1                   |   |
|   | 3            |        | SSB.2 FR1                   | SSB.2 FR1                   |   |
| OCNG Patterns                                     | 1~3          |        | OP.1                        | OP.1                        |   |
| TRS configuration                                 | 1            |        | TRS.1.1 FDD                 | TRS.1.1 FDD                 |   |
|   | 2            |        | TRS.1.1 TDD                 | TRS.1.1 TDD                 |   |
|   | 3            |        | TRS.1.2 TDD                 | TRS.1.2 TDD                 |   |
| Initial BWP Configuration                         | 1~3          |        | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |   |
| Dedicated BWP configuration                       | 1~3          |        | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |   |
| SMTC configuration                                | 1~3          |        | SMTC.1                      | SMTC.1                      |   |
| CSI-RS configuration as CMR                       | 1            |        | CSI-RS 1.2 FDD              | CSI-RS 1.2 FDD              |   |
|   | 2            |        | CSI-RS 1.2 TDD              | CSI-RS 1.2 TDD              |   |
|   | 3            |        | CSI-RS 2.2 TDD              | CSI-RS 2.2 FDD              |   |
| CSI-IM configuration as IMR                       | 1            |        | CSI-IM 1.3 FDD              | CSI-IM 1.3 FDD              |   |
|   | 2            |        | CSI-IM 1.3 TDD              | CSI-IM 1.3 TDD              |   |
|   | 3            |        | CSI-IM 2.3 TDD              | CSI-IM 2.3 TDD              |   |
| reportConfigType                                  | 1~3          |        | periodic                    | periodic                    |   |
| reportQuantity-r16                                | 1~3          |        | cri-SINR-r16                | cri-SINR-r16                |   |
| nrofReportedRS                                    | 1~3          |        | 2                           | 2                           |   |
| L1-RSRP reporting period                          | 1~3          |        | slot80                      | slot80                      |   |
| EPRE ratio of PSS to SSS                          | 1~3          | dB     | 0                           | 0                           |   |
| EPRE ratio of PBCH DMRS to SSS                    |              |        |                             |                             |   |
| EPRE ratio of PBCH to PBCH DMRS                   |              |        |                             |                             |   |
| EPRE ratio of PDCCH DMRS to SSS                   |              |        |                             |                             |   |
| EPRE ratio of PDCCH to PDCCH DMRS                 |              |        |                             |                             |   |
| EPRE ratio of PDSCH DMRS to SSS                   |              |        |                             |                             |   |
| EPRE ratio of PDSCH to PDSCH DMRS                 |              |        |                             |                             |   |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |              |        |                             |                             |   |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |              |        |                             |                             |   |
| N <sub>oc</sub><br>Note2                          |              |        |                             |                             | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |
|   | NR_FDD_FR1_B | -116.5 |                             |                             |   |

|   |   |   |                   |        |                 |        |                   |        |        |
|---|---|---|-------------------|--------|-----------------|--------|-------------------|--------|--------|
|   | NR_TDD_FR1_C                            |   |                   |        | -116            |        |                   |        |        |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                   |        | -115.5          |        |                   |        |        |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                   |        | -115            |        |                   |        |        |
|   | NR_FDD_FR1_F                            |   |                   |        | -114.5          |        |                   |        |        |
|   | NR_FDD_FR1_G                            |   |                   |        | -114            |        |                   |        |        |
|   | NR_FDD_FR1_H                            |   |                   |        | -113.5          |        |                   |        |        |
| $N_{oc}$<br>Note2                       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1,2                                     | dBm/CSI-RS<br>SCS | -94.65 | -117            |        |                   |        |        |
|   | NR_FDD_FR1_B                            |   |                   |        | -116.5          |        |                   |        |        |
|   | NR_TDD_FR1_C                            |   |                   |        | -116            |        |                   |        |        |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                   |        | -115.5          |        |                   |        |        |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                   |        | -115            |        |                   |        |        |
|   | NR_FDD_FR1_F                            |   |                   |        | -114.5          |        |                   |        |        |
|   | NR_FDD_FR1_G                            |   |                   |        | -114            |        |                   |        |        |
|   | NR_FDD_FR1_H                            |   |                   |        | -113.5          |        |                   |        |        |
|   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 3                                       |                   |        | -91.65          | -114   |                   |        |        |
|   | NR_FDD_FR1_B                            |   |                   |        |                 | -113.5 |                   |        |        |
|   | NR_TDD_FR1_C                            |   |                   |        |                 | -114   |                   |        |        |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |                   |        |                 | -112.5 |                   |        |        |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |                   |        |                 | -112   |                   |        |        |
|   | NR_FDD_FR1_F                            |   |                   |        |                 | -111.5 |                   |        |        |
|   | NR_FDD_FR1_G                            |   |                   |        |                 | -111   |                   |        |        |
|   | NR_FDD_FR1_H                            |   |                   |        |                 | -110.5 |                   |        |        |
|   | $\hat{E}_s/I_{\alpha}$                  | 1~3                                     |                   |        |                 | dB     | 10                | -3     |        |
|   | CSI-RS<br>RSRP<br>Note3                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |                   |        |                 | 1,2    | dBm/CSI-RS<br>SCS | -84.65 | -120   |
| NR_FDD_FR1_B                            |   |   | -119.5            |        |                 |        |                   |        |        |
| NR_TDD_FR1_C                            |   |   | -119              |        |                 |        |                   |        |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |   | -118.5            |        |                 |        |                   |        |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |   | -118              |        |                 |        |                   |        |        |
| NR_FDD_FR1_F                            |   |   | -117.5            |        |                 |        |                   |        |        |
| NR_FDD_FR1_G                            |   |   | -117              |        |                 |        |                   |        |        |
| NR_FDD_FR1_H                            |   |   | -116.5            |        |                 |        |                   |        |        |
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |   | 3                                       | -81.65            | -117   |                 |        |                   |        |        |
| NR_FDD_FR1_B                            |   |   |                   | -116.5 |                 |        |                   |        |        |
| NR_TDD_FR1_C                            |   |   |                   | -116   |                 |        |                   |        |        |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   |   |                   | -115.5 |                 |        |                   |        |        |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   |   |                   | -115   |                 |        |                   |        |        |
| NR_FDD_FR1_F                            |   |   |                   | -114.5 |                 |        |                   |        |        |
| NR_FDD_FR1_G                            |   |   |                   | -114   |                 |        |                   |        |        |
| NR_FDD_FR1_H                            |   |   |                   | -113.5 |                 |        |                   |        |        |
| $I_o$ Note3                             |   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 |                   | 1,2    | dBm/9.36<br>MHz | -56.28 |                   |        | -87.28 |
|   |   | NR_FDD_FR1_B                            |                   |        |                 |        |                   |        | -86.78 |
|   | NR_TDD_FR1_C                            |   | -86.28            |        |                 |        |                   |        |        |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |   | -85.78            |        |                 |        |                   |        |        |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |   | -85.28            |        |                 |        |                   |        |        |

|  |     |                  |        |        |
|--|-----|------------------|--------|--------|
| NR_FDD_FR1_F   |     |                  |        | -84.78 |
| NR_FDD_FR1_G   |     |                  |        | -84.28 |
| NR_FDD_FR1_H   |     |                  |        | -83.78 |
| NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5  | 3   | dBm/38.16<br>MHz | -50.19 | -81.19 |
| NR_FDD_FR1_B   |     |                  |        | -80.69 |
| NR_TDD_FR1_C   |     |                  |        | -80.19 |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D  |     |                  |        | -79.69 |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E  |     |                  |        | -79.19 |
| NR_FDD_FR1_F   |     |                  |        | -78.69 |
| NR_FDD_FR1_G   |     |                  |        | -78.19 |
| NR_FDD_FR1_H   |     |                  |        | -77.69 |
| $\hat{E}_s/N_{oc}$   | 1~3 | dB               | 10     | -3     |
| Propagation condition  | 1~3 |                  | AWGN   | AWGN   |
| Antenna configuration  | 1~3 |                  | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |     |                  |        |        |

A.6.7.9.3.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM# of Cell 1 shall fulfil the requirements in clause 10.1.27.3.A.7 NR standalone tests with one or more NR cells in FR2.

A.6.7.10 CSI-RSRP

A.6.7.10.1 SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

A.6.7.10.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.3.1 and 10.1.2.3.2 for CSI-RS intra-frequency measurements.

A.6.7.10.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.10.1.2-1. Both absolute and relative accuracy of CSI-RSRP intra-frequency measurements are tested by using the parameters in A.6.7.10.1.2-2. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell.

**Table A.6.7.10.1.2-1: CSI-RSRP intra frequency supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3      | NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

**Table A.6.7.10.1.2-2: CSI-RSRP intra frequency test parameters**

| Parameter                            |            | Unit | Test 1                      |           | Test 2      |           | Test 3      |           |
|--------------------------------------|------------|------|-----------------------------|-----------|-------------|-----------|-------------|-----------|
|                                      |            |      | Cell 1                      | Cell 2    | Cell 1      | Cell 2    | Cell 1      | Cell 2    |
| Cell ID                              |            |      | 489                         | 0         | 489         | 0         | 489         | 0         |
| SSB ARFCN                            |            |      | freq1                       |           | freq1       |           | freq1       |           |
| Duplex mode                          | Config 1   |      | FDD                         |           |             |           |             |           |
|                                      | Config 2,3 |      | TDD                         |           |             |           |             |           |
| TDD configuration                    | Config 1   |      | Not Applicable              |           |             |           |             |           |
|                                      | Config 2   |      | TDDConf.1.1                 |           |             |           |             |           |
|                                      | Config 3   |      | TDDConf.2.1                 |           |             |           |             |           |
| BW <sub>channel</sub>                | Config 1   | MHz  | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |           |             |           |             |           |
| BWP BW                               | Config 1   |      | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 2   |      | 10: N <sub>RB,c</sub> = 52  |           |             |           |             |           |
|                                      | Config 3   |      | 40: N <sub>RB,c</sub> = 106 |           |             |           |             |           |
| Downlink initial BWP configuration   |            |      | DLBWP.0.1                   |           |             |           |             |           |
| Downlink dedicated BWP configuration |            |      | DLBWP.1.1                   |           |             |           |             |           |
| Uplink initial BWP configuration     |            |      | ULBWP.0.1                   |           |             |           |             |           |
| Uplink dedicated BWP configuration   |            |      | ULBWP.1.1                   |           |             |           |             |           |
| TRS configuration                    | Config 1   |      | TRS.1.1 FDD                 | NA        | TRS.1.1 FDD | NA        | TRS.1.1 FDD | NA        |
|                                      | Config 2   |      | TRS.1.1 TDD                 | NA        | TRS.1.1 TDD | NA        | TRS.1.1 TDD | NA        |
|                                      | Config 3   |      | TRS.1.2 TDD                 | NA        | TRS.1.2 TDD | NA        | TRS.1.2 TDD | NA        |
| DRX Cycle                            |            | ms   | Not Applicable              |           |             |           |             |           |
| PDSCH Reference measurement channel  | Config 1   |      | SR.1.1 FDD                  | -         | SR.1.1 FDD  | -         | SR.1.1 FDD  | -         |
|                                      | Config 2   |      | SR.1.1 TDD                  | -         | SR.1.1 TDD  | -         | SR.1.1 TDD  | -         |
|                                      | Config 3   |      | SR.2.1 TDD                  | -         | SR.2.1 TDD  | -         | SR.2.1 TDD  | -         |
| RMSI CORESET Reference Channel       | Config 1   |      | CR.1.1 FDD                  | -         | CR.1.1 FDD  | -         | CR.1.1 FDD  | -         |
|                                      | Config 2   |      | CR.1.1 TDD                  | -         | CR.1.1 TDD  | -         | CR.1.1 TDD  | -         |
|                                      | Config 3   |      | CR.2.1 TDD                  | -         | CR.2.1 TDD  | -         | CR.2.1 TDD  | -         |
| Control channel RMC                  | Config 1   |      | CCR.1.1 FDD                 | -         | CCR.1.1 FDD | -         | CCR.1.1 FDD | -         |
|                                      | Config 2   |      | CCR.1.1 TDD                 | -         | CCR.1.1 TDD | -         | CCR.1.1 TDD | -         |
|                                      | Config 3   |      | CCR2.1 TDD                  | -         | CCR2.1 TDD  | -         | CCR2.1 TDD  | -         |
| SSB configuration                    | Config 1   |      | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |
|                                      | Config 2   |      | SSB.1 FR1                   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 | SSB.1 FR1   | SSB.1 FR1 |
|                                      | Config 3   |      | SSB.2 FR1                   | SSB.2 FR1 | SSB.2 FR1   | SSB.2 FR1 | SSB.2 FR1   | SSB.2 FR1 |
| Time offset with Cell 1              | Config 1,2 | µs   | -                           | 4.7       | -           | 4.7       | -           | 4.7       |
|                                      | Config 3   | µs   | -                           | 2.35      | -           | 2.35      | -           | 2.35      |

|  |                    |   |               |                      |                                  |        |                        |        |        |
|--|--------------------|---|---------------|----------------------|----------------------------------|--------|------------------------|--------|--------|
| SMTC configuration                       |                    | Config 1                                |               | SMTC.2               |                                  |        |                        |        |        |
|  |                    | Config 2,3                              |               | SMTC.1               |                                  |        |                        |        |        |
| CSI-RS configuration for RRM             |                    | Config 1                                |               | CSI-RS.RRM.FR1.1 FDD |                                  |        |                        |        |        |
|  |                    | Config 2                                |               | CSI-RS.RRM.FR1.1 TDD |                                  |        |                        |        |        |
|  |                    | Config 3                                |               | CSI-RS.RRM.FR1.2 TDD |                                  |        |                        |        |        |
| OCNG Patterns                            |                    |   |               | OCNG pattern 1       |                                  |        |                        |        |        |
| PDSCH/PDCCH subcarrier spacing           |                    | Config 1,2                              | kHz           | 15 kHz               |                                  |        |                        |        |        |
|  |                    | Config 3                                |               | 30kHz                |                                  |        |                        |        |        |
| EPRE ratio of PSS to SSS                 |                    |   | dB            | 0                    | 0                                | 0      | 0                      | 0      | 0      |
| EPRE ratio of PBCH DMRS to SSS           |                    |   |               |                      |                                  |        |                        |        |        |
| EPRE ratio of PBCH to PBCH DMRS          |                    |   |               |                      |                                  |        |                        |        |        |
| EPRE ratio of PDCCH DMRS to SSS          |                    |   |               |                      |                                  |        |                        |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                    |   |               |                      |                                  |        |                        |        |        |
| EPRE ratio of PDSCH DMRS to SSS          |                    |   |               |                      |                                  |        |                        |        |        |
| EPRE ratio of PDSCH to PDSCH             |                    |   |               |                      |                                  |        |                        |        |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |   |               |                      |                                  |        |                        |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                    |   |               |                      |                                  |        |                        |        |        |
| $N_{oc}$<br>Note2                        | Config 1,2         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15Kh<br>Z | -106                 | -88                              | -114   |                        |        |        |
|  |                    | NR_FDD_FR1_B                            |               |                      |                                  | -113.5 |                        |        |        |
|  |                    | NR_TDD_FR1_C                            |               |                      |                                  | -113   |                        |        |        |
|  |                    | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |               |                      |                                  | -112.5 |                        |        |        |
|  |                    | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |               |                      |                                  | -112   |                        |        |        |
|  |                    | NR_FDD_FR1_F                            |               |                      |                                  | -111.5 |                        |        |        |
|  |                    | NR_FDD_FR1_G                            |               |                      |                                  | -111   |                        |        |        |
|  |                    | NR_FDD_FR1_H                            |               |                      |                                  | -110.5 |                        |        |        |
|  | Config 3           | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |               | dBm/15Kh<br>Z        | Not applicable <sup>Note 5</sup> | -94    | -114                   |        |        |
|  |                    | NR_FDD_FR1_B                            |               |                      |                                  |        | -113.5                 |        |        |
|  |                    | NR_TDD_FR1_C                            |               |                      |                                  |        | -113                   |        |        |
|  |                    | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |               |                      |                                  |        | -112.5                 |        |        |
|  |                    | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |               |                      |                                  |        | -112                   |        |        |
|  |                    | NR_FDD_FR1_F                            |               |                      |                                  |        | -111.5                 |        |        |
|  |                    | NR_FDD_FR1_G                            |               |                      |                                  |        | -111                   |        |        |
|  |                    | NR_FDD_FR1_H                            |               |                      |                                  |        | -110.5                 |        |        |
| $N_{oc}$<br>Note2                        | Config 1,2         |   | dBm/SCS       |                      | -106                             | -88    | Same as $N_{oc}/15kHz$ |        |        |
|  | Config 3           | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |               |                      |                                  |        | -111                   |        |        |
|  |                    | NR_FDD_FR1_B                            |               |                      | -110.5                           |        |                        |        |        |
|  |                    | NR_TDD_FR1_C                            |               |                      | -110                             |        |                        |        |        |
|  |                    | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |               |                      | -109.5                           |        |                        |        |        |
|  |                    | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |               |                      | -109                             |        |                        |        |        |
|  |                    | NR_FDD_FR1_F                            |               |                      | -108.5                           |        |                        |        |        |
|  |                    | NR_FDD_FR1_G                            |               |                      | -108                             |        |                        |        |        |
|  |                    | NR_FDD_FR1_H                            |               | -107.5               |                                  |        |                        |        |        |
|  | $\hat{E}_s/I_{ot}$ |   |               | dB                   | 2.46                             | -5.97  | 2.46                   | -5.97  | -0.01  |
| $\hat{E}_s/N_{oc}$                       |                    |   | dB            | 6                    | 1                                | 6      | 1                      | 3      | 0      |
| CSI-RSRP <sup>Not e3</sup>               | Config 1,2         | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS       | -100                 | -105                             | -82    | -87                    | -      | -      |
|  |                    | NR_FDD_FR1_B                            |               |                      |                                  |        |                        | 111.00 | 114.00 |
|  |                    |   |               |                      |                                  |        |                        | -      | -      |
|  |                    |   |               |                      |                                  |        |                        | 110.50 | 113.50 |

|                               |              |   |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
|-------------------------------|--------------|---|-----------------|--------|--------|--|--|------------------|-------------------------------------|--------|--|--|--------|--|
|                               |              | NR_TDD_FR1_C                            |                 |        |        |  |  | -                | -                                   |        |  |  |        |  |
|                               |              |   |                 |        |        |  |  | 110.00           | 113.00                              |        |  |  |        |  |
|                               |              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                 |        |        |  |  | -                | -                                   |        |  |  |        |  |
|                               |              |   |                 |        |        |  |  | 109.50           | 112.50                              |        |  |  |        |  |
|                               |              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                 |        |        |  |  | -                | -                                   |        |  |  |        |  |
|                               |              |   |                 |        |        |  |  | 109.00           | 112.00                              |        |  |  |        |  |
|                               | NR_FDD_FR1_F | -                                       |                 |        |        |  |  | -                |                                     |        |  |  |        |  |
|                               |              | 108.50                                  |                 |        |        |  |  | 111.50           |                                     |        |  |  |        |  |
|                               | NR_FDD_FR1_G | -                                       |                 |        |        |  |  | -                |                                     |        |  |  |        |  |
|                               |              | 108.00                                  |                 |        |        |  |  | 111.00           |                                     |        |  |  |        |  |
|                               | NR_FDD_FR1_H | -                                       |                 |        |        |  |  | -                |                                     |        |  |  |        |  |
|                               |              | 107.50                                  |                 |        |        |  |  | 110.50           |                                     |        |  |  |        |  |
|                               | Config 3     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                 |        |        |  |  | -                | -                                   |        |  |  |        |  |
|                               |              |   |                 |        |        |  |  | 108.00           | 111.00                              |        |  |  |        |  |
| NR_FDD_FR1_B                  |              | -                                       | -               |        |        |  |  |                  |                                     |        |  |  |        |  |
|                               |              | 107.50                                  | 110.50          |        |        |  |  |                  |                                     |        |  |  |        |  |
| NR_TDD_FR1_C                  |              | -                                       | -               |        |        |  |  |                  |                                     |        |  |  |        |  |
|                               |              | 107.00                                  | 110.00          |        |        |  |  |                  |                                     |        |  |  |        |  |
| NR_FDD_FR1_D,<br>NR_TDD_FR1_D |              | -                                       | -               |        |        |  |  |                  |                                     |        |  |  |        |  |
|                               |              | 106.50                                  | 109.50          |        |        |  |  |                  |                                     |        |  |  |        |  |
| NR_FDD_FR1_E,<br>NR_TDD_FR1_E | -            | -                                       |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
|                               | 106.00       | 109.00                                  |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
| NR_FDD_FR1_F                  | -            | -                                       |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
|                               | 105.50       | 108.50                                  |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
| NR_FDD_FR1_G                  | -            | -                                       |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
|                               | 105.00       | 108.00                                  |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
| NR_FDD_FR1_H                  | -            | -                                       |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
|                               | 104.50       | 107.50                                  |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
| Io <sup>Note3</sup>           | Config 1,2   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz | -70.09 | -52.09 |  |  | -80.03           |                                     |        |  |  |        |  |
|                               |              |   |                 |        |        |  |  | -79.53           |                                     |        |  |  |        |  |
|                               |              | NR_TDD_FR1_C                            |                 |        |        |  |  | -79.03           |                                     |        |  |  |        |  |
|                               |              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                 |        |        |  |  | -78.53           |                                     |        |  |  |        |  |
|                               |              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                 |        |        |  |  | -78.03           |                                     |        |  |  |        |  |
|                               |              | NR_FDD_FR1_F                            |                 |        |        |  |  | -77.53           |                                     |        |  |  |        |  |
|                               |              | NR_FDD_FR1_G                            |                 |        |        |  |  | -77.03           |                                     |        |  |  |        |  |
|                               |              | NR_FDD_FR1_H                            |                 |        |        |  |  | -76.53           |                                     |        |  |  |        |  |
|                               | Config 3     | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |                 |        |        |  |  | dBm/<br>38.16MHz | Not<br>applicable <sup>Note 5</sup> | -51.99 |  |  | -73.94 |  |
|                               |              |   |                 |        |        |  |  |                  |                                     |        |  |  | -73.44 |  |
|                               |              | NR_TDD_FR1_C                            |                 |        |        |  |  |                  |                                     |        |  |  | -72.94 |  |
|                               |              | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                 |        |        |  |  |                  |                                     |        |  |  | -72.44 |  |
|                               |              | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                 |        |        |  |  |                  |                                     |        |  |  | -71.94 |  |
|                               |              | NR_FDD_FR1_F                            |                 |        |        |  |  |                  |                                     |        |  |  | -71.44 |  |
| NR_FDD_FR1_G                  |              | -70.94                                  |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
| NR_FDD_FR1_H                  | -70.44       |   |                 |        |        |  |  |                  |                                     |        |  |  |        |  |
| Propagation condition         |              |   | -               | AWGN   |        |  |  |                  |                                     |        |  |  |        |  |
| Antenna configuration         |              |   | 1x2             |        |        |  |  |                  |                                     |        |  |  |        |  |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | CSI-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | Subtest 1 is not used when testing with 30kHz SSB and CSI-RS SCS.  |
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |

### A.6.7.10.1.3 Test Requirements

The CSI-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in clause 10.1.2.3.1 and relative requirement in clause 10.1.2.3.2.

## A.6.7.10.2 SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

### A.6.7.10.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.4.3.1 and 10.1.4.3.2 for CSI-RS inter-frequency measurements with the testing configurations for NR cells in Table A.6.7.10.2.1-1.

**Table A.6.7.10.2.1-1: Applicable NR configurations for FR1 inter-frequency CSI-RSRP accuracy test**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode   |
| 2      | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode   |
| 3      | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

### A.6.7.10.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.6.7.10.2.2-1 below. Both absolute and relative accuracy of CSI-RSRP inter-frequency measurements are tested by using the parameters in Table A.6.7.10.2.2-1. The inter-frequency measurements are supported by a measurement gap.



**Table A.6.7.10.2.2-1: CSI-RSRP inter-frequency test parameters**

| Parameter                           | Config | Unit | Test 1                      |        | Test 2                      |        |
|-------------------------------------|--------|------|-----------------------------|--------|-----------------------------|--------|
|                                     |        |      | Cell 1                      | Cell 2 | Cell 1                      | Cell 2 |
| SSB ARFCN                           | 1~3    |      | freq1                       | freq2  | freq1                       | freq2  |
| BW <sub>channel</sub>               | 1      | MHz  | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |
|                                     | 2      |      | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |
|                                     | 3      |      | 40: N <sub>RB,c</sub> = 106 |        | 40: N <sub>RB,c</sub> = 106 |        |
| Duplex mode                         | 1      |      | FDD                         |        | FDD                         |        |
|                                     | 2      |      | TDD                         |        | TDD                         |        |
|                                     | 3      |      | TDD                         |        | TDD                         |        |
| TDD configuration                   | 1      |      | N/A                         |        | N/A                         |        |
|                                     | 2      |      | TDDConf.1.1                 |        | TDDConf.1.1                 |        |
|                                     | 3      |      | TDDConf.2.1                 |        | TDDConf.2.1                 |        |
| PDSCH Reference measurement channel | 1      |      | SR.1.1<br>FDD               | -      | SR.1.1<br>FDD               | -      |
|                                     | 2      |      | SR.1.1<br>TDD               |        | SR.1.1<br>TDD               |        |
|                                     | 3      |      | SR.2.1<br>FDD               |        | SR.2.1<br>FDD               |        |
| RMSI CORESET Reference Channel      | 1      |      | CR.1.1<br>FDD               | -      | CR.1.1<br>FDD               | -      |
|                                     | 2      |      | CR.1.1<br>TDD               | -      | CR.1.1<br>TDD               | -      |
|                                     | 3      |      | CR.2.1<br>FDD               | -      | CR.2.1<br>FDD               | -      |
| Dedicated CORESET Reference Channel | 1      |      | CCR.1.1<br>FDD              | -      | CCR.1.1<br>FDD              | -      |
|                                     | 2      |      | CCR.1.1<br>TDD              | -      | CCR.1.1<br>TDD              | -      |
|                                     | 3      |      | CCR.2.1<br>TDD              | -      | CCR.2.1<br>TDD              | -      |
| SSB configuration                   | 1      |      | SSB.1 FR1                   |        | SSB.1 FR1                   |        |
|                                     | 2      |      | SSB.1 FR1                   |        | SSB.1 FR1                   |        |
|                                     | 3      |      | SSB.2 FR1                   |        | SSB.2 FR1                   |        |
| OCNG Patterns                       | 1~3    |      | OP.1                        |        | OP.1                        |        |
| TRS configuration                   | 1      |      | TRS.1.1<br>FDD              | -      | TRS.1.1<br>FDD              | -      |
|                                     | 2      |      | TRS.1.1<br>TDD              |        | TRS.1.1<br>TDD              |        |
|                                     | 3      |      | TRS.1.2<br>TDD              |        | TRS.1.2<br>TDD              |        |
| Initial BWP Configuration           | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      |        | DLBWP.0.1<br>ULBWP.0.1      |        |
| Dedicated BWP configuration         | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      |        | DLBWP.1.1<br>ULBWP.1.1      |        |
| Time offset with Cell 1             | 1,2    | µs   | -                           | 4.7    | -                           | 4.7    |
|                                     | 3      | µs   | -                           | 2.35   | -                           | 2.35   |
| SMTC configuration                  | 1      |      | SMTC.2                      |        | SMTC.2                      |        |
|                                     | 2,3    |      | SMTC.1                      |        | SMTC.1                      |        |
| CSI-RS configuration for RRM        | 1      |      | CSI-RS.RRM.FR1.1<br>FDD     |        | CSI-RS.RRM.FR1.1<br>FDD     |        |
|                                     | 2      |      | CSI-RS.RRM.FR1.1<br>TDD     |        | CSI-RS.RRM.FR1.1<br>TDD     |        |
|                                     | 3      |      | CSI-RS.RRM.FR1.2<br>TDD     |        | CSI-RS.RRM.FR1.2<br>TDD     |        |
| EPRE ratio of PSS to SSS            | 1~3    | dB   | 0                           | 0      | 0                           | 0      |
| EPRE ratio of PBCH DMRS to SSS      |        |      |                             |        |                             |        |
| EPRE ratio of PBCH to PBCH DMRS     |        |      |                             |        |                             |        |
| EPRE ratio of PDCCH DMRS to SSS     |        |      |                             |        |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |        |                             |        |
| EPRE ratio of PDSCH DMRS to SSS     |        |      |                             |        |                             |        |

|  |                      |                      |              |              |                               |                               |         |
|--|----------------------|----------------------|--------------|--------------|-------------------------------|-------------------------------|---------|
| EPRE ratio of PDSCH to PDSCH DMRS      |                      |                      |              |              |                               |                               |         |
| EPRE ratio of OCNG DMRS to SSS>Note 1  |                      |                      |              |              |                               |                               |         |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |                      |                      |              |              |                               |                               |         |
| $N_{oc}$ Note2                         | NR_FDD_FR1_A         | 1~3                  | dBm/15 kHz   | -94.65       | $(N_{oc}$ for Channel 2 +8dB) | -115                          |         |
|  | NR_TDD_FR1_A NOTE 5  |                      |              |              |                               | -114.5                        |         |
|  | NR_FDD_FR1_B         |                      |              |              |                               | -114                          |         |
|  | NR_TDD_FR1_C         |                      |              |              |                               | -113.5                        |         |
|  | NR_FDD_FR1_D         |                      |              |              |                               | -113                          |         |
|  | NR_TDD_FR1_D         |                      |              |              |                               | -112.5                        |         |
|  | NR_FDD_FR1_E         |                      |              |              |                               | -112                          |         |
|  | NR_TDD_FR1_E         |                      |              |              |                               | -111.5                        |         |
|  | NR_FDD_FR1_F         |                      |              |              |                               | -112.5                        |         |
|  | NR_FDD_FR1_G         |                      |              |              |                               | -112                          |         |
| $N_{oc}$ Note2                         | NR_FDD_FR1_H         | 1,2                  | dBm/SS B SCS | -94.65       | $(N_{oc}$ for Channel 2 +8dB) | -111.5                        |         |
|  | NR_TDD_FR1_A NOTE 5, |                      |              |              |                               | -115                          |         |
|  | NR_FDD_FR1_B         |                      |              |              |                               | -114.5                        |         |
|  | NR_TDD_FR1_C         |                      |              |              |                               | -114                          |         |
|  | NR_FDD_FR1_D         |                      |              |              |                               | -113.5                        |         |
|  | NR_TDD_FR1_D         |                      |              |              |                               | -113                          |         |
|  | NR_FDD_FR1_E         |                      |              |              |                               | -112.5                        |         |
|  | NR_TDD_FR1_E         |                      |              |              |                               | -112                          |         |
|  | NR_FDD_FR1_F         |                      |              |              |                               | -111.5                        |         |
|  | NR_FDD_FR1_G         | -112.00              |              |              |                               |                               |         |
|  | 3                    | NR_FDD_FR1_A         | 3            | dBm/SS B SCS | -91.65                        | $(N_{oc}$ for Channel 2 +8dB) | -112.00 |
|  |                      | NR_TDD_FR1_A NOTE 5, |              |              |                               |                               | -112.50 |
|  |                      | NR_FDD_FR1_B         |              |              |                               |                               | -112.00 |
|  |                      | NR_TDD_FR1_C         |              |              |                               |                               | -111.50 |
|  |                      | NR_FDD_FR1_D         |              |              |                               |                               | -111.00 |
|  |                      | NR_TDD_FR1_D         |              |              |                               |                               | -110.50 |
|  |                      | NR_FDD_FR1_E         |              |              |                               |                               | -110.00 |
|  |                      | NR_TDD_FR1_E         |              |              |                               |                               | -110.00 |
| NR_FDD_FR1_F                           |                      | -110.50              |              |              |                               |                               |         |
| NR_FDD_FR1_G                           | -110.00              |                      |              |              |                               |                               |         |
| NR_FDD_FR1_H                           | -110.50              |                      |              |              |                               |                               |         |
| $\hat{E}_s/I_{ot}$                     |                      | 1~3                  | dB           | 10           | 10                            | 13                            | -3      |
| CSI-RSRP>Note3                         | NR_FDD_FR1_A         | 1,2                  | dBm/SC S     | -84.65       | (RSRP for Cell 2 +25dB)       | -118.00                       |         |
|  | NR_TDD_FR1_A NOTE 5, |                      |              |              |                               | -117.50                       |         |
|  | NR_FDD_FR1_B         |                      |              |              |                               | -117.00                       |         |
|  | NR_TDD_FR1_C         |                      |              |              |                               | -116.50                       |         |
|  | NR_FDD_FR1_D         |                      |              |              |                               | -116.00                       |         |
|  | NR_TDD_FR1_D         |                      |              |              |                               | -115.50                       |         |
|  | NR_FDD_FR1_E         |                      |              |              |                               | -115.00                       |         |
|  | NR_TDD_FR1_E         |                      |              |              |                               | -115.00                       |         |
|  | NR_FDD_FR1_F         |                      |              |              |                               | -115.00                       |         |
|  | NR_FDD_FR1_G         |                      |              |              |                               | -115.00                       |         |

|   |                         |     |                      |        |   |        |         |
|---|-------------------------|-----|----------------------|--------|---|--------|---------|
|   | NR_FDD_FR1_H            |     |                      |        |   |        | -114.50 |
|   | NR_FDD_FR1_A            |     |                      |        |   |        | -115.00 |
|   | NR_TDD_FR1_A<br>NOTE 5, |     |                      |        |   |        |         |
|   | NR_FDD_FR1_B            |     |                      |        |   |        | -114.50 |
|   | NR_TDD_FR1_C            |     |                      |        |   |        | -114.00 |
|   | NR_FDD_FR1_D            |     |                      |        |   |        | -113.50 |
|   | NR_TDD_FR1_D            | 3   |                      | -81.65 | (RSRP for<br>Cell 2<br>+25dB)               |        | -113.00 |
|   | NR_FDD_FR1_E            |     |                      |        |   |        | -113.00 |
|   | NR_TDD_FR1_E            |     |                      |        |   |        |         |
|   | NR_FDD_FR1_F            |     |                      |        |   |        | -112.50 |
|   | NR_FDD_FR1_G            |     |                      |        |   |        | -112.00 |
|   | NR_FDD_FR1_H            |     |                      |        |   |        | -111.50 |
| I <sub>o</sub> Note3  | NR_FDD_FR1_A            |     |                      |        |   |        | -85.28  |
|   | NR_TDD_FR1_A<br>NOTE 5, |     |                      |        |   |        |         |
|   | NR_FDD_FR1_B            |     |                      |        |   |        | -84.78  |
|   | NR_TDD_FR1_C            |     |                      |        |   |        | -84.28  |
|   | NR_FDD_FR1_D            | 1,2 | dBm/<br>9.36MH<br>z  | -56.28 | I <sub>o</sub> for<br>Channel 2<br>+19.75dB |        | -83.78  |
|   | NR_TDD_FR1_D            |     |                      |        |   |        | -83.28  |
|   | NR_FDD_FR1_E            |     |                      |        |   |        |         |
|   | NR_TDD_FR1_E            |     |                      |        |   |        | -82.78  |
|   | NR_FDD_FR1_F            |     |                      |        |   |        | -82.28  |
|   | NR_FDD_FR1_G            |     |                      |        |   |        | -81.78  |
|   | NR_FDD_FR1_H            |     |                      |        |   |        | -79.19  |
|   | NR_TDD_FR1_A<br>NOTE 5, |     |                      |        |   |        |         |
|   | NR_FDD_FR1_B            |     |                      |        |   |        | -78.69  |
|   | NR_TDD_FR1_C            |     |                      |        |   |        | -78.19  |
|   | NR_FDD_FR1_D            | 3   | dBm/<br>38.16M<br>Hz | -50.19 | I <sub>o</sub> for<br>Channel 2<br>+19.75dB |        | -77.69  |
|   | NR_TDD_FR1_D            |     |                      |        |   |        | -77.19  |
|   | NR_FDD_FR1_E            |     |                      |        |   |        |         |
|   | NR_TDD_FR1_E            |     |                      |        |   |        | -76.69  |
| NR_FDD_FR1_F  |                         |     |                      |        |   | -76.19 |         |
| NR_FDD_FR1_G  |                         |     |                      |        |   | -75.69 |         |
|   | NR_FDD_FR1_H            |     |                      |        |   |        | -75.69  |
| $\hat{E}_s / N_{oc}$  |                         | 1~3 | dB                   | 10     | 10  | 13     | -3      |
| Propagation condition   |                         | 1~3 | -                    | AWGN   |   | AWGN   |         |
| Antenna configuration   |                         | 1~3 |                      | 1x2    |   | 1x2    |         |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |                         |     |                      |        |   |        |         |

### A.6.7.10.2.3 Test Requirements

The CSI-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirement in clause 10.1.4.3.1 and relative requirement in clause 10.1.4.3.2.

## A.6.7.11 CSI-RSRQ

### A.6.7.11.1 SA: Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.11.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.2.

#### A.6.7.11.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.11.1.2-1. The absolute accuracy of CSI-RSRQ intra-frequency measurement is tested by using the parameters in Table A.6.7.11.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

**Table A.6.7.11.1.2-1: Intra frequency CSI-RSRQ supported test configurations**

| <b>Config</b> | <b>Description</b>   |
|---------------|--|
| 1             | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode                  |
| 2             | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode                  |
| 3             | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode                  |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.11.1.2-2: CSI-RSRQ Intra frequency test parameters**

| Parameter                           |                  | Unit | Test 1                      |        | Test 2      |        | Test 3      |        |
|-------------------------------------|------------------|------|-----------------------------|--------|-------------|--------|-------------|--------|
|                                     |                  |      | Cell 1                      | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |
| Duplex mode                         | Config 1         |      | FDD                         |        |             |        |             |        |
|                                     | Config 2,3       |      | TDD                         |        |             |        |             |        |
| TDD configuration                   | Config 1         |      | Not Applicable              |        |             |        |             |        |
|                                     | Config 2         |      | TDDConf.1.1                 |        |             |        |             |        |
|                                     | Config 3         |      | TDDConf.2.1                 |        |             |        |             |        |
| BW <sub>channel</sub>               | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| Gap Pattern ID                      |                  |      | 0                           |        |             |        |             |        |
| BWP configuration                   | Initial DL BWP   |      | DLBWP.0.1                   |        |             |        |             |        |
|                                     | Dedicated DL BWP |      | DLBWP.1.1                   |        |             |        |             |        |
|                                     | Initial UL BWP   |      | ULBWP.0.1                   |        |             |        |             |        |
|                                     | Dedicated UL BWP |      | ULBWP.1.1                   |        |             |        |             |        |
| DRX Cycle                           |                  | ms   | Not Applicable              |        |             |        |             |        |
| PDSCH Reference measurement channel | Config 1         |      | SR.1.1 FDD                  | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|                                     | Config 2         |      | SR.1.1 TDD                  |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|                                     | Config 3         |      | SR.2.1 TDD                  |        | SR.2.1 TDD  |        | SR.2.1 TDD  |        |
| RMSI CORESET Reference Channel      | Config 1         |      | CR.1.1 FDD                  | -      | CR.1.1 FDD  | -      | CR.1.1 FDD  |        |
|                                     | Config 2         |      | CR.1.1 TDD                  |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|                                     | Config 3         |      | CR.2.1 TDD                  |        | CR.2.1 TDD  |        | CR.2.1 TDD  |        |
| Control Channel RMC                 | Config 1         |      | CCR.1.1 FDD                 | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD |        |
|                                     | Config 2         |      | CCR.1.1 TDD                 |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|                                     | Config 3         |      | CCR.2.1 TDD                 |        | CCR.2.1 TDD |        | CCR.2.1 TDD |        |
| TRS Configuration                   | Config 1         |      | TRS.1.1 FDD                 | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD |        |
|                                     | Config 2         |      | TRS.1.1 TDD                 |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|                                     | Config 3         |      | TRS.1.2 TDD                 |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns                       |                  |      | OP. 1                       |        |             |        |             |        |
| Time offset with Cell 1             | Config 1         | μs   | -                           | 4.7    | -           | 4.7    | -           | 4.7    |
|                                     | Config 2,3       | μs   | -                           | 2.35   | -           | 2.35   | -           | 2.35   |
| CSI-RS configuration for RRM        | Config 1         |      | CSI-RS.RRM.FR1.1 FDD        |        |             |        |             |        |
|                                     | Config 2         |      | CSI-RS.RRM.FR1.1 TDD        |        |             |        |             |        |
|                                     | Config 3         |      | CSI-RS.RRM.FR1.2 TDD        |        |             |        |             |        |
| SMTC configuration                  | Config 1         |      | SMTC.2                      |        |             |        |             |        |
|                                     | Config 2,3       |      | SMTC.1                      |        |             |        |             |        |
|                                     | Config 1,2       |      | SSB.1 FR1                   |        |             |        |             |        |

|  |            |                                      |                    |           |      |        |       |   |        |
|--|------------|--------------------------------------|--------------------|-----------|------|--------|-------|---|--------|
| SSB configuration                        |            | Config 3                             |                    | SSB.2 FR1 |      |        |       |   |        |
| PDSCH/PDCCH H subcarrier spacing         |            | Config 1,2                           | kHz                | 15 kHz    |      |        |       |   |        |
|  |            | Config 3                             |                    | 30kHz     |      |        |       |   |        |
| EPRE ratio of PSS to SSS                 |            |                                      | dB                 | 0         | 0    | 0      | 0     | 0 | 0      |
| EPRE ratio of PBCH DMRS to SSS           |            |                                      |                    |           |      |        |       |   |        |
| EPRE ratio of PBCH to PBCH DMRS          |            |                                      |                    |           |      |        |       |   |        |
| EPRE ratio of PDCCH DMRS to SSS          |            |                                      |                    |           |      |        |       |   |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |                                      |                    |           |      |        |       |   |        |
| EPRE ratio of PDSCH DMRS to SSS          |            |                                      |                    |           |      |        |       |   |        |
| EPRE ratio of PDSCH to PDSCH             |            |                                      |                    |           |      |        |       |   |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |                                      |                    |           |      |        |       |   |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |                                      |                    |           |      |        |       |   |        |
| $N_{oc}$<br>Note2                        | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>15kHz<br>z | -85       | -101 |        |       |   | -114   |
|  |            | NR_FDD_FR1_B                         |                    |           |      |        |       |   | -113.5 |
|  |            | NR_TDD_FR1_C                         |                    |           |      |        |       |   | -113   |
|  |            | NR_FDD_FR1_D, NR_TDD_FR1_D           |                    |           |      |        |       |   | -112.5 |
|  |            | NR_FDD_FR1_E, NR_TDD_FR1_E           |                    |           |      |        |       |   | -112   |
|  |            | NR_FDD_FR1_F                         |                    |           |      |        |       |   | -111.5 |
|  |            | NR_FDD_FR1_G                         |                    |           |      |        |       |   | -111   |
|  |            | NR_FDD_FR1_H                         |                    |           |      |        |       |   | -110.5 |
|  | Config 3   | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 |                    | -91       | -    |        |       |   | -114   |
|  |            | NR_FDD_FR1_B                         |                    |           |      |        |       |   | -113.5 |
|  |            | NR_TDD_FR1_C                         |                    |           |      |        |       |   | -113   |
|  |            | NR_FDD_FR1_D, NR_TDD_FR1_D           |                    |           |      |        |       |   | -112.5 |
|  |            | NR_FDD_FR1_E, NR_TDD_FR1_E           |                    |           |      |        |       |   | -112   |
|  |            | NR_FDD_FR1_F                         |                    |           |      |        |       |   | -111.5 |
| NR_FDD_FR1_G                             | -111       |                                      |                    |           |      |        |       |   |        |
| NR_FDD_FR1_H                             | -110.5     |                                      |                    |           |      |        |       |   |        |
| $N_{oc}$<br>Note2                        | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>SCS        | -85       | -101 |        |       |   | -114   |
|  |            | NR_FDD_FR1_B                         |                    |           |      |        |       |   | -113.5 |
|  |            | NR_TDD_FR1_C                         |                    |           |      |        |       |   | -113   |
|  |            | NR_FDD_FR1_D, NR_TDD_FR1_D           |                    |           |      |        |       |   | -112.5 |
|  |            | NR_FDD_FR1_E, NR_TDD_FR1_E           |                    |           |      |        |       |   | -112   |
|  |            | NR_FDD_FR1_F                         |                    |           |      |        |       |   | -111.5 |
|  |            | NR_FDD_FR1_G                         |                    |           |      |        |       |   | -111   |
|  |            | NR_FDD_FR1_H                         |                    |           |      |        |       |   | -110.5 |
|  | Config 3   | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 |                    | -88       | -    |        |       |   | -111   |
|  |            | NR_FDD_FR1_B                         |                    |           |      |        |       |   | -110.5 |
|  |            | NR_TDD_FR1_C                         |                    |           |      |        |       |   | -110   |
|  |            | NR_FDD_FR1_D, NR_TDD_FR1_D           |                    |           |      |        |       |   | -109.5 |
|  |            | NR_FDD_FR1_E, NR_TDD_FR1_E           |                    |           |      |        |       |   | -109   |
|  |            | NR_FDD_FR1_F                         |                    |           |      |        |       |   | -108.5 |
| NR_FDD_FR1_G                             | -108       |                                      |                    |           |      |        |       |   |        |
| NR_FDD_FR1_H                             | -107.5     |                                      |                    |           |      |        |       |   |        |
| $\hat{E}_s/I_{ca}$                       |            |                                      | dB                 | -1.76     | -4.7 | -5..46 | -5.46 |   |        |



| $\hat{E}_s/N_{oc}$                |                                      |                                      | dB           | 3             | 3      | -2.9   | -2.9   | -4     | -4     |
|-----------------------------------|--------------------------------------|--------------------------------------|--------------|---------------|--------|--------|--------|--------|--------|
| SS-RSRP/CSI-RSRP <sup>Note3</sup> | Config 1,2                           | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS      | -82           | -82    | -103.9 | -103.9 | -118   | -118   |
|                                   |                                      | NR_FDD_FR1_B                         |              |               |        |        |        | -117.5 | -117.5 |
|                                   |                                      | NR_TDD_FR1_C                         |              |               |        |        |        | -117   | -117   |
|                                   |                                      | NR_FDD_FR1_D, NR_TDD_FR1_D           |              |               |        |        |        | -116.5 | -116.5 |
|                                   |                                      | NR_FDD_FR1_E, NR_TDD_FR1_E           |              |               |        |        |        | -116   | -116   |
|                                   |                                      | NR_FDD_FR1_F                         |              |               |        |        |        | -115.5 | -115.5 |
|                                   |                                      | NR_FDD_FR1_G                         |              |               |        |        |        | -115   | -115   |
|                                   | NR_FDD_FR1_H                         | -114.5                               |              | -114.5        |        |        |        |        |        |
|                                   | Config 3                             | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 |              | -85           | -85    | -      | -      | -115   | -115   |
|                                   |                                      | NR_FDD_FR1_B                         |              |               |        |        |        | -114.5 | -114.5 |
|                                   |                                      | NR_TDD_FR1_C                         |              |               |        |        |        | -114   | -114   |
|                                   |                                      | NR_FDD_FR1_D, NR_TDD_FR1_D           |              |               |        |        |        | -113.5 | -113.5 |
|                                   |                                      | NR_FDD_FR1_E, NR_TDD_FR1_E           |              |               |        |        |        | -113   | -113   |
|                                   |                                      | NR_FDD_FR1_F                         |              |               |        |        |        | -112.5 | -112.5 |
| NR_FDD_FR1_G                      |                                      | -112                                 | -112         |               |        |        |        |        |        |
| NR_FDD_FR1_H                      | -111.5                               | -111.5                               |              |               |        |        |        |        |        |
| SS-RSRQ/CSI-RSRQ <sup>Note3</sup> | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dB                                   | -14.77       | -14.77        | -16.76 | -16.76 | -17.34 | -17.34 |        |
|                                   | NR_FDD_FR1_B                         |                                      |              |               |        |        |        |        |        |
|                                   | NR_TDD_FR1_C                         |                                      |              |               |        |        |        |        |        |
|                                   | NR_FDD_FR1_D, NR_TDD_FR1_D           |                                      |              |               |        |        |        |        |        |
|                                   | NR_FDD_FR1_E, NR_TDD_FR1_E           |                                      |              |               |        |        |        |        |        |
|                                   | NR_FDD_FR1_F                         |                                      |              |               |        |        |        |        |        |
|                                   | NR_FDD_FR1_G                         |                                      |              |               |        |        |        |        |        |
| NR_FDD_FR1_H                      |                                      |                                      |              |               |        |        |        |        |        |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1,2                           | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 | dBm/9.36M Hz | -50           | -50    | -70    | -83.5  |        |        |
|                                   |                                      | NR_FDD_FR1_B                         |              |               |        |        | -83    |        |        |
|                                   |                                      | NR_TDD_FR1_C                         |              |               |        |        | -82.5  |        |        |
|                                   |                                      | NR_FDD_FR1_D, NR_TDD_FR1_D           |              |               |        |        | -82    |        |        |
|                                   |                                      | NR_FDD_FR1_E, NR_TDD_FR1_E           |              |               |        |        | -81.5  |        |        |
|                                   |                                      | NR_FDD_FR1_F                         |              |               |        |        | -81    |        |        |
|                                   |                                      | NR_FDD_FR1_G                         |              |               |        |        | -80.5  |        |        |
|                                   | NR_FDD_FR1_H                         | -80                                  |              |               |        |        |        |        |        |
|                                   | Config 3                             | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 |              | dBm/38.16 MHz | -50    | -50    | -      | -77.4  |        |
|                                   |                                      | NR_FDD_FR1_B                         |              |               |        |        |        | -76.9  |        |
|                                   |                                      | NR_TDD_FR1_C                         |              |               |        |        |        | -76.4  |        |
|                                   |                                      | NR_FDD_FR1_D, NR_TDD_FR1_D           |              |               |        |        |        | -75.9  |        |
|                                   |                                      | NR_FDD_FR1_E, NR_TDD_FR1_E           |              |               |        |        |        | -75.4  |        |
|                                   |                                      | NR_FDD_FR1_F                         |              |               |        |        |        | -74.9  |        |
| NR_FDD_FR1_G                      |                                      | -74.4                                |              |               |        |        |        |        |        |
| NR_FDD_FR1_H                      | -73.9                                |                                      |              |               |        |        |        |        |        |
| Propagation condition             |                                      |                                      | -            | AWGN          | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   |
| Antenna configuration             |                                      |                                      |              | 1x2           | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP, and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | NR operating band groups are as defined in clause 3.5.2.   |
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.   |

#### A.6.7.11.1.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.2.

#### A.6.7.11.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.6.7.11.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.9.2.1 and 10.1.9.2.2.

##### A.6.7.11.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.11.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test parameters in Table A.6.7.11.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A.6.7.11.2.2-1: CSI-RSRQ Inter frequency CSI-RSRQ supported test configurations**

| <b>Config</b> | <b>Description</b>   |
|---------------|--|
| 1             | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode                          |
| 2             | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode                          |
| 3             | NR 30 kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode                          |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.11.2.2-2: CSI-RSRQ Inter frequency test parameters**

| Parameter                           |              | Unit | Test 1                      |        | Test 2      |        | Test 3      |        |
|-------------------------------------|--------------|------|-----------------------------|--------|-------------|--------|-------------|--------|
|                                     |              |      | Cell 1                      | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |
| Duplex mode                         | Config 1     |      | FDD                         |        |             |        |             |        |
|                                     | Config 2,3   |      | TDD                         |        |             |        |             |        |
| TDD configuration                   | Config 1     |      | Not Applicable              |        |             |        |             |        |
|                                     | Config 2     |      | TDDConf.1.1                 |        |             |        |             |        |
|                                     | Config 3     |      | TDDConf.2.1                 |        |             |        |             |        |
| BW <sub>channel</sub>               | Config 1     | MHz  | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 2     |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 3     |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| Gap pattern ID                      | Config 1,2,3 |      | 0                           |        |             |        |             |        |
| BWP BW                              | Config 1     |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 2     |      | 10: N <sub>RB,c</sub> = 52  |        |             |        |             |        |
|                                     | Config 3     |      | 40: N <sub>RB,c</sub> = 106 |        |             |        |             |        |
| DRX Cycle                           |              | ms   | Not Applicable              |        |             |        |             |        |
| PDSCH Reference measurement channel | Config 1,4   |      | SR.1.1 FDD                  | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|                                     | Config 2,5   |      | SR.1.1 TDD                  |        | SR.1.1 TDD  |        | SR.1.1 TDD  |        |
|                                     | Config 3,6   |      | SR.2.1 TDD                  |        | SR.2.1 TDD  |        | SR.2.1 TDD  |        |
| RMSI CORESET Reference Channel      | Config 1     |      | CR.1.1 FDD                  | -      | R.1.1 FDD   | -      | CR.1.1 FDD  |        |
|                                     | Config 2     |      | CR.1.1 TDD                  |        | CR.1.1 TDD  |        | CR.1.1 TDD  |        |
|                                     | Config 3     |      | CR2.1 TDD                   |        | CR2.1 TDD   |        | CR2.1 TDD   |        |
| Dedicated CORESET Reference Channel | Config 1     |      | CCR.1.1 FDD                 | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|                                     | Config 2     |      | CCR.1.1 TDD                 |        | CCR.1.1 TDD |        | CCR.1.1 TDD |        |
|                                     | Config 3     |      | CCR2.1 TDD                  |        | CCR2.1 TDD  |        | CCR2.1 TDD  |        |
| TRS Configuration                   | Config 1     |      | TRS.1.1 FDD                 | -      | TRS.1.1 FDD | -      | TRS.1.1 FDD | -      |
|                                     | Config 2     |      | TRS.1.1 TDD                 |        | TRS.1.1 TDD |        | TRS.1.1 TDD |        |
|                                     | Config 3     |      | TRS.1.2 TDD                 |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns                       |              |      | OCNG pattern 1              |        |             |        |             |        |
| Time offset with Cell 1             | Config 1,2   | µs   | -                           | 4.7    | -           | 4.7    | -           | 4.7    |
|                                     | Config 3     | µs   | -                           | 2.35   | -           | 2.35   | -           | 2.35   |
| CSI-RS configuration for RRM        | Config 1     |      | CSI-RS.RRM.FR1.1 FDD        |        |             |        |             |        |
|                                     | Config 2     |      | CSI-RS.RRM.FR1.1 TDD        |        |             |        |             |        |
|                                     | Config 3     |      | CSI-RS.RRM.FR1.2 TDD        |        |             |        |             |        |
| SSB configuration                   | Config 1,2   |      | SSB.1 FR1                   |        |             |        |             |        |
|                                     | Config 3     |      | SSB.2 FR1                   |        |             |        |             |        |
| SMTc configuration                  | Config 1,2   |      | SMTc.2                      |        |             |        |             |        |
|                                     | Config 3     |      | SMTc.1                      |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing      | Config 1,2   | kHz  | 15 kHz                      |        |             |        |             |        |
|                                     | Config 3     |      | 30 kHz                      |        |             |        |             |        |
| EPRE ratio of PSS to SSS            |              | dB   | 0                           | 0      | 0           | 0      | 0           | 0      |

|  |            |  |           |        |        |   |   |        |        |        |        |
|--|------------|--|-----------|--------|--------|---|---|--------|--------|--------|--------|
| EPRE ratio of PBCH DMRS to SSS           |            |  |           |        |        |   |   |        |        |        |        |
| EPRE ratio of PBCH to PBCH DMRS          |            |  |           |        |        |   |   |        |        |        |        |
| EPRE ratio of PDCCH DMRS to SSS          |            |  |           |        |        |   |   |        |        |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |  |           |        |        |   |   |        |        |        |        |
| EPRE ratio of PDSCH DMRS to SSS          |            |  |           |        |        |   |   |        |        |        |        |
| EPRE ratio of PDSCH to PDSCH             |            |  |           |        |        |   |   |        |        |        |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |  |           |        |        |   |   |        |        |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |  |           |        |        |   |   |        |        |        |        |
| $N_{oc}$<br>Note2                        | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz | -80.18 | -106   |   |   | -116   |        |        |        |
|  |            | NR_FDD_FR1_B<br>NR_TDD_FR1_C           |           |        |        |   |   | -115.5 |        |        |        |
|  |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   | -115   |        |        |        |
|  |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   | -114.5 |        |        |        |
|  |            | NR_FDD_FR1_F                           |           |        |        |   |   | -114   |        |        |        |
|  |            | NR_FDD_FR1_G                           |           |        |        |   |   | -113.5 |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -113   |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -112.5 |        |        |        |
| $N_{oc}$<br>Note2                        | Config 3   | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz | -86.27 | -113   |   |   | -116   |        |        |        |
|  |            | NR_FDD_FR1_B<br>NR_TDD_FR1_C           |           |        |        |   |   | -115.5 |        |        |        |
|  |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   | -115   |        |        |        |
|  |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   | -114.5 |        |        |        |
|  |            | NR_FDD_FR1_F                           |           |        |        |   |   | -114   |        |        |        |
|  |            | NR_FDD_FR1_G                           |           |        |        |   |   | -113.5 |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -113   |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -112.5 |        |        |        |
| $N_{oc}$<br>Note2                        | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz | -80.18 | -106   |   |   | -116   |        |        |        |
|  |            | NR_FDD_FR1_B<br>NR_TDD_FR1_C           |           |        |        |   |   | -115.5 |        |        |        |
|  |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   | -115   |        |        |        |
|  |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   | -114.5 |        |        |        |
|  |            | NR_FDD_FR1_F                           |           |        |        |   |   | -114   |        |        |        |
|  |            | NR_FDD_FR1_G                           |           |        |        |   |   | -113.5 |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -113   |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -112.5 |        |        |        |
|  | Config 3   | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz | -83.27 | -110   |   |   | -113   |        |        |        |
|  |            | NR_FDD_FR1_B<br>NR_TDD_FR1_C           |           |        |        |   |   | -112.5 |        |        |        |
|  |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |           |        |        |   |   | -112   |        |        |        |
|  |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |           |        |        |   |   | -111.5 |        |        |        |
|  |            | NR_FDD_FR1_F                           |           |        |        |   |   | -111   |        |        |        |
|  |            | NR_FDD_FR1_G                           |           |        |        |   |   | -110.5 |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -110   |        |        |        |
|  |            | NR_FDD_FR1_H                           |           |        |        |   |   | -109.5 |        |        |        |
| $\hat{E}_s / I_{ot}$                     |            |  | dB        | -1.75  | -1.75  |   |   | 3      | -1.75  |        |        |
| $\hat{E}_s / N_{oc}$                     |            |  | dB        | -1.75  | -1.75  |   |   | 3      | -1.75  |        |        |
| SS-RSRP/C<br>SI-RSRP <sup>Not e3</sup>   | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS   | -81.93 | -81.93 | - | - | 107.75 | 107.75 | -113   | -      |
|  |            | NR_FDD_FR1_B                           |           |        |        |   |   |        |        | -112.5 | 117.75 |
|  |            |  |           |        |        |   |   |        |        |        | 117.25 |

|                                   |  |  |         |        |        |        |        |            |                 |        |        |        |                 |
|-----------------------------------|--|--|---------|--------|--------|--------|--------|------------|-----------------|--------|--------|--------|-----------------|
|                                   |  | NR_TDD_FR1_C                           |         |        |        |        |        | -112       | -<br>116.7<br>5 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |         |        |        |        |        | -111.5     | -<br>116.2<br>5 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |         |        |        |        |        | -111       | -<br>115.7<br>5 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_F                           |         |        |        |        |        | -110.5     | -<br>115.2      |        |        |        |                 |
|                                   |  | NR_FDD_FR1_G                           |         |        |        |        |        | -110       | -<br>114.7<br>5 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_H                           |         |        |        |        |        | -109.5     | -<br>114.2<br>5 |        |        |        |                 |
|                                   | Config 3                               | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |         |        |        |        |        | -85.02     | -85.02          | -      | -      | -110   | -<br>114.7<br>5 |
|                                   |  | NR_FDD_FR1_B                           |         |        |        |        |        | -109.5     | -               | -      | -      | -109.5 | -<br>114.2<br>5 |
|                                   |  | NR_TDD_FR1_C                           |         |        |        |        |        | -109       | -               | -      | -      | -109   | -<br>113.7<br>5 |
|                                   |  | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |         |        |        |        |        | -108.5     | -               | 111.75 | 111.75 | -108.5 | -<br>113.2<br>5 |
|                                   |  | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |         |        |        |        |        | -108       | -               | -      | -      | -108   | -<br>112.7<br>5 |
|                                   |  | NR_FDD_FR1_F                           |         |        |        |        |        | -107.5     | -               | -      | -      | -107.5 | -<br>112.2      |
|                                   |  | NR_FDD_FR1_G                           |         |        |        |        |        | -107       | -               | -      | -      | -107   | -<br>111.7<br>5 |
|                                   |  | NR_FDD_FR1_H                           |         |        |        |        |        | -106.5     | -               | -      | -      | -106.5 | -<br>111.2<br>5 |
| SS-RSRQ/CSI-RSRQ <sup>Note3</sup> | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dB                                     | -14.77  | -14.77 | -40.59 | -40.59 | 12.56T | 14.76<br>T |                 |        |        |        |                 |
|                                   | NR_FDD_FR1_B<br>NR_TDD_FR1_C           |  |         |        |        |        |        |            |                 |        |        |        |                 |
|                                   | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |  |         |        |        |        |        |            |                 |        |        |        |                 |
|                                   | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |  |         |        |        |        |        |            |                 |        |        |        |                 |
|                                   | NR_FDD_FR1_F<br>NR_FDD_FR1_G           |  |         |        |        |        |        |            |                 |        |        |        |                 |
|                                   | NR_FDD_FR1_H                           |  |         |        |        |        |        |            |                 |        |        |        |                 |
|                                   |  |  |         |        |        |        |        |            |                 |        |        |        |                 |
| Io <sup>Note3</sup>               | Config 1,2                             | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -50    |        | -75.83 | -83.28 | -<br>85.83 |                 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_B                           |         |        |        |        | -82.78 | -<br>85.33 |                 |        |        |        |                 |
|                                   |  | NR_TDD_FR1_C                           |         |        |        |        | -82.28 | -<br>84.83 |                 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |         |        |        |        | -81.78 | -<br>84.33 |                 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |         |        |        |        | -81.28 | -<br>83.83 |                 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_F                           |         |        |        |        | -80.78 | -<br>83.33 |                 |        |        |        |                 |
|                                   |  | NR_FDD_FR1_G                           |         |        |        |        | -80.28 | -<br>82.83 |                 |        |        |        |                 |

|   |  |     |        |        |          |       |      |      |
|---|--|-----|--------|--------|----------|-------|------|------|
| Config 3  | NR_FDD_FR1_H                           | -50 | -76.73 | -79.78 | -        | 82.33 |      |      |
|   | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |     |        | -77.19 | -        | 79.73 |      |      |
|   | NR_FDD_FR1_B                           |     |        | -76.69 | -        | 79.23 |      |      |
|   | NR_TDD_FR1_C                           |     |        | -76.19 | -        | 78.73 |      |      |
|   | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |     |        | -75.69 | -        | 78.23 |      |      |
|   | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |     |        | -75.19 | -        | 77.73 |      |      |
|   | NR_FDD_FR1_F                           |     |        | -74.69 | -        | 77.23 |      |      |
|   | NR_FDD_FR1_G                           |     |        | -74.19 | -        | 76.73 |      |      |
|   | NR_FDD_FR1_H                           |     |        | -73.69 | -        | 76.53 |      |      |
|   | Propagation condition                  |     |        | -      | AWG<br>N | AWGN  | AWGN | AWGN |
| Antenna configuration   |  |     | 1x2    | 1x2    | 1x2      | 1x2   | 1x2  | 1x2  |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |  |     |        |        |          |       |      |      |

### A.6.7.11.2.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.2.1 and 10.1.9.2.2.

## A.6.7.12 CSI-SINR

### A.6.7.12.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.12.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.2.1.

#### A.6.7.12.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.12.1.2-1. The absolute accuracy of CSI-SINR intra-frequency measurement is tested by using the parameters in Table A.6.7.12.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

**Table A.6.7.12.1.2-1: CSI-SINR Intra frequency CSI-SINR supported test configurations**

| Config   | Description   |
|--|---|
| 1  | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.6.7.12.1.2-2: CSI-SINR Intra frequency test parameters**



| Parameter                            |            | Unit | Test 1               |        | Test 2      |        |
|--------------------------------------|------------|------|----------------------|--------|-------------|--------|
|                                      |            |      | Cell 1               | Cell 2 | Cell 1      | Cell 2 |
| SSB ARFCN                            |            |      | freq1                |        | freq1       |        |
| Duplex mode                          | Config 1   |      | FDD                  |        |             |        |
|                                      | Config 2,3 |      | TDD                  |        |             |        |
| TDD configuration                    | Config 1   |      | Not Applicable       |        |             |        |
|                                      | Config 2   |      | TDDConf.1.1          |        |             |        |
|                                      | Config 3   |      | TDDConf.2.1          |        |             |        |
| Downlink initial BWP configuration   |            |      | DLBWP.0.1            |        |             |        |
| Downlink dedicated BWP configuration |            |      | DLBWP.1.1            |        |             |        |
| Uplink initial BWP configuration     |            |      | ULBWP.0.1            |        |             |        |
| Uplink dedicated BWP configuration   |            |      | ULBWP.1.1            |        |             |        |
| DRX Cycle configuration              |            | ms   | Not Applicable       |        |             |        |
| TRS configuration                    | Config 1   |      | TRS.1.1 FDD          |        |             |        |
|                                      | Config 2   |      | TRS.1.1 TDD          |        |             |        |
|                                      | Config 3   |      | TRS.1.2 TDD          |        |             |        |
| PDSCH Reference measurement channel  | Config 1   |      | SR.1.1 FDD           | -      | SR.1.1 FDD  | -      |
|                                      | Config 2   |      | SR.1.1 TDD           |        | SR.1.1 TDD  |        |
|                                      | Config 3   |      | SR.2.1 TDD           |        | SR.2.1 TDD  |        |
| RMSI CORESET Reference Channel       | Config 1   |      | CR.1.1 FDD           | -      | CR.1.1 FDD  | -      |
|                                      | Config 2   |      | CR.1.1 TDD           |        | CR.1.1 TDD  |        |
|                                      | Config 3   |      | CR.2.1 TDD           |        | CR.2.1 TDD  |        |
| Dedicated CORESET Reference Channel  | Config 1   |      | CCR.1.1 FDD          | -      | CCR.1.1 FDD | -      |
|                                      | Config 2   |      | CCR.1.1 TDD          |        | CCR.1.1 TDD |        |
|                                      | Config 3   |      | CCR.2.1 TDD          |        | CCR.2.1 TDD |        |
| OCNG Patterns                        |            |      | OP.1                 |        |             |        |
| CSI-RSSI-Measurement                 |            |      | Not Applicable       |        |             |        |
| Time offset with Cell 1              | Config 1,2 | µs   | -                    | 2.35   | -           | 2.35   |
|                                      | Config 3   | µs   | -                    | 1.17   | -           | 1.17   |
| SSB configuration                    | Config 1,2 |      | SSB.1 FR1            |        |             |        |
|                                      | Config 3   |      | SSB.2 FR1            |        |             |        |
| SMTC configuration                   | Config 1   |      | SMTC.2               |        |             |        |
|                                      | Config 2,3 |      | SMTC.1               |        |             |        |
| CSI-RS for mobility                  | Config 1   |      | CSI-RS.RRM.FR1.1 FDD |        |             |        |
|                                      | Config 2   |      | CSI-RS.RRM.FR1.1 TDD |        |             |        |
|                                      | Config 3   |      | CSI-RS.RRM.FR1.2 TDD |        |             |        |
| PDSCH/PDCCH subcarrier spacing       | Config 1,2 | kHz  | 15                   |        |             |        |
|                                      | Config 3   |      | 30                   |        |             |        |
| EPRE ratio of PSS to SSS             |            | dB   | 0                    | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS       |            |      |                      |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS      |            |      |                      |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS      |            |      |                      |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS    |            |      |                      |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS      |            |      |                      |        |             |        |
| EPRE ratio of PDSCH to PDSCH         |            |      |                      |        |             |        |

|  |   |                |   |   |        |        |                               |
|--|---|----------------|---|---|--------|--------|-------------------------------|
| EPRE ratio of OCNB DMRS to SSS(Note 1)   |   |                |   |   |        |        |                               |
| EPRE ratio of OCNB to OCNB DMRS (Note 1) |   |                |   |   |        |        |                               |
| $N_{oc}$ Note2                           | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz<br>z | -93                                     | -116                                    |        |        |                               |
|  |   |                |   | -115.5                                  |        |        |                               |
|  |   |                |   | -115                                    |        |        |                               |
|  |   |                |   | -114.5                                  |        |        |                               |
|  |   |                |   | -114                                    |        |        |                               |
|  |   |                |   | -113.5                                  |        |        |                               |
|  |   |                |   | -113                                    |        |        |                               |
|  |   |                |   | -112.5                                  |        |        |                               |
| $N_{oc}$ Note2                           | Config 1,2                              | dBm/SCS        | -90                                     | Same as $N_{oc}$ for 15 kHz             |        |        |                               |
|  | Config 3                                |                |   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | -113   |        |                               |
|  |   |                |   | NR_FDD_FR1_B<br>NR_TDD_FR1_C            | -112.5 |        |                               |
|  |   |                |   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           | -112   |        |                               |
|  |   |                |   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           | -111.5 |        |                               |
|  |   |                |   | NR_FDD_FR1_F                            | -111   |        |                               |
|  |   |                |   | NR_FDD_FR1_G                            | -110.5 |        |                               |
|  |   |                |   | NR_FDD_FR1_H                            | -110   |        |                               |
|  |   |                |   | -109.5                                  |        |        |                               |
| $\hat{E}_s / I_{ot}$                     |   | dB             | 0                                       | -3.19                                   | -5.46  | -5.46  |                               |
| $\hat{E}_s / N_{oc}$                     |   | dB             | 4.54                                    | 2.66                                    | -4     | -4     |                               |
| CSI-RSRP <sup>Not e3</sup>               | Config 1,2                              | dBm/SCS        | -88.46                                  | -90.34                                  | -120   | -120   |                               |
|  |   |                |   |   | -119.5 | -119.5 |                               |
|  |   |                |   |   | -119   | -119   |                               |
|  |   |                |   |   | -118.5 | -118.5 |                               |
|  |   |                |   |   | -118   | -118   |                               |
|  |   |                |   |   | -117.5 | -117.5 |                               |
|  |   |                |   |   | -117   | -117   |                               |
|  |   |                |   |   | -116.5 | -116.5 |                               |
|  | Config 3                                |                | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | -117                                    | -117   |        |                               |
|  |   |                | NR_FDD_FR1_B                            | -116.5                                  | -116.5 |        |                               |
|  |   |                | NR_TDD_FR1_C                            | -116                                    | -116   |        |                               |
|  |   |                | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           | -115.5                                  | -115.5 |        |                               |
|  |   |                | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           | -115                                    | -115   |        |                               |
|  |   |                | NR_FDD_FR1_F                            | -114.5                                  | -114.5 |        |                               |
|  |   |                | NR_FDD_FR1_G                            | -114                                    | -114   |        |                               |
|  |   |                | NR_FDD_FR1_H                            | -113.5                                  | -113.5 |        |                               |
| CSI-SINR Note3                           | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dB             | 0                                       | -3.19                                   | -5.46  | -5.46  |                               |
|  |   |                |   |   |        |        | NR_FDD_FR1_B                  |
|  |   |                |   |   |        |        | NR_TDD_FR1_C                  |
|  |   |                |   |   |        |        | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |
|  |   |                |   |   |        |        | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |
|  |   |                |   |   |        |        | NR_FDD_FR1_F                  |
|  |   |                |   |   |        |        | NR_FDD_FR1_G                  |
|  |   |                |   |   |        |        | NR_FDD_FR1_H                  |

|   |            |   |                  |        |        |
|---|------------|---|------------------|--------|--------|
| Io <sup>Note3</sup>   | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz  | -57.5  | -85.51 |
|   |            | NR_FDD_FR1_B                            |                  |        | -85.01 |
|   |            | NR_TDD_FR1_C                            |                  |        | -84.51 |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        | -84.01 |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        | -83.51 |
|   |            | NR_FDD_FR1_F                            |                  |        | -83.01 |
|   |            | NR_FDD_FR1_G                            |                  |        | -82.51 |
|   |            | NR_FDD_FR1_H                            |                  |        | -82.01 |
|   | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MHz | -51.41 | -79.41 |
|   |            | NR_FDD_FR1_B                            |                  |        | -78.91 |
|   |            | NR_TDD_FR1_C                            |                  |        | -78.41 |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        | -77.91 |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        | -77.41 |
|   |            | NR_FDD_FR1_F                            |                  |        | -76.91 |
|   |            | NR_FDD_FR1_G                            |                  |        | -76.41 |
| NR_FDD_FR1_H  | -75.91     |   |                  |        |        |
| Propagation condition   |            |   | -                | AWGN   |        |
| Antenna configuration   |            |   | -                | 1x2    |        |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |            |   |                  |        |        |

### A.6.7.12.1.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.2.1.

### A.6.7.12.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.12.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.14.2.1 and 10.1.14.2.2.

#### A.6.7.12.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.12.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test parameters in Table A.6.7.12.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A.6.7.12.2.2-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

| <b>Config</b> | <b>Description</b>   |
|---------------|--|
| 1             | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode                  |
| 2             | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode                  |
| 3             | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode                  |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

**Table A.6.7.12.2.2-2: CSI-SINR Inter frequency test parameters**

| Parameter                            |            | Unit | Test 1               |        | Test 2      |        | Test 3      |        |
|--------------------------------------|------------|------|----------------------|--------|-------------|--------|-------------|--------|
|                                      |            |      | Cell 1               | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |
| SSB ARFCN                            |            |      | freq1                | freq2  | freq1       | freq2  | freq1       | freq2  |
| Duplex mode                          | Config 1   |      | FDD                  |        |             |        |             |        |
|                                      | Config 2,3 |      | TDD                  |        |             |        |             |        |
| TDD configuration                    | Config 1   |      | Not Applicable       |        |             |        |             |        |
|                                      | Config 2   |      | TDDConf.1.1          |        |             |        |             |        |
|                                      | Config 3   |      | TDDConf.2.1          |        |             |        |             |        |
| Downlink initial BWP configuration   |            |      | DLBWP.0.1            |        |             |        |             |        |
| Downlink dedicated BWP configuration |            |      | DLBWP.1.1            |        |             |        |             |        |
| Uplink initial BWP configuration     |            |      | ULBWP.0.1            |        |             |        |             |        |
| Uplink dedicated BWP configuration   |            |      | ULBWP.1.1            |        |             |        |             |        |
| DRX Cycle configuration              |            | ms   | Not Applicable       |        |             |        |             |        |
| TRS configuration                    | Config 1   |      | TRS.1.1 FDD          |        |             |        |             |        |
|                                      | Config 2   |      | TRS.1.1 TDD          |        |             |        |             |        |
|                                      | Config 3   |      | TRS.1.2 TDD          |        |             |        |             |        |
| PDSCH Reference measurement channel  | Config 1   |      | SR.1.1 FDD           | -      | SR.1.1 FDD  | -      | SR.1.1 FDD  | -      |
|                                      | Config 2   |      | SR.1.1 TDD           | -      | SR.1.1 TDD  | -      | SR.1.1 TDD  | -      |
|                                      | Config 3   |      | SR.2.1 TDD           | -      | SR.2.1 TDD  | -      | SR.2.1 TDD  | -      |
| RMSI CORESET Reference Channel       | Config 1   |      | CR.1.1 FDD           | -      | R.1.1 FDD   | -      | CR.1.1 FDD  | -      |
|                                      | Config 2   |      | CR.1.1 TDD           | -      | CR.1.1 TDD  | -      | CR.1.1 TDD  | -      |
|                                      | Config 3   |      | CR.2.1 TDD           | -      | CR.2.1 TDD  | -      | CR.2.1 TDD  | -      |
| Dedicated CORESET Reference Channel  | Config 1   |      | CCR.1.1 FDD          | -      | CCR.1.1 FDD | -      | CCR.1.1 FDD | -      |
|                                      | Config 2   |      | CCR.1.1 TDD          | -      | CCR.1.1 TDD | -      | CCR.1.1 TDD | -      |
|                                      | Config 3   |      | CCR.2.1 TDD          | -      | CCR.2.1 TDD | -      | CCR.2.1 TDD | -      |
| OCNG Patterns                        |            |      | OP.1                 |        |             |        |             |        |
| CSI-RSSI-Measurement                 |            |      | Not Applicable       |        |             |        |             |        |
| Time offset with Cell 1              | Config 1,2 | μs   | -                    | 2.35   | -           | 2.35   | -           | 2.35   |
|                                      | Config 3   | μs   | -                    | 1.17   | -           | 1.17   | -           | 1.17   |
| SMTC configuration                   | Config 1   |      | SMTC.2               |        |             |        |             |        |
|                                      | Config 2,3 |      | SMTC.1               |        |             |        |             |        |
| SSB configuration                    | Config 1,2 |      | SSB.1 FR1            |        |             |        |             |        |
|                                      | Config 3   |      | SSB.2 FR1            |        |             |        |             |        |
| CSI-RS for mobility                  | Config 1   |      | CSI-RS.RRM.FR1.1 FDD |        |             |        |             |        |
|                                      | Config 2   |      | CSI-RS.RRM.FR1.1 TDD |        |             |        |             |        |
|                                      | Config 3   |      | CSI-RS.RRM.FR1.2 TDD |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing       | Config 1,2 | kHz  | 15                   |        |             |        |             |        |
|                                      | Config 3   |      | 30                   |        |             |        |             |        |
| EPRE ratio of PSS to SSS             |            | dB   | 0                    | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS       |            |      |                      |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS      |            |      |                      |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS      |            |      |                      |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS    |            |      |                      |        |             |        |             |        |

| EPRE ratio of PDSCH DMRS to SSS          |                 |                         |               |        |        |                            |        |      |      |
|--|-----------------|-------------------------|---------------|--------|--------|----------------------------|--------|------|------|
| EPRE ratio of PDSCH to PDSCH             |                 |                         |               |        |        |                            |        |      |      |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                 |                         |               |        |        |                            |        |      |      |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                 |                         |               |        |        |                            |        |      |      |
| $N_{oc}$ Note2                           | Config 1,2      | NR_FDD_F<br>R1_A        | dBm/1<br>5kHz | -88    | -108.5 | -119.5                     |        |      |      |
|  |                 | NR_TDD_F<br>R1_A NOTE 6 |               |        |        | -119                       |        |      |      |
|  |                 | NR_FDD_F<br>R1_B        |               |        |        | -118.5                     |        |      |      |
|  |                 | NR_TDD_F<br>R1_C        |               |        |        | -118                       |        |      |      |
|  |                 | NR_FDD_F<br>R1_D        |               |        |        | -117.5                     |        |      |      |
|  |                 | NR_TDD_F<br>R1_D        |               |        |        | -117                       |        |      |      |
|  |                 | NR_FDD_F<br>R1_E        |               |        |        | -116.5                     |        |      |      |
|  |                 | NR_TDD_F<br>R1_E        |               |        |        | -116                       |        |      |      |
|  |                 | NR_FDD_F<br>R1_F        |               |        |        |                            |        |      |      |
|  |                 | NR_FDD_F<br>R1_G        |               |        |        |                            |        |      |      |
| $N_{oc}$ Note2                           | Config 1,2<br>N |                         | dBm/1<br>5kHz | -88    | -108.5 | Same as Noc<br>for 15kHz T |        |      |      |
|  |                 |                         |               |        |        |                            |        |      |      |
|  | Config 3        | NR_FDD_F<br>R1_A        |               |        | -85    | -105.5                     | -116.5 |      |      |
|  |                 | NR_TDD_F<br>R1_A NOTE 6 |               |        |        |                            | -116   |      |      |
|  |                 | NR_FDD_F<br>R1_B        |               |        |        |                            | -115.5 |      |      |
|  |                 | NR_TDD_F<br>R1_C        |               |        |        |                            | -115   |      |      |
|  |                 | NR_FDD_F<br>R1_D        |               |        |        |                            | -114.5 |      |      |
|  |                 | NR_TDD_F<br>R1_D        |               |        |        |                            | -114   |      |      |
|  |                 | NR_FDD_F<br>R1_E        |               |        |        |                            | -114.5 |      |      |
|  |                 | NR_TDD_F<br>R1_E        |               |        |        |                            | -113   |      |      |
| NR_FDD_F<br>R1_F                         |                 |                         |               |        |        |                            |        |      |      |
| NR_FDD_F<br>R1_G                         |                 |                         |               |        |        |                            |        |      |      |
| NR_FDD_F<br>R1_H                         |                 |                         |               |        |        |                            |        |      |      |
| $\hat{E}_s/I_{ot}$                       |                 |                         | dB            | -1.75  | -1.75  | 15                         | 15     | -4.0 | -4.0 |
| $\hat{E}_s/N_{oc}$                       |                 |                         | dB            | -1.75  |        | 15                         |        | -4.0 |      |
| CSI-RSRP>Note3                           | Config 1,2      | NR_FDD_F<br>R1_A        | dBm/S<br>CS   | -89.75 | -93.5  |                            | -123.5 |      |      |
|  |                 | NR_TDD_F<br>R1_A NOTE 6 |               |        |        |                            |        |      |      |

|                                      |                                      |                                      |  |                     |        |  |        |       |    |      |        |
|--------------------------------------|--------------------------------------|--------------------------------------|--|---------------------|--------|--|--------|-------|----|------|--------|
|                                      |                                      | NR_FDD_F<br>R1_B                     |  |                     |        | -123   |        |       |    |      |        |
|                                      |                                      | NR_TDD_F<br>R1_C                     |  |                     |        | -122.5   |        |       |    |      |        |
|                                      |                                      | NR_FDD_F<br>R1_D<br>NR_TDD_F<br>R1_D |  |                     |        | -122   |        |       |    |      |        |
|                                      |                                      | NR_FDD_F<br>R1_E<br>NR_TDD_F<br>R1_E |  |                     |        | -121.5   |        |       |    |      |        |
|                                      |                                      | NR_FDD_F<br>R1_F                     |  |                     |        | -121   |        |       |    |      |        |
|                                      |                                      | NR_FDD_F<br>R1_G                     |  |                     |        | -120.5   |        |       |    |      |        |
|                                      |                                      | NR_FDD_F<br>R1_H                     |  |                     |        | -120   |        |       |    |      |        |
|                                      |                                      | Config 3                             |  |                     |        | NR_FDD_F<br>R1_A<br>NR_TDD_F<br>R1_A <small>NOTE 6</small> | -120.5 |       |    |      |        |
|                                      | NR_FDD_F<br>R1_B                     |                                      |  |                     |        | -120   |        |       |    |      |        |
|                                      | NR_TDD_F<br>R1_C                     |                                      |  |                     |        | -119.5   |        |       |    |      |        |
|                                      | NR_FDD_F<br>R1_D<br>NR_TDD_F<br>R1_D |                                      |  |                     |        | -119   |        |       |    |      |        |
|                                      | NR_FDD_F<br>R1_E<br>NR_TDD_F<br>R1_E |                                      |  |                     |        | -118.5   |        |       |    |      |        |
|                                      | NR_FDD_F<br>R1_F                     |                                      |  |                     |        | -118   |        |       |    |      |        |
|                                      | NR_FDD_F<br>R1_G                     |                                      |  |                     |        | -117.5   |        |       |    |      |        |
|                                      | NR_FDD_F<br>R1_H                     |                                      |  |                     |        | -117   |        |       |    |      |        |
|                                      | CSI-SINR <sup>Note3</sup>            |                                      |  |                     |        | NR_FDD_F<br>R1_A<br>NR_TDD_F<br>R1_A <small>NOTE 6</small> | dB     | -1.75 | 15 | -4.0 |        |
|                                      |                                      |                                      |  |                     |        | NR_FDD_F<br>R1_B   |        |       |    |      |        |
|                                      |                                      | NR_TDD_F<br>R1_C                     |  |                     |        |  |        |       |    |      |        |
| NR_FDD_F<br>R1_D<br>NR_TDD_F<br>R1_D |                                      |                                      |  |                     |        |  |        |       |    |      |        |
| NR_FDD_F<br>R1_E<br>NR_TDD_F<br>R1_E |                                      |                                      |  |                     |        |  |        |       |    |      |        |
| NR_FDD_F<br>R1_F                     |                                      |                                      |  |                     |        |  |        |       |    |      |        |
| NR_FDD_F<br>R1_G                     |                                      |                                      |  |                     |        |  |        |       |    |      |        |
| NR_FDD_F<br>R1_H                     |                                      |                                      |  |                     |        |  |        |       |    |      |        |
| Io <sup>Note3</sup>                  |                                      | Config 1,2                           | NR_FDD_F<br>R1_A<br>NR_TDD_F<br>R1_A <small>NOTE 6</small> | dBm/<br>9.36M<br>Hz | -57.83 | -65.4  |        |       |    |      | -90.09 |



|   |                                      |                                      |       |     |      |  |  |
|---|--------------------------------------|--------------------------------------|-------|-----|------|--|--|
|   |                                      | NR_FDD_F<br>R1_B                     |       |     |      |  | -89.59   |
|   |                                      | NR_TDD_F<br>R1_C                     |       |     |      |  | -89.09   |
|   |                                      | NR_FDD_F<br>R1_D<br>NR_TDD_F<br>R1_D |       |     |      |  | -88.59   |
|   |                                      | NR_FDD_F<br>R1_E<br>NR_TDD_F<br>R1_E |       |     |      |  | -88.09   |
|   |                                      | NR_FDD_F<br>R1_F                     |       |     |      |  | -87.59   |
|   |                                      | NR_FDD_F<br>R1_G                     |       |     |      |  | -87.09   |
|   |                                      | NR_FDD_F<br>R1_H                     |       |     |      |  | -86.59   |
|   |                                      | Config 3                             |       |     |      |  | NR_FDD_F<br>R1_A<br>NR_TDD_F<br>R1_A <small>NOTE 6</small> |
|   | NR_FDD_F<br>R1_B                     |                                      | -83.5 |     |      |  |  |
|   | NR_TDD_F<br>R1_C                     |                                      | -83   |     |      |  |  |
|   | NR_FDD_F<br>R1_D<br>NR_TDD_F<br>R1_D |                                      | -82.5 |     |      |  |  |
|   | NR_FDD_F<br>R1_E<br>NR_TDD_F<br>R1_E |                                      | -82   |     |      |  |  |
|   | NR_FDD_F<br>R1_F                     |                                      | -81.5 |     |      |  |  |
|   | NR_FDD_F<br>R1_G                     |                                      | -81   |     |      |  |  |
|   | NR_FDD_F<br>R1_H                     |                                      | -80.5 |     |      |  |  |
|   | Propagation condition                |                                      |       | -   | AWGN |  |  |
| Antenna configuration   |                                      |                                      | -     | 1x2 |      |  |  |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-SINR, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |                                      |                                      |       |     |      |  |  |

### A.6.7.12.2.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.2.1 and 10.1.14.2.2.

## A.6.7.13 RSTD measurements

### A.6.7.13.1 RSTD measurement accuracy test case for single positioning frequency layer

#### A.6.7.13.1.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.7.13.1.1-1.

**Table A.6.7.13.1.1-1: Supported test configurations**

| Configuration | Description                                       |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations.

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR1. GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

**Table A.6.7.13.1.1-2: RSTD accuracy test parameters**

| Parameter   | Config  | Unit | Test 1                      |        | Test 2                      |        |
|---|---------|------|-----------------------------|--------|-----------------------------|--------|
|   |         |      | Cell 1                      | Cell 2 | Cell 1                      | Cell 2 |
| PRS ARFCN   | 1~3     |      | freq1                       | Freq1  | freq1                       | Freq1  |
| BW <sub>channel</sub>                             | 1       | MHz  | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |
|   | 2       |      | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |
|   | 3       |      | 40: N <sub>RB,c</sub> = 106 |        | 40: N <sub>RB,c</sub> = 106 |        |
| Duplex mode                                       | 1       |      | FDD                         |        | FDD                         |        |
|   | 2       |      | TDD                         |        | TDD                         |        |
|   | 3       |      | TDD                         |        | TDD                         |        |
| TDD configuration                                 | 1       |      | N/A                         |        | N/A                         |        |
|   | 2       |      | TDDConf.1.1                 |        | TDDConf.1.1                 |        |
|   | 3       |      | TDDConf.2.1                 |        | TDDConf.2.1                 |        |
| PDSCH Reference measurement channel               | 1       |      | SR.1.1 FDD                  | -      | SR.1.1 FDD                  | -      |
|   | 2       |      | SR.1.1 TDD                  |        | SR.1.1 TDD                  |        |
|   | 3       |      | SR.2.1 FDD                  |        | SR.2.1 FDD                  |        |
| RMSI CORESET Reference Channel                    | 1       |      | CR.1.1 FDD                  | -      | CR.1.1 FDD                  | -      |
|   | 2       |      | CR.1.1 TDD                  | -      | CR.1.1 TDD                  | -      |
|   | 3       |      | CR.2.1 FDD                  | -      | CR.2.1 FDD                  | -      |
| Dedicated CORESET Reference Channel               | 1       |      | CCR.1.1 FDD                 | -      | CCR.1.1 FDD                 | -      |
|   | 2       |      | CCR.1.1 TDD                 | -      | CCR.1.1 TDD                 | -      |
|   | 3       |      | CCR.2.1 TDD                 | -      | CCR.2.1 TDD                 | -      |
| SSB configuration                                 | 1       |      | SSB.1 FR1                   |        | SSB.1 FR1                   |        |
|   | 2       |      | SSB.1 FR1                   |        | SSB.1 FR1                   |        |
|   | 3       |      | SSB.2 FR1                   |        | SSB.2 FR1                   |        |
| OCNG Patterns                                     | 1~3     |      | OP.1                        |        | OP.1                        |        |
| TRS configuration                                 | 1       |      | TRS.1.1 FDD                 | -      | TRS.1.1 FDD                 |        |
|   | 2       |      | TRS.1.1 TDD                 |        | TRS.1.1 TDD                 |        |
|   | 3       |      | TRS.1.2 TDD                 |        | TRS.1.2 TDD                 |        |
| Initial BWP Configuration                         | 1~3     |      | DLBWP.0.1<br>ULBWP.0.1      |        | DLBWP.0.1<br>ULBWP.0.1      |        |
| Dedicated BWP configuration                       | 1~3     |      | DLBWP.1.1<br>ULBWP.1.1      |        | DLBWP.1.1<br>ULBWP.1.1      |        |
| Time offset with Cell 1                           | 1       | μs   | -                           | 3      | -                           | 3      |
|   | 2,3     |      | -                           | 3      | -                           | 3      |
| SMTc configuration                                | 1       |      | SMTc.2                      |        | SMTc.2                      |        |
|   | 2,3     |      | SMTc.1                      |        | SMTc.1                      |        |
| PRS configuration                                 | 1       |      | PRS.1.1 FR1                 |        | PRS.1.2 FR1                 |        |
|   | 2       |      | PRS.1.1 FR1                 |        | PRS.1.2 FR1                 |        |
|   | 3       |      | PRS.2.1 FR1                 |        | PRS.2.2 FR1                 |        |
| PRS muting info                                   | 1~3     |      | '10'                        | '01'   | '10'                        | '01'   |
| Expected RSTD                                     | 1, 2, 3 | μs   | N/A                         | 3      | N/A                         | 3      |
| Expected RSTD uncertainty                         | 1, 2, 3 | μs   | N/A                         | 5      | N/A                         | 5      |
| EPRE ratio of PSS to SSS                          | 1~3     | dB   | 0                           | 0      | 0                           | 0      |
| EPRE ratio of PBCH DMRS to SSS                    |         |      |                             |        |                             |        |
| EPRE ratio of PBCH to PBCH DMRS                   |         |      |                             |        |                             |        |
| EPRE ratio of PDCCH DMRS to SSS                   |         |      |                             |        |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |         |      |                             |        |                             |        |
| EPRE ratio of PDSCH DMRS to SSS                   |         |      |                             |        |                             |        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |         |      |                             |        |                             |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |         |      |                             |        |                             |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |         |      |                             |        |                             |        |
| N <sub>oc</sub> <sup>Note 2</sup>                 |         |      |                             |        |                             |        |
|   | 3       | -95  |                             | -95    |                             |        |
| $\hat{E}_s/I_{ot}$                                | 1~3     |      | -6                          | -13    | -6                          | -13    |
| PRS-RSRP <sup>Note 3</sup>                        | 1,2     |      | -104                        | -111   | -104                        | -111   |

|                       |  |                      |        |            |        |        |
|-----------------------|--|----------------------|--------|------------|--------|--------|
|                       | 3  | dBm/SC<br>S          | -101   | -108       | -101   | -108   |
| $I_{o\text{Note3}}$   | 1,2  | dBm/<br>9.36MHz<br>z | -69.07 | -<br>69.83 | -69.07 | -69.83 |
|                       | 3  | dBm/<br>38.16M<br>Hz | -62.98 | -<br>63.74 | -62.98 | -63.74 |
| $\hat{E}_s/N_{oc}$    | 1~3  | dB                   | -6     | -13        | -6     | -13    |
| Propagation condition | 1~3  | -                    | AWGN   |            | AWGN   |        |
| Antenna configuration | 1~3  |                      | 1x2    |            | 1x2    |        |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                      |        |            |        |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                      |        |            |        |        |
| Note 3:               | RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                      |        |            |        |        |
| Note 4:               | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |                      |        |            |        |        |
| Note 5:               | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.   |                      |        |            |        |        |

#### A.6.7.13.1.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

### A.6.7.13.2 RSTD measurement accuracy test case for dual positioning frequency layer

#### A.6.7.13.2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.7.13.2.1-1.

**Table A.6.7.13.2.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell on NR RF channel #1 in FR1. Cell 2 is a neighbour cell on a different NR RF channel #2 in FR1. GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

**Table A.6.7.13.2.1-2: RSTD accuracy test parameters**

| Parameter   | Config  | Unit | Test 1                      |        | Test 2                      |        |
|---|---------|------|-----------------------------|--------|-----------------------------|--------|
|   |         |      | Cell 1                      | Cell 2 | Cell 1                      | Cell 2 |
| PRS ARFCN   | 1~3     |      | freq1                       | freq2  | freq1                       | freq2  |
| BW <sub>channel</sub>                             | 1       | MHz  | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |
|   | 2       |      | 10: N <sub>RB,c</sub> = 52  |        | 10: N <sub>RB,c</sub> = 52  |        |
|   | 3       |      | 40: N <sub>RB,c</sub> = 106 |        | 40: N <sub>RB,c</sub> = 106 |        |
| Duplex mode                                       | 1       |      | FDD                         |        | FDD                         |        |
|   | 2       |      | TDD                         |        | TDD                         |        |
|   | 3       |      | TDD                         |        | TDD                         |        |
| TDD configuration                                 | 1       |      | N/A                         |        | N/A                         |        |
|   | 2       |      | TDDConf.1.1                 |        | TDDConf.1.1                 |        |
|   | 3       |      | TDDConf.2.1                 |        | TDDConf.2.1                 |        |
| PDSCH Reference measurement channel               | 1       |      | SR.1.1<br>FDD               | -      | SR.1.1<br>FDD               | -      |
|   | 2       |      | SR.1.1<br>TDD               |        | SR.1.1<br>TDD               |        |
|   | 3       |      | SR.2.1<br>FDD               |        | SR.2.1<br>FDD               |        |
| RMSI CORESET Reference Channel                    | 1       |      | CR.1.1<br>FDD               | -      | CR.1.1<br>FDD               | -      |
|   | 2       |      | CR.1.1<br>TDD               | -      | CR.1.1<br>TDD               | -      |
|   | 3       |      | CR.2.1<br>FDD               | -      | CR.2.1<br>FDD               | -      |
| Dedicated CORESET Reference Channel               | 1       |      | CCR.1.1<br>FDD              | -      | CCR.1.1<br>FDD              | -      |
|   | 2       |      | CCR.1.1<br>TDD              | -      | CCR.1.1<br>TDD              | -      |
|   | 3       |      | CCR.2.1<br>TDD              | -      | CCR.2.1<br>TDD              | -      |
| SSB configuration                                 | 1       |      | SSB.1 FR1                   |        | SSB.1 FR1                   |        |
|   | 2       |      | SSB.1 FR1                   |        | SSB.1 FR1                   |        |
|   | 3       |      | SSB.2 FR1                   |        | SSB.2 FR1                   |        |
| OCNG Patterns                                     | 1~3     |      | OP.1                        |        | OP.1                        |        |
| TRS configuration                                 | 1       |      | TRS.1.1<br>FDD              | -      | TRS.1.1<br>FDD              |        |
|   | 2       |      | TRS.1.1<br>TDD              |        | TRS.1.1<br>TDD              |        |
|   | 3       |      | TRS.1.2<br>TDD              |        | TRS.1.2<br>TDD              |        |
| Initial BWP Configuration                         | 1~3     |      | DLBWP.0.1<br>ULBWP.0.1      |        | DLBWP.0.1<br>ULBWP.0.1      |        |
| Dedicated BWP configuration                       | 1~3     |      | DLBWP.1.1<br>ULBWP.1.1      |        | DLBWP.1.1<br>ULBWP.1.1      |        |
| Time offset with Cell 1                           | 1       | µs   | -                           | 3      | -                           | 3      |
|   | 2,3     |      | -                           | 3      | -                           | 3      |
| SMTC configuration                                | 1       |      | SMTC.2                      |        | SMTC.2                      |        |
|   | 2,3     |      | SMTC.1                      |        | SMTC.1                      |        |
| PRS configuration                                 | 1       |      | PRS.1.1 FR1                 |        | PRS.1.2 FR1                 |        |
|   | 2       |      | PRS.1.1 FR1                 |        | PRS.1.2 FR1                 |        |
|   | 3       |      | PRS.2.1 FR1                 |        | PRS.2.2 FR1                 |        |
| PRS Resource slot offset                          | 1, 2, 3 | slot | 0                           | 4      | 0                           | 4      |
| Expected RSTD                                     | 1, 2, 3 | µs   | N/A                         | 3      | N/A                         | 3      |
| Expected RSTD uncertainty                         | 1, 2, 3 | µs   | N/A                         | 5      | N/A                         | 5      |
| EPRE ratio of PSS to SSS                          | 1~3     | dB   | 0                           | 0      | 0                           | 0      |
| EPRE ratio of PBCH DMRS to SSS                    |         |      |                             |        |                             |        |
| EPRE ratio of PBCH to PBCH DMRS                   |         |      |                             |        |                             |        |
| EPRE ratio of PDCCH DMRS to SSS                   |         |      |                             |        |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |         |      |                             |        |                             |        |
| EPRE ratio of PDSCH DMRS to SSS                   |         |      |                             |        |                             |        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |         |      |                             |        |                             |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |         |      |                             |        |                             |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |         |      |                             |        |                             |        |
| N <sub>oc</sub> <sup>Note 2</sup>                 |         |      |                             |        |                             |        |
|   | 3       | -95  |                             | -95    |                             |        |

|  |     |                      |        |        |        |        |
|--|-----|----------------------|--------|--------|--------|--------|
| $\hat{E}_s/I_{ot}$   | 1~3 | dB                   | -6     | -13    | -6     | -13    |
| PRS-RSRP <sup>Note3</sup>  | 1,2 | dBm/SC               | -104   | -111   | -104   | -111   |
|  | 3   | S                    | -101   | -108   | -101   | -108   |
| $I_o$ <sup>Note3</sup>   | 1,2 | dBm/<br>9.36MHz<br>z | -69.07 | -69.83 | -69.07 | -69.83 |
|  | 3   | dBm/<br>38.16M<br>Hz | -62.98 | -63.74 | -62.98 | -63.74 |
| $\hat{E}_s/N_{oc}$   | 1~3 | dB                   | -6     | -13    | -6     | -13    |
| Propagation condition  | 1~3 | -                    | AWGN   |        | AWGN   |        |
| Antenna configuration  | 1~3 |                      | 1x2    |        | 1x2    |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |     |                      |        |        |        |        |

#### A.6.7.13.2.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

### A.6.7.14 PRS-RSRP measurements

#### A.6.7.14.1 SA: measurement accuracy with PRS in FR1

##### A.6.7.14.1.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.24.2.1 and 10.1.24.2.2.

##### A.6.7.14.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.14.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.6.7.14.1.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.7.14.1.2-1: PRS-RSRP supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |



**Table A.6.7.14.1.2-2: PRS-RSRP test parameters**

| Parameter                            |              | Unit | Test 1                          |             | Test 2         |             |
|--------------------------------------|--------------|------|---------------------------------|-------------|----------------|-------------|
|                                      |              |      | Cell 1                          | Cell 2      | Cell 1         | Cell 2      |
| Cell ID                              |              |      | 489                             | 0           | 489            | 0           |
| SSB ARFCN                            |              |      | freq1                           |             | freq1          |             |
| Duplex mode                          | Config 1     |      | FDD                             |             |                |             |
|                                      | Config 2,3   |      | TDD                             |             |                |             |
| TDD configuration                    | Config 1     |      | Not Applicable                  |             |                |             |
|                                      | Config 2     |      | TDDConf.1.1                     |             |                |             |
|                                      | Config 3     |      | TDDConf.2.1                     |             |                |             |
| BW <sub>channel</sub>                | Config 1     | MHz  | 10: N <sub>RB,c</sub> = 52      |             |                |             |
|                                      | Config 2     |      | 10: N <sub>RB,c</sub> = 52      |             |                |             |
|                                      | Config 3     |      | 40: N <sub>RB,c</sub> = 106     |             |                |             |
| BWP BW                               | Config 1     |      | 10: N <sub>RB,c</sub> = 52      |             |                |             |
|                                      | Config 2     |      | 10: N <sub>RB,c</sub> = 52      |             |                |             |
|                                      | Config 3     |      | 40: N <sub>RB,c</sub> = 106     |             |                |             |
| Downlink initial BWP configuration   |              |      | DLBWP.0.1                       |             |                |             |
| Downlink dedicated BWP configuration |              |      | DLBWP.1.1                       |             |                |             |
| Uplink initial BWP configuration     |              |      | ULBWP.0.1                       |             |                |             |
| Uplink dedicated BWP configuration   |              |      | ULBWP.1.1                       |             |                |             |
| TRS configuration                    | Config 1     |      | TRS.1.1<br>FDD                  | NA          | TRS.1.1<br>FDD | NA          |
|                                      | Config 2     |      | TRS.1.1<br>TDD                  | NA          | TRS.1.1<br>TDD | NA          |
|                                      | Config 3     |      | TRS.1.2<br>TDD                  | NA          | TRS.1.2<br>TDD | NA          |
| DRX Cycle                            |              | ms   | Not Applicable                  |             |                |             |
| Measurement gap                      |              |      | GP#24 or GP#0 <sup>Note 7</sup> |             |                |             |
| PDSCH Reference measurement channel  | Config 1     |      | SR.1.1 FDD                      | -           | SR.1.1 FDD     | -           |
|                                      | Config 2     |      | SR.1.1 TDD                      |             | SR.1.1 TDD     |             |
|                                      | Config 3     |      | SR2.1 TDD                       |             | SR2.1 TDD      |             |
| RMSI CORESET Reference Channel       | Config 1     |      | CR.1.1 FDD                      | -           | CR.1.1 FDD     | -           |
|                                      | Config 2     |      | CR.1.1 TDD                      |             | CR.1.1 TDD     |             |
|                                      | Config 3     |      | CR2.1 TDD                       |             | CR2.1 TDD      |             |
| Control channel RMC                  | Config 1     |      | CCR.1.1 FDD                     | -           | CCR.1.1 FDD    | -           |
|                                      | Config 2     |      | CCR.1.1 TDD                     |             | CCR.1.1 TDD    |             |
|                                      | Config 3     |      | CCR2.1 TDD                      |             | CCR2.1 TDD     |             |
| PRS configuration                    | Config 1     |      | PRS.1.3 FR1                     | PRS.1.3 FR1 | PRS.1.4 FR1    | PRS.1.4 FR1 |
|                                      | Config 2     |      | PRS.1.3 FR1                     | PRS.1.3 FR1 | PRS.1.4 FR1    | PRS.1.4 FR1 |
|                                      | Config 3     |      | PRS.2.3 FR1                     | PRS.2.3 FR1 | PRS.2.4 FR1    | PRS.2.4 FR1 |
| PRS Resource slot offset (slot)      | Config 1,2,3 | slot | 0                               | 4           | 0              | 4           |
| SSB configuration                    | Config 1     |      | SSB.1 FR1                       | SSB.1 FR1   | SSB.1 FR1      | SSB.1 FR1   |
|                                      | Config 2     |      | SSB.1 FR1                       | SSB.1 FR1   | SSB.1 FR1      | SSB.1 FR1   |
|                                      | Config 3     |      | SSB.2 FR1                       | SSB.2 FR1   | SSB.2 FR1      | SSB.2 FR1   |
| Time offset with Cell 1              | Config 1     | ms   | -                               | 3           | -              | 3           |
|                                      | Config 2,3   | µs   | -                               | 3           | -              | 3           |
| SMTc configuration                   | Config 1     |      | SMTc.2                          |             |                |             |
|                                      | Config 2,3   |      | SMTc.1                          |             |                |             |
| OCNG Patterns                        |              |      | OCNG pattern 1                  |             |                |             |
| PDSCH/PDCCH subcarrier spacing       | Config 1,2   | kHz  | 15 kHz                          |             |                |             |
|                                      | Config 3     |      | 30 kHz                          |             |                |             |

|  |             |   |           |                                  |       |      |       |
|--|-------------|---|-----------|----------------------------------|-------|------|-------|
| EPRE ratio of PSS to SSS                 |             |   | dB        | 0                                | 0     | 0    | 0     |
| EPRE ratio of PBCH DMRS to SSS           |             |   |           |                                  |       |      |       |
| EPRE ratio of PBCH to PBCH DMRS          |             |   |           |                                  |       |      |       |
| EPRE ratio of PDCCH DMRS to SSS          |             |   |           |                                  |       |      |       |
| EPRE ratio of PDCCH to PDCCH DMRS        |             |   |           |                                  |       |      |       |
| EPRE ratio of PDSCH DMRS to SSS          |             |   |           |                                  |       |      |       |
| EPRE ratio of PDSCH to PDSCH             |             |   |           |                                  |       |      |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |             |   |           |                                  |       |      |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |             |   |           |                                  |       |      |       |
| $N_{oc}$<br>Note2                        | Config 1,2  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | dBm/15KHz | -106                             |       | -88  |       |
|  | Config 3    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H |           |                                  |       |      |       |
| $N_{oc}$<br>Note2                        | Config 1,2  |   | dBm/SCS   | -106                             |       | -88  |       |
|  | Config 3    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H |           | Not applicable <sup>Note 5</sup> |       | -91  |       |
| $\hat{E}_s/I_{ot}$                       |             |   | dB        | 2.46                             | -5.97 | 2.46 | -5.97 |
| $\hat{E}_s/N_{oc}$                       |             |   | dB        | 6                                | 1     | 6    | 1     |
| PRS-<br>RSRP<br>Note3                    | Config 1, 2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | dBm/SCS   | -100                             | -105  | -82  | -87   |

|  |            |   |              |                                  |                          |        |     |
|--|------------|---|--------------|----------------------------------|--------------------------|--------|-----|
|  | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H |              | Not applicable<br>Note 5         | Not applicable<br>Note 5 | -85    | -90 |
| Io <sup>Note3</sup>  | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | dBm/9.36MHz  | -70.09                           |                          | -52.09 |     |
|  | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H | dBm/38.16MHz | Not applicable <sup>Note 5</sup> |                          | -51.99 |     |
| Propagation condition  |            |   |              | AWGN                             |                          |        |     |
| Antenna configuration  |            |   |              | 1x2                              |                          |        |     |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> <p>Note 7: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured.</p> |            |   |              |                                  |                          |        |     |

A.6.7.14.1.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.2.1. **The relative PRS-RSRP measurement between the two PRS resources within the same cell** shall fulfil the relative accuracy requirement in clause 10.1.24.2.2.

## A.6.7.15 UE Rx-Tx time difference measurements

### A.6.7.15.1 UE Rx-Tx time difference measurement accuracy for single positioning frequency layer in FR1 SA

#### A.6.7.15.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx time difference measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.25.2. The test is conducted in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.6.7.15.1.1-1.

**Table A.6.7.15.1.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                                 |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                                 |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                                 |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on the same RF channel in FR1.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE before the start of the test.

The UE is configured with measurement gap pattern ID #0 or ID #24 before the test.

The UE is configured to transmit SRS on Cell 1 during the test.

The test equipment measures the transmit timing of the UE using the transmitted SRS and measures the receive timing using the PRS. The test equipment then compares the difference of these two timings to the UE Rx-Tx measurement reported by the UE for each cell.

#### A.6.7.15.1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.6.7.15.1.2-1.

**Table A.6.7.15.1.2-2: UE Rx-Tx time difference measurement accuracy test parameters**

| Parameter                           | Unit         | Test configuration | Test 1                          |             | Test 2                          |             |
|-------------------------------------|--------------|--------------------|---------------------------------|-------------|---------------------------------|-------------|
|                                     |              |                    | Cell 1                          | Cell 2      | Cell 1                          | Cell 2      |
| RF Channel Number                   |              | 1,2,3              | 1                               | 1           | 1                               | 1           |
| Measurement gap                     |              | 1,2,3              | GP#24 or GP#0 <sup>Note 4</sup> |             | GP#24 or GP#0 <sup>Note 4</sup> |             |
| DRX                                 |              | 1,2,3              | OFF                             |             | OFF                             |             |
| Time offset with Cell 1             | μs           | 1, 2, 3            | N/A                             | 3           | N/A                             | 3           |
| TDD configuration                   |              | 1                  | N/A                             | N/A         | N/A                             | N/A         |
|                                     |              | 2                  | TDDConf.1.1                     | TDDConf.1.1 | TDDConf.1.1                     | TDDConf.1.1 |
|                                     |              | 3                  | TDDConf.2.1                     | TDDConf.2.1 | TDDConf.2.1                     | TDDConf.2.1 |
| PDSCH RMC configuration             |              | 1                  | SR.1.1 FDD                      | N/A         | SR.1.1 FDD                      | N/A         |
|                                     |              | 2                  | SR.1.1 TDD                      |             | SR.1.1 TDD                      |             |
|                                     |              | 3                  | SR.2.1 TDD                      |             | SR.2.1 TDD                      |             |
| RMSI CORESET RMC configuration      |              | 1                  | CR.1.1 FDD                      | N/A         | CR.1.1 FDD                      | N/A         |
|                                     |              | 2                  | CR.1.1 TDD                      |             | CR.1.1 TDD                      |             |
|                                     |              | 3                  | CR.2.1 TDD                      |             | CR.2.1 TDD                      |             |
| Dedicated CORESET RMC configuration |              | 1                  | CCR.1.1 FDD                     | N/A         | CCR.1.1 FDD                     | N/A         |
|                                     |              | 2                  | CCR.1.1 TDD                     |             | CCR.1.1 TDD                     |             |
|                                     |              | 3                  | CCR.2.1 TDD                     |             | CCR.2.1 TDD                     |             |
| OCNG Patterns                       |              | 1, 2, 3            | OP.1                            | OP.1        | OP.1                            | OP.1        |
| TRS Configuration                   |              | 1                  | TRS.1.1 FDD                     | N/A         | TRS.1.1 FDD                     | N/A         |
|                                     |              | 2                  | TRS.1.1 TDD                     |             | TRS.1.1 TDD                     |             |
|                                     |              | 3                  | TRS.1.2 TDD                     |             | TRS.1.2 TDD                     |             |
| Initial BWP configuration           |              | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1          | N/A         | DLBWP.0.1<br>ULBWP.0.1          | N/A         |
| Active DL BWP configuration         |              | 1, 2, 3            | DLBWP.1.1                       | N/A         | DLBWP.1.1                       | N/A         |
| Active UL BWP configuration         |              | 1, 2, 3            | ULBWP.1.1                       | N/A         | ULBWP.1.1                       | N/A         |
| PRS configuration                   |              | 1                  | PRS.1.1 FR1                     | PRS.1.1 FR1 | PRS.1.2 FR1                     | PRS.1.2 FR1 |
|                                     |              | 2                  | PRS.1.1 FR1                     | PRS.1.1 FR1 | PRS.1.2 FR1                     | PRS.1.2 FR1 |
|                                     |              | 3                  | PRS.2.1 FR1                     | PRS.2.1 FR1 | PRS.2.2 FR1                     | PRS.2.2 FR1 |
| PRS Resource slot offset            | slot         | 1, 2, 3            | 0                               | 4           | 0                               | 4           |
| SRS configuration                   |              | 1                  | POS-SRS.1                       | N/A         | POS-SRS.1                       | N/A         |
|                                     |              | 2                  | POS-SRS.1                       | N/A         | POS-SRS.1                       | N/A         |
|                                     |              | 3                  | POS-SRS.2                       | N/A         | POS-SRS.2                       | N/A         |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/SCS      | 1                  | -98                             |             | -98                             |             |
|                                     |              | 2                  | -98                             |             | -98                             |             |
|                                     |              | 3                  | -95                             |             | -95                             |             |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/15 kHz   | 1                  | -98                             |             | -98                             |             |
|                                     |              | 2                  |                                 |             |                                 |             |
|                                     |              | 3                  |                                 |             |                                 |             |
| PRS $\hat{E}_s/I_{ot}$              | dB           | 1                  | -2.41                           | -12.12      | -2.41                           | -12.12      |
|                                     |              | 2                  |                                 |             |                                 |             |
|                                     |              | 3                  |                                 |             |                                 |             |
| PRS $\hat{E}_s/N_{oc}$              | dB           | 1                  | -2                              | -10         | -2                              | -10         |
|                                     |              | 2                  |                                 |             |                                 |             |
|                                     |              | 3                  |                                 |             |                                 |             |
| PRS-RSRP <sup>Note 3</sup>          | dBm/SCS kHz  | 1                  | -100                            | -108        | -100                            | -108        |
|                                     |              | 2                  | -100                            | -108        | -100                            | -108        |
|                                     |              | 3                  | -97                             | -105        | -97                             | -105        |
| I <sub>o</sub>                      | dBm/9.36 MHz | 1                  | -67.67                          | -67.67      | -67.67                          | -67.67      |
|                                     |              | 2                  | -67.67                          | -67.67      | -67.67                          | -67.67      |
|                                     |              | 3                  | -61.57                          | -61.57      | -61.57                          | -61.57      |
| Propagation Condition               |              | 1, 2, 3            | AWGN                            |             | AWGN                            |             |

|         |  |
|---------|--|
| Note 1: | Void.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured.  |

**Table A.6.7.15.1.2-2: Void**

### A.6.7.15.1.3 Test requirements

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.2 for both Cell 1 and Cell 2.

## A.7.1 SA: RRC\_IDLE state mobility

### A.7.1.1 Cell re-selection to NR

#### A.7.1.1.1 Cell reselection to FR2 intra-frequency NR case

##### A.7.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

##### A.7.1.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.7.1.1.1.2-1, A.7.1.1.1.2-2 and A.7.1.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

**Table A.7.1.1.1.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| 2             | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |



**Table A.7.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case**

| Parameter                  |                | Unit | Test configuration | Value          | Comment   |
|----------------------------|----------------|------|--------------------|----------------|---|
| Initial condition          | Active cell    |      | 1, 2               | Cell1          |   |
| T2 end condition           | Active cell    |      | 1, 2               | Cell2          |   |
|                            | Neighbour cell |      | 1, 2               | Cell1          |   |
| Final condition            | Active cell    |      | 1, 2               | Cell1          |   |
|                            | Neighbour cell |      | 1, 2               | Cell2          |   |
| RF Channel Number          |                |      | 1, 2               | 1              |   |
| Time offset between cells  |                |      | 1, 2               | 3 $\mu$ s      | Synchronous cells   |
| Access Barring Information |                | -    | 1, 2               | Not Sent       | No additional delays in random access procedure.  |
| SMTC configuration         |                |      | 1, 2               | SMTC.1         |   |
| DRX cycle length           |                | s    | 1, 2               | 1.28           | The value shall be used for all cells in the test.  |
| PRACH configuration index  |                |      | 1, 2               | 190            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2   |
| rangeToBestCell            |                |      | 1, 2               | Not configured |   |
| T1                         |                | s    | 1, 2               | >7             | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2                         |                | s    | 1, 2               | 135            | T2 needs to be defined so that cell re-selection reaction time is taken into account.   |
| T3                         |                | s    | 1, 2               | 35             | T3 needs to be defined so that cell re-selection reaction time is taken into account.   |

**Table A.7.1.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN**

| Parameter  | Unit   | Test configuration | Cell 1                      |        |        | Cell 2                      |        |        |
|--|--|--------------------|-----------------------------|--------|--------|-----------------------------|--------|--------|
|  |  |                    | T1                          | T2     | T3     | T1                          | T2     | T3     |
| TDD configuration                                  |  | 1, 2               | TDDConf.3.1                 |        |        | TDDConf.3.1                 |        |        |
| PDSCH RMC configuration                            |  | 1                  | SR.3.1 TDD                  |        |        | SR.3.1 TDD                  |        |        |
|  |  | 2                  | SR.3.1 TDD                  |        |        | SR.3.1 TDD                  |        |        |
| RMSI CORESET RMC configuration                     |  | 1                  | CR.3.1 TDD                  |        |        | CR.3.1 TDD                  |        |        |
|  |  | 2                  | CR.3.1 TDD                  |        |        | CR.3.1 TDD                  |        |        |
| Dedicated CORESET RMC configuration                |  | 1                  | CCR.3.1 TDD                 |        |        | CCR.3.1 TDD                 |        |        |
|  |  | 2                  | CCR.3.1 TDD                 |        |        | CCR.3.1 TDD                 |        |        |
| SSB configuration                                  |  | 1                  | SSB.3 FR2                   |        |        | SSB.7 FR2                   |        |        |
|  |  | 2                  | SSB.4 FR2                   |        |        | SSB.8 FR2                   |        |        |
| OCNG Pattern                                       |  | 1, 2               | OP.4                        |        |        | OP.4                        |        |        |
| $BW_{channel}$                                     | MHz  | 1, 2               | 100: $N_{RB,C} = 66$        |        |        | 100: $N_{RB,C} = 66$        |        |        |
| Data RBs allocated                                 |  | 1, 2               | 66                          |        |        | 66                          |        |        |
| Initial DL BWP configuration                       |  | 1, 2               | DLBWP.0.1                   |        |        | DLBWP.0.1                   |        |        |
| Initial UL BWP configuration                       |  | 1, 2               | ULBWP.0.1                   |        |        | ULBWP.0.1                   |        |        |
| RLM-RS   |  | 1, 2               | SSB                         |        |        | SSB                         |        |        |
| $Q_{rxlevmin}$                                     | dBm/SCS  | 1                  | -138                        |        |        | -138                        |        |        |
|  |  | 2                  | -135                        |        |        | -135                        |        |        |
| $P_{compensation}$                                 | dB   | 1, 2               | 0                           |        |        | 0                           |        |        |
| $Q_{hyst_s}$                                       | dB   | 1, 2               | 0                           |        |        | 0                           |        |        |
| $Q_{offset_{s,n}}$                                 | dB   | 1, 2               | 0                           |        |        | 0                           |        |        |
| Cell_selection_and_reselection_quality_measurement |  | 1, 2               | SS-RSRP                     |        |        | SS-RSRP                     |        |        |
| AoA setup  |  | 1, 2               | Setup 1 defined in A.3.15.1 |        |        | Setup 1 defined in A.3.15.1 |        |        |
| $\hat{E}_s / I_{ot}$                               | dB   | 1                  | 8                           | -3     | 1.5    | -infinity                   | 1.5    | -3     |
|  |  | 2                  |                             |        |        |                             |        |        |
| Beam assumption <sup>Note4</sup>                   |  | 1,2                | Rough                       |        |        |                             |        |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/SCS  | 1                  | -93                         |        |        |                             |        |        |
|  |  | 2                  | -90                         |        |        |                             |        |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/15 kHz   | 1                  | -102                        |        |        |                             |        |        |
|  |  | 2                  |                             |        |        |                             |        |        |
| $\hat{E}_s / N_{oc}$                               | dB   | 1                  | 8                           | -3     | 1.5    | -infinity                   | 1.5    | -3     |
|  |  | 2                  |                             |        |        |                             |        |        |
| SS-RSRP <sup>Note3</sup>                           | dBm/SCS  | 1                  | -85                         | -96    | -91.5  | -infinity                   | -91.5  | -96    |
|  |  | 2                  | -82                         | -93    | -88.5  | -infinity                   | -88.5  | -93    |
| Io on SSB symbols of each cell                     | dBm/95.04 MHz  | 1                  | -59.37                      | -63.40 | -62.47 | -64.01                      | -62.47 | -63.40 |
|  |  | 2                  | -57.18                      | -62.86 | -61.67 | -64.01                      | -61.67 | -62.86 |
| Treselection                                       | s  | 1, 2               | 0                           | 0      | 0      | 0                           | 0      | 0      |
| SintrasearchP                                      | dB   | 1, 2               | 50                          |        |        | 50                          |        |        |
| Propagation Condition                              |  | 1, 2               | AWGN                        |        |        |                             |        |        |
| Note 1:  | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                    |                             |        |        |                             |        |        |
| Note 2:  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |                             |        |        |                             |        |        |
| Note 3:  | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                    |                             |        |        |                             |        |        |
| Note 4:  | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                    |                             |        |        |                             |        |        |

### A.7.1.1.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 130 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than 27 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as:  $T_{\text{detect, NR\_Intra}} + T_{\text{SI-NR}}$ , and to an already detected cell can be expressed as:  $T_{\text{evaluate, NR\_intra}} + T_{\text{SI-NR}}$ .

Where:

$T_{\text{detect, NR\_Intra}}$  See Table 4.2.2.3-1 in clause 4.2.2.3

$T_{\text{evaluate, NR\_intra}}$  See Table 4.2.2.3-1 in clause 4.2.2.3

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 129.28 s, allow 130 s for the cell re-selection delay to a newly detectable cell and 26.88 s for the cell re-selection delay to an already detected cell in the test case, which we allow 27 s.

### A.7.1.1.2 Cell reselection to FR2 inter-frequency NR case

#### A.7.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

#### A.7.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.7.1.1.2.2-1, A.7.1.1.2.2-2 and A.7.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 2.

**Table A.7.1.1.2.2-1: Supported test configurations**

| Configuration   | Description for serving cell                        | Description for target cell                         |
|---|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |   |

**Table A.7.1.1.2.2-2: General test parameters for FR2 inter frequency NR cell re-selection test case**

| Parameter                  |                 | Unit | Test configuration | Value          | Comment  |
|----------------------------|-----------------|------|--------------------|----------------|--|
| Initial condition          | Active cell     |      | 1, 2               | Cell2          | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1  |
|                            | Neighbour cell  |      | 1, 2               | Cell1          |  |
| T1 end condition           | Active cell     |      | 1, 2               | Cell1          | The UE shall perform reselection to cell 1 during T1   |
|                            | Neighbour cells |      | 1, 2               | Cell2          |  |
| T3 end condition           | Active cell     |      | 1, 2               | Cell2          | The UE shall perform reselection to cell 2 with higher priority during T3  |
|                            | Neighbour cell  |      | 1, 2               | Cell1          |  |
| RF Channel Number          |                 |      | 1, 2               | 1, 2           |  |
| Time offset between cells  |                 |      | 1, 2               | 3 $\mu$ s      | Synchronous cells  |
| Access Barring Information |                 | -    | 1, 2               | Not Sent       | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | SSB.1 FR2      |  |
|                            |                 |      | 2                  | SSB.2 FR2      |  |
| SMTC configuration         |                 |      | 1, 2               | SMTC.1         |  |
| DRX cycle length           |                 | s    | 1, 2               | 1.28           | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                 |      | 1, 2               | 190            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| rangeToBestCell            |                 |      | 1, 2               | Not configured |  |
| T1                         |                 | s    | 1, 2               | 35             | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2                         |                 | s    | 1, 2               | >7             | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3                         |                 | s    | 1, 2               | 95             | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

**Table A.7.1.1.2.2-3: Cell specific test parameters for FR2 inter frequency NR cell re-selection test case in AWGN**

| Parameter  | Unit          | Test configuration | Cell 1                      |        |        | Cell 2                      |           |        |
|--|---------------|--------------------|-----------------------------|--------|--------|-----------------------------|-----------|--------|
|  |               |                    | T1                          | T2     | T3     | T1                          | T2        | T3     |
| TDD configuration  |               | 1, 2               | TDDConf.3.1                 |        |        | TDDConf.3.1                 |           |        |
| PDSCH RMC configuration  |               | 1, 2               | SR.3.1 TDD                  |        |        | SR.3.1 TDD                  |           |        |
| RMSI CORESET parameters  |               | 1, 2               | CR.3.1 TDD                  |        |        | CR.3.1 TDD                  |           |        |
| RMSI CORESET RMC configuration   |               | 1, 2               | CCR.3.1 TDD                 |        |        | CCR.3.1 TDD                 |           |        |
| OCNG Pattern   |               | 1, 2               | OP.1 defined in A.3.2.1     |        |        | OP.1 defined in A.3.2.1     |           |        |
| Initial DL BWP configuration   |               | 1, 2               | DLBWP.0.1                   |        |        | DLBWP.0.1                   |           |        |
| Initial UL BWP configuration   |               | 1, 2               | ULBWP.0.1                   |        |        | ULBWP.0.1                   |           |        |
| RLM-RS   |               | 1, 2               | SSB                         |        |        | SSB                         |           |        |
| Qrxlevmin  | dBm/SCS       | 1                  | -140                        |        |        | -140                        |           |        |
|  |               | 2                  | -137                        |        |        | -137                        |           |        |
| Pcompensation  | dB            | 1, 2               | 0                           |        |        | 0                           |           |        |
| Qhyst <sub>s</sub>   | dB            | 1, 2               | 0                           |        |        | 0                           |           |        |
| Qoffset <sub>s, n</sub>  | dB            | 1, 2               | 0                           |        |        | 0                           |           |        |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2               | SS-RSRP                     |        |        | SS-RSRP                     |           |        |
| AoA setup  |               | 1, 2               | Setup 1 defined in A.3.15.1 |        |        | Setup 1 defined in A.3.15.1 |           |        |
| Beam assumption <sup>Note 4</sup>  |               | 1, 2               | Rough                       |        |        | Rough                       |           |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1                  | 10.5                        | 10.5   | 8      | -10.5                       | -infinity | 8.5    |
|  |               | 2                  |                             |        |        |                             |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1                  | -93                         |        |        | -93                         |           |        |
|  |               | 2                  | -90                         |        |        | -90                         |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | 1                  | -102                        |        |        | -102                        |           |        |
|  |               | 2                  |                             |        |        |                             |           |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 10.5                        | 10.5   | 8      | -10.5                       | -infinity | 8.5    |
|  |               | 2                  |                             |        |        |                             |           |        |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1                  | -83.5                       | -83.5  | -85    | -103.5                      | -infinity | -84.5  |
|  |               | 2                  | -80.5                       | -80.5  | -82    | -100.5                      | -infinity | -80.5  |
| Io   | dBm/95.04 MHz | 1, 2               | -54.05                      | -54.05 | -55.37 | -63.64                      | -54.01    | -54.94 |
| Treselection   | s             | 1, 2               | -54.05                      | -54.05 | -55.37 | -63.64                      | -54.01    | -54.94 |
| SnonintrasearchP   | dB            | 1, 2               | 50                          |        |        | 50                          |           |        |
| Thresh <sub>x, highP</sub>   | dB            | 1, 2               | 48                          |        |        | 48                          |           |        |
| Thresh <sub>serv, lowP</sub>   | dB            | 1, 2               | 44                          |        |        | 44                          |           |        |
| Thresh <sub>x, lowP</sub>  | dB            | 1, 2               | 50                          |        |        | 50                          |           |        |
| Propagation Condition  |               | 1, 2               | AWGN                        |        |        | AWGN                        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |               |                    |                             |        |        |                             |           |        |

### A.7.1.1.2.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 87 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 27 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{\text{higher\_priority\_search}} + T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$ , and to a lower priority cell can be expressed as:  $T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$ .

Where:

$T_{\text{higher\_priority\_search}}$  See clause 4.2.2.7

$T_{\text{evaluate, NR\_inter}}$  See Table 4.2.2.4-1 in clause 4.2.2.4

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 86.88 s, allow 87 s for the cell re-selection delay to a higher priority cell and 26.88 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 27 s.

### A.7.1.1.3 Cell reselection to FR2 intra-frequency NR case for UE fulfilling low mobility relaxed measurement criterion

#### A.7.1.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements for UE configured with relaxed measurement criterion specified in clause 4.2.2.9.2.

#### A.7.1.1.3.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.7.1.1.3.2-1, A.7.1.1.3.2-2 and A.7.1.1.3.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. During T1 and T2, only criteria *lowMobilityEvaluation* is configured and fulfilled, where  $(S_{\text{rxlev}}^{\text{VRef}} - S_{\text{rxlev}}) < S_{\text{SearchDeltaP}}$ . UE has not registered with network for the tracking area containing cell2.

**Table A.7.1.1.3.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| 2             | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.7.1.1.3.2-2: General test parameters for FR2 intra-frequency NR cell re-selection test case for UE fulfilling low mobility criterion**

| Parameter                  |                 | Unit | Test configuration | Value          | Comment   |
|----------------------------|-----------------|------|--------------------|----------------|---|
| Initial condition          | Active cell     |      | 1, 2               | Cell1          | The UE camps on cell 1 in the initial phase                         |
|                            | Neighbour cells |      | 1, 2               | Cell2          |   |
| T1 end condition           | Active cell     |      | 1, 2               | Cell2          | The UE reselects to cell 2 during T1 period                         |
|                            | Neighbour cells |      | 1, 2               | Cell1          |   |
| Final condition            | Active cell     |      | 1, 2               | Cell1          | The UE reselects to cell 1 during T2 period                         |
|                            | Neighbour cells |      | 1,2                | Cell2          |   |
| RF Channel Number          |                 |      | 1, 2               | 1              |   |
| Time offset between cells  |                 |      | 1, 2               | 3 $\mu$ s      | Synchronous cells   |
| Access Barring Information |                 | -    | 1, 2               | Not Sent       | No additional delays in random access procedure.                    |
| SMTC configuration         |                 |      | 1, 2               | SMTC pattern 1 |   |
| DRX cycle length           |                 | s    | 1, 2               | 0.64           | The value shall be used for all cells in the test.                  |
| PRACH configuration index  |                 |      | 1, 2               | 190            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell            |                 |      | 1, 2               | Not configured |   |
| T1                         |                 | s    | 1, 2               | 100            |   |
| T2                         |                 | s    | 1, 2               | 100            |   |

**Table A.7.1.1.3.2-3: Cell specific test parameters for FR2 intra-frequency NR cell re-selection test case in AWGN for UE fulfilling low mobility criterion**

| Parameter  | Unit          | Test configuration | Cell 1                      |        | Cell 2                      |        |
|--|---------------|--------------------|-----------------------------|--------|-----------------------------|--------|
|  |               |                    | T1                          | T2     | T1                          | T2     |
| TDD configuration  |               | 1, 2               | TDDConf.3.1                 |        | TDDConf.3.1                 |        |
| PDSCH RMC configuration  |               | 1                  | SR.3.1 TDD                  |        | SR.3.1 TDD                  |        |
|  |               | 2                  | SR.3.1 TDD                  |        | SR.3.1 TDD                  |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.3.1 TDD                  |        | CR.3.1 TDD                  |        |
|  |               | 2                  | CR.3.1 TDD                  |        | CR.3.1 TDD                  |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.3.1 TDD                 |        | CCR.3.1 TDD                 |        |
|  |               | 2                  | CCR.3.1 TDD                 |        | CCR.3.1 TDD                 |        |
| SSB configuration  |               | 1                  | SSB.3 FR2                   |        | SSB.7 FR2                   |        |
|  |               | 2                  | SSB.4 FR2                   |        | SSB.8 FR2                   |        |
| OCNG Pattern   |               | 1, 2               | OP.4                        |        | OP.4                        |        |
| Initial DL BWP configuration   |               | 1, 2               | DLBWP.0.1                   |        | DLBWP.0.1                   |        |
| Initial UL BWP configuration   |               | 1, 2               | ULBWP.0.1                   |        | ULBWP.0.1                   |        |
| RLM-RS   |               | 1, 2               | SSB                         |        | SSB                         |        |
| Qrxlevmin  | dBm/SCS       | 1                  | -140                        |        | -140                        |        |
|  |               | 2                  | -137                        |        | -137                        |        |
| S <sub>SearchDeltaP</sub>  | dB            | 1, 2               | 6                           |        | 6                           |        |
| T <sub>SearchDeltaP</sub>  | s             | 1,2                | 5                           |        | 5                           |        |
| Pcompensation  | dB            | 1, 2               | 0                           |        | 0                           |        |
| Q <sub>hyst<sub>s</sub></sub>  | dB            | 1, 2               | 0                           |        | 0                           |        |
| Q <sub>offset<sub>s, n</sub></sub>   | dB            | 1, 2               | 0                           |        | 0                           |        |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2               | SS-RSRP                     |        | SS-RSRP                     |        |
| AoA setup  |               | 1, 2               | Setup 1 defined in A.3.15.1 |        | Setup 1 defined in A.3.15.1 |        |
| Beam assumption <sup>Note 4</sup>  |               | 1,2                | Rough                       |        | Rough                       |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1                  | -3                          | 1.5    | 1.5                         | -3     |
|  |               | 2                  |                             |        |                             |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1                  | -93                         |        |                             |        |
|  |               | 2                  | -90                         |        |                             |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | 1                  | -102                        |        |                             |        |
|  |               | 2                  |                             |        |                             |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | -3                          | 1.5    | 1.5                         | -3     |
|  |               | 2                  |                             |        |                             |        |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1                  | -96                         | -91.5  | -91.5                       | -96    |
|  |               | 2                  | -93                         | -88.5  | -88.5                       | -93    |
| Io on SSB symbols of each cell   | dBm/95.04 MHz | 1                  | -63.40                      | -62.47 | -62.47                      | -63.40 |
|  |               | 2                  | -62.86                      | -61.67 | -61.67                      | -62.86 |
| Treselection   | s             | 1, 2               | 0                           | 0      | 0                           | 0      |
| SintrasearchP  | dB            | 1, 2               | 50                          |        | 50                          |        |
| Propagation Condition  |               | 1, 2               | AWGN                        |        |                             |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |               |                    |                             |        |                             |        |



### A.7.1.1.3.3 Test Requirements

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected cell shall be less than 79 s.

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

NOTE: The cell re-selection delay to an already detectable cell can be expressed as:  $T_{\text{evaluate, NR\_Intra}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{evaluate, NR\_Intra}}$  See Table 4.2.2.9.1-1 in clause 4.2.2.9,

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

### A.7.1.1.4 Cell reselection to FR2 intra-frequency NR case for UE fulfilling not-at-cell edge relaxed measurement criterion

#### A.7.1.1.4.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements for UE configured with relaxed measurement criterion specified in clause 4.2.2.9.3.

#### A.7.1.1.4.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.7.1.1.4.2-1, A.7.1.1.4.2-2 and A.7.1.1.4.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. During T1 and T2, only criteria *cellEdgeEvaluation* is configured and fulfilled, where  $S_{\text{rxlev}} > S_{\text{SearchThresholdP}}$ . UE has not registered with network for the tracking area containing cell2.

**Table A.7.1.1.4.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| 2             | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.7.1.1.4.2-2: General test parameters for FR2 intra-frequency NR cell re-selection test case for UE fulfilling not-at-cell edge criterion**

| Parameter                  |                 | Unit | Test configuration | Value          | Comment   |
|----------------------------|-----------------|------|--------------------|----------------|---|
| Initial condition          | Active cell     |      | 1, 2               | Cell1          | The UE camps on cell 1 in the initial phase                         |
|                            | Neighbour cells |      | 1, 2               | Cell2          |   |
| T1 end condition           | Active cell     |      | 1, 2               | Cell2          | The UE reselects to cell 2 during T1 period                         |
|                            | Neighbour cells |      | 1, 2               | Cell1          |   |
| Final condition            | Active cell     |      | 1, 2               | Cell1          |   |
|                            | Neighbour cells |      | 1,2                | Cell2          |   |
| RF Channel Number          |                 |      | 1, 2               | 1              |   |
| Time offset between cells  |                 |      | 1, 2               | 3 $\mu$ s      | Synchronous cells   |
| Access Barring Information |                 | -    | 1, 2               | Not Sent       | No additional delays in random access procedure.                    |
| SMTC configuration         |                 |      | 1, 2               | SMTC pattern 1 |   |
| DRX cycle length           |                 | s    | 1, 2               | 0.64           | The value shall be used for all cells in the test.                  |
| PRACH configuration index  |                 |      | 1, 2               | 190            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell            |                 |      | 1, 2               | Not configured |   |
| T1                         |                 | s    | 1, 2               | 100            |   |
| T2                         |                 | s    | 1, 2               | 100            |   |

**Table A.7.1.1.4.2-3: Cell specific test parameters for FR2 intra-frequency NR cell re-selection test case in AWGN for UE fulfilling not-at-cell edge criterion**

| Parameter  | Unit          | Test configuration | Cell 1                      |        | Cell 2                      |        |
|--|---------------|--------------------|-----------------------------|--------|-----------------------------|--------|
|  |               |                    | T1                          | T2     | T1                          | T2     |
| TDD configuration                                  |               | 1, 2               | TDDConf.3.1                 |        | TDDConf.3.1                 |        |
| PDSCH RMC configuration                            |               | 1                  | SR.3.1 TDD                  |        | SR.3.1 TDD                  |        |
|  |               | 2                  | SR.3.1 TDD                  |        | SR.3.1 TDD                  |        |
| RMSI CORESET RMC configuration                     |               | 1                  | CR.3.1 TDD                  |        | CR.3.1 TDD                  |        |
|  |               | 2                  | CR.3.1 TDD                  |        | CR.3.1 TDD                  |        |
| Dedicated CORESET RMC configuration                |               | 1                  | CCR.3.1 TDD                 |        | CCR.3.1 TDD                 |        |
|  |               | 2                  | CCR.3.1 TDD                 |        | CCR.3.1 TDD                 |        |
| SSB configuration                                  |               | 1                  | SSB.3 FR2                   |        | SSB.7 FR2                   |        |
|  |               | 2                  | SSB.4 FR2                   |        | SSB.8 FR2                   |        |
| OCNG Pattern                                       |               | 1, 2               | OP.4                        |        | OP.4                        |        |
| Initial DL BWP configuration                       |               | 1, 2               | DLBWP.0.1                   |        | DLBWP.0.1                   |        |
| Initial UL BWP configuration                       |               | 1, 2               | ULBWP.0.1                   |        | ULBWP.0.1                   |        |
| RLM-RS   |               | 1, 2               | SSB                         |        | SSB                         |        |
| Qrxlevmin  | dBm/SCS       | 1                  | -140                        |        | -140                        |        |
|  |               | 2                  | -137                        |        | -137                        |        |
| Pcompensation                                      | dB            | 1, 2               | 0                           |        | 0                           |        |
| Qhysts   | dB            | 1, 2               | 0                           |        | 0                           |        |
| Qoffsets,n   | dB            | 1, 2               | 0                           |        | 0                           |        |
| Cell_selection_and_reselection_quality_measurement |               | 1, 2               | SS-RSRP                     |        | SS-RSRP                     |        |
| AoA setup  |               | 1, 2               | Setup 1 defined in A.3.15.1 |        | Setup 1 defined in A.3.15.1 |        |
| Beam assumption <sup>Note 4</sup>                  |               | 1,2                | Rough                       |        | Rough                       |        |
| $\hat{E}_s / I_{ot}$                               | dB            | 1                  | -3                          | 1.5    | 1.5                         | -3     |
|  |               | 2                  |                             |        |                             |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/SCS       | 1                  | -93                         |        |                             |        |
|  |               | 2                  | -90                         |        |                             |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/15 kHz    | 1                  | -102                        |        |                             |        |
|  |               | 2                  |                             |        |                             |        |
| $\hat{E}_s / N_{oc}$                               | dB            | 1                  | -3                          | 1.5    | 1.5                         | -3     |
|  |               | 2                  |                             |        |                             |        |
| SS-RSRP <sup>Note3</sup>                           | dBm/SCS       | 1                  | -96                         | -91.5  | -91.5                       | -96    |
|  |               | 2                  | -93                         | -88.5  | -88.5                       | -93    |
| Io on SSB symbols of each cell                     | dBm/95.04 MHz | 1                  | -63.40                      | -62.47 | -62.47                      | -63.40 |
|  |               | 2                  | -62.86                      | -61.67 | -61.67                      | -62.86 |
| Treselection                                       | s             | 1, 2               | 0                           | 0      | 0                           | 0      |
| S <sub>SearchThresholdP</sub>                      |               | 1, 2               | 35                          | 35     | 35                          | 35     |
| S <sub>intrasearchP</sub>                          | dB            | 1, 2               | 50                          |        | 50                          |        |
| Propagation Condition                              |               | 1, 2               | AWGN                        |        |                             |        |

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over

subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

### A.7.1.1.4.3 Test Requirements

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 79 s.

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

NOTE: The cell re-selection delay to an already detected cell can be expressed as:  $T_{\text{evaluate, NR\_Intra}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{evaluate, NR\_Intra}}$  See Table 4.2.2.9.3-1 in clause 4.2.2.9,

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

### A.7.1.1.5 Cell reselection to FR2 inter-frequency NR case for UE fulfilling low mobility relaxed measurement criterion

#### A.7.1.1.5.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in clause 4.2.2.10.2.

#### A.7.1.1.5.2 Test Parameters

The test scenario comprises of 2 cells (Cell 1 and Cell 2) on 2 different NR carriers respectively as given in tables A.7.1.1.5.2-1, A.7.1.1.5.2-2 and A.7.1.1.5.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. Cell 2 is of higher priority than Cell 1. The UE is configured with *lowMobilityEvaluation* criterion [2].

**Table A.7.1.1.5.2-1: Supported test configurations**

| Configuration   | Description for serving cell                        | Description for target cell                         |
|---|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |   |

**Table A.7.1.1.5.2-2: General test parameters for FR2 inter frequency NR cell re-selection test case for UE fulfilling low mobility criterion**

| Parameter                  |                | Unit | Test configuration | Value             | Comment   |
|----------------------------|----------------|------|--------------------|-------------------|---|
| Initial condition          | Active cell    |      | 1, 2               | Cell2             | The UE camps on cell2 and fulfils low mobility ( <i>lowMobilityEvaluation</i> [2]) criterion. |
|                            | Neighbour cell |      | 1, 2               | Cell1             |   |
| T1 final condition         | Active cell    |      | 1, 2               | Cell1             | The UE reselects to low priority cell1 during T1  |
|                            | Neighbour cell |      | 1, 2               | Cell2             |   |
| T2 final condition         | Active cell    |      | 1, 2               | Cell2             | The UE reselects to high priority cell2 during T2   |
|                            | Neighbour cell |      |                    | Cell1             |   |
| RF Channel Number          |                |      | 1, 2               | 1, 2              |   |
| Time offset between cells  |                |      | 1, 2               | 3 $\mu$ s         | Synchronous cells   |
| Access Barring Information |                | -    | 1, 2               | Not Sent          | No additional delays in random access procedure.  |
| SSB configuration          |                |      | 1                  | SSB.1<br>FR2      |   |
|                            |                |      | 2                  | SSB.2<br>FR2      |   |
| SMTC configuration         |                |      | 1, 2               | SMTC<br>pattern 1 |   |
| DRX cycle length           |                | s    | 1, 2               | 0.64              | The value shall be used for all cells in the test.  |
| PRACH configuration index  |                |      | 1, 2               | 190               | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                           |
| rangeToBestCell            |                |      | 1, 2               | Not configured    |   |
| T1                         |                | s    | 1, 2               | 85                | T1 needs to be long enough to allow cell re-selection to already known cell1                  |
| T2                         |                | s    | 1, 2               | [85]              | T2 needs to be long enough to allow cell re-selection to already known cell2                  |

**Table A.7.1.1.5.2-3: Cell specific test parameters for FR2 inter frequency NR cell re-selection test case in AWGN for UE fulfilling low mobility criterion**

| Parameter  | Unit          | Test configuration | Cell 1                      |         | Cell 2                      |        |
|--|---------------|--------------------|-----------------------------|---------|-----------------------------|--------|
|  |               |                    | T1                          | T2      | T1                          | T2     |
| TDD configuration  |               | 1, 2               | TDDConf.3.1                 |         | TDDConf.3.1                 |        |
| PDSCH RMC configuration  |               | 1, 2               | SR.3.1 TDD                  |         | SR.3.1 TDD                  |        |
| RMSI CORESET parameters  |               | 1, 2               | CR.3.1 TDD                  |         | CR.3.1 TDD                  |        |
| RMSI CORESET RMC configuration   |               | 1, 2               | CCR.3.1 TDD                 |         | CCR.3.1 TDD                 |        |
| OCNG Pattern   |               | 1, 2               | OP.1 defined in A.3.2.1     |         | OP.1 defined in A.3.2.1     |        |
| Initial DL BWP configuration   |               | 1, 2               | DLBWP.0.1                   |         | DLBWP.0.1                   |        |
| Initial UL BWP configuration   |               | 1, 2               | ULBWP.0.1                   |         | ULBWP.0.1                   |        |
| RLM-RS   |               | 1, 2               | SSB                         |         | SSB                         |        |
| Qrxlevmin  | dBm/SCS       | 1                  | -140                        |         | -140                        |        |
|  |               | 2                  | -137                        |         | -137                        |        |
| Pcompensation  | dB            | 1, 2               | 0                           |         | 0                           |        |
| Qhyst <sub>s</sub>   | dB            | 1, 2               | 0                           |         | 0                           |        |
| Qoffset <sub>s, n</sub>  | dB            | 1, 2               | 0                           |         | 0                           |        |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2               | SS-RSRP                     |         | SS-RSRP                     |        |
| AoA setup  |               | 1, 2               | Setup 1 defined in A.3.15.1 |         | Setup 1 defined in A.3.15.1 |        |
| Beam assumption <sup>Note 4</sup>  |               | 1, 2               | Rough                       |         | Rough                       |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1, 2               | 10.5                        | 8       | -10.5                       | 8.5    |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1                  | -93                         |         | -93                         |        |
|  |               | 2                  | -90                         |         | -90                         |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | 1, 2               | -102                        |         | -102                        |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1, 2               | 10.5                        | 8       | -10.5                       | 8.5    |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1                  | -82.5                       | -85     | -103.5                      | -84.5  |
|  |               | 2                  | -79.5                       | -82     | -100.5                      | -81.5  |
| Io   | dBm/95.04 MHz | 1                  | -53.14                      | -55.37  | -63.64                      | -54.94 |
|  |               | 2                  | -58.10                      | -60.189 | -66.79                      | -59.79 |
| TreselectionNR   | s             | 1, 2               | 0                           |         | 0                           |        |
| SnonintrasearchP   | dB            | 1, 2               | 50                          |         | Not sent                    |        |
| S <sub>SearchDeltaP</sub>  | dB            | 1, 2               | 6                           |         | 6                           |        |
| T <sub>SearchDeltaP</sub>  | s             | 1, 2               | 5                           |         | 5                           |        |
| Thresh <sub>x, highP</sub>   | dB            | 1, 2               | 48                          |         | 48                          |        |
| Thresh <sub>serv, lowP</sub>   | dB            | 1, 2               | 44                          |         | 44                          |        |
| Thresh <sub>x, lowP</sub>  | dB            | 1, 2               | 50                          |         | 50                          |        |
| Propagation Condition  |               | 1, 2               | AWGN                        |         | AWGN                        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |               |                    |                             |         |                             |        |

### A.7.1.1.5.3 Test Requirements

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than [79] s.

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

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as:  $T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as:  $T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$

Where:

$T_{\text{evaluate, NR\_inter}}$  See Table 4.2.2.10.2-1 in clause 4.2.2.10.2

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling low mobility criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling low mobility criterion in the test case.

### A.7.1.1.6 Cell reselection to FR2 inter-frequency NR case for UE fulfilling not-at-cell edge relaxed measurement criterion

#### A.7.1.1.6.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in clause 4.2.2.10.3.

#### A.7.1.1.6.2 Test Parameters

The test scenario comprises of 2 cells (Cell 1 and Cell 2) on 2 different NR carriers respectively as given in tables A.7.1.1.6.2-1, A.7.1.1.6.2-2 and A.7.1.1.6.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. Cell 2 is of higher priority than Cell 1. The UE is configured with *cellEdgeEvaluation* criterion [2].

**Table A.7.1.1.6.2-1: Supported test configurations**

| Configuration   | Description for serving cell                        | Description for target cell                         |
|---|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |   |

**Table A.7.1.1.6.2-2: General test parameters for FR2 inter frequency NR cell re-selection test case for UE fulfilling not-at-cell edge criterion**

| Parameter                  |                | Unit | Test configuration | Value          | Comment  |
|----------------------------|----------------|------|--------------------|----------------|--|
| Initial condition          | Active cell    |      | 1, 2               | Cell2          | The UE camps on cell2 and fulfils not-at-cell edge ( <i>cellEdgeEvaluation</i> [2]) criterion. |
|                            | Neighbour cell |      | 1, 2               | Cell1          |  |
| T1 final condition         | Active cell    |      | 1, 2               | Cell1          | The UE reselects to low priority cell1 during T1   |
|                            | Neighbour cell |      | 1, 2               | Cell2          |  |
| T2 final condition         | Active cell    |      | 1, 2               | Cell2          | The UE reselects to high priority cell2 during T2  |
|                            | Neighbour cell |      | 1, 2               | Cell1          |  |
| RF Channel Number          |                |      | 1, 2               | 1, 2           |  |
| Time offset between cells  |                |      | 1, 2               | 3 $\mu$ s      | Synchronous cells  |
| Access Barring Information |                | -    | 1, 2               | Not Sent       | No additional delays in random access procedure.   |
| SSB configuration          |                |      | 1                  | SSB.1 FR2      |  |
|                            |                |      | 2                  | SSB.2 FR2      |  |
| SMTC configuration         |                |      | 1, 2               | SMTC pattern 1 |  |
| DRX cycle length           |                | s    | 1, 2               | 0.64           | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                |      | 1, 2               | 190            | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                            |
| rangeToBestCell            |                |      | 1, 2               | Not configured |  |
| T1                         |                | s    | 1, 2               | 85             | T1 needs to be long enough to allow cell re-selection to already known cell.                   |
| T2                         |                | s    | 1, 2               | [85]           | T2 needs to be long enough to allow cell re-selection to already known cell.                   |

**Table A.7.1.1.6.2-3: Cell specific test parameters for FR2 inter frequency NR cell re-selection test case in AWGN for UE fulfilling not-at-cell edge criterion**

| Parameter | Unit | Test configuration | Cell 1 |    | Cell 2 |    |
|-----------|------|--------------------|--------|----|--------|----|
|           |      |                    | T1     | T2 | T1     | T2 |
|           |      |                    |        |    |        |    |



|  |               |      |                             |         |                             |        |
|--|---------------|------|-----------------------------|---------|-----------------------------|--------|
| TDD configuration  |               | 1, 2 | TDDConf.3.1                 |         | TDDConf.3.1                 |        |
| PDSCH RMC configuration  |               | 1, 2 | SR.3.1 TDD                  |         | SR.3.1 TDD                  |        |
| RMSI CORESET parameters  |               | 1, 2 | CR.3.1 TDD                  |         | CR.3.1 TDD                  |        |
| RMSI CORESET RMC configuration   |               | 1, 2 | CCR.3.1 TDD                 |         | CCR.3.1 TDD                 |        |
| OCNG Pattern   |               | 1, 2 | OP.1 defined in A.3.2.1     |         | OP.1 defined in A.3.2.1     |        |
| Initial DL BWP configuration   |               | 1, 2 | DLBWP.0.1                   |         | DLBWP.0.1                   |        |
| Initial UL BWP configuration   |               | 1, 2 | ULBWP.0.1                   |         | ULBWP.0.1                   |        |
| RLM-RS   |               | 1, 2 | SSB                         |         | SSB                         |        |
| Qrxlevmin  | dBm/SCS       | 1    | -140                        |         | -140                        |        |
|  |               | 2    | -137                        |         | -137                        |        |
| Pcompensation  | dB            | 1, 2 | 0                           |         | 0                           |        |
| Qhyst <sub>s</sub>   | dB            | 1, 2 | 0                           |         | 0                           |        |
| Qoffset <sub>s, n</sub>  | dB            | 1, 2 | 0                           |         | 0                           |        |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2 | SS-RSRP                     |         | SS-RSRP                     |        |
| AoA setup  |               | 1, 2 | Setup 1 defined in A.3.15.1 |         | Setup 1 defined in A.3.15.1 |        |
| Beam assumption <sup>Note 4</sup>  |               | 1, 2 | Rough                       |         | Rough                       |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1, 2 | 10.5                        | 8       | -10.5                       | 8.5    |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1    | -93                         |         | -93                         |        |
|  |               | 2    | -90                         |         | -90                         |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | 1, 2 | -102                        |         | -102                        |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1, 2 | 10.5                        | 8       | -10.5                       | 8.5    |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1    | -82.5                       | -85     | -103.5                      | -84.5  |
|  |               | 2    | -79.5                       | -82     | -100.5                      | -81.5  |
| Io   | dBm/95.04 MHz | 1    | -53.14                      | -55.37  | -63.64                      | -54.94 |
|  |               | 2    | -58.10                      | -60.189 | -66.79                      | -59.79 |
| S <sub>SearchThresholdP</sub>  |               | 1, 2 | 35                          | 35      | 29                          | 29     |
| T <sub>reselectionNR</sub>   | s             | 1, 2 | 0                           |         | 0                           |        |
| S <sub>nonintrasearchP</sub>   | dB            | 1, 2 | 50                          |         | Not sent                    |        |
| Thresh <sub>x, highP</sub>   | dB            | 1, 2 | 48                          |         | 48                          |        |
| Thresh <sub>serv, lowP</sub>   | dB            | 1, 2 | 44                          |         | 44                          |        |
| Thresh <sub>x, lowP</sub>  | dB            | 1, 2 | 50                          |         | 50                          |        |
| Propagation Condition  |               | 1, 2 | AWGN                        |         | AWGN                        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |               |      |                             |         |                             |        |

### A.7.1.1.6.3 Test Requirements

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

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

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as:  $T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as:  $T_{\text{evaluate, NR\_inter}} + T_{\text{SI-NR}}$

Where:

$T_{\text{evaluate, NR\_inter}}$  See Table 4.2.2.10.3-1 in clause 4.2.2.10.3

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case.

This gives a total of 78.8 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling not-at-cell edge criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling not-at-cell edge criterion in the test case.

## A.7.2 SA: RRC\_INACTIVE state mobility

## A.7.3 RRC\_CONNECTED state mobility

### A.7.3.1 Handover

#### A.7.3.1.1 Inter-frequency handover from FR1 to FR2; unknown target cell

##### A.7.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR2 inter frequency handover requirements specified in clause 6.1.1.5.

##### A.7.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.1.2-2, and A.7.3.1.1.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.7.3.1.1.2-1: Inter-frequency handover from FR1 to FR2 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.7.3.1.1.2-2: General test parameters Inter-frequency handover from FR1 to FR2**

| Parameter                  |                   | Unit | Value     | Comment  |
|----------------------------|-------------------|------|-----------|--|
| Initial conditions         | Active cell       |      | Cell 1    |  |
|                            | Neighbouring cell |      | Cell 2    |  |
| Final condition            | Active cell       |      | Cell 2    |  |
| A4-Offset                  |                   | dBm  | -120      |  |
| Hysteresis                 |                   | dB   | 0         |  |
| Time To Trigger            |                   | s    | 0         |  |
| Filter coefficient         |                   |      | 0         | L3 filtering is not used                         |
| Access Barring Information |                   | -    | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   |      | 3 $\mu$ s | Synchronous cells                                |
| T1                         |                   | s    | 5         |  |
| T2                         |                   | s    | $\leq 10$ |  |

**Table A.7.3.1.1.2-3: Cell specific test parameters for NR FR1-FR2 Inter frequency handover test case**

| Parameter                                 |                  | Unit | Cell 1                      |    | Cell 2                          |    |
|---|------------------|------|-----------------------------|----|---------------------------------|----|
|   |                  |      | T1                          | T2 | T1                              | T2 |
| Assumption for UE beams <sup>Note 6</sup> |                  |      | N/A                         |    | Rough                           |    |
| AoA setup                                 |                  |      | NA                          |    | Setup 1<br>as defined in A.3.15 |    |
| NR RF Channel Number                      |                  |      | 1                           |    | 2                               |    |
| Duplex mode                               | Config 1         |      | FDD                         |    | TDD                             |    |
|   | Config 2,3       |      | TDD                         |    | TDD                             |    |
| TDD configuration                         | Config 1         |      | Not Applicable              |    | TDDConf.3.1                     |    |
|   | Config 2         |      | TDDConf.1.1                 |    | TDDConf.3.1                     |    |
|   | Config 3         |      | TDDConf.2.1                 |    | TDDConf.3.1                     |    |
| BW <sub>channel</sub>                     | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66     |    |
|   | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66     |    |
|   | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66     |    |
| BWP BW                                    | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66     |    |
|   | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66     |    |
|   | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66     |    |
| Data RBs allocated                        | Config 1         |      | 52                          |    | 66                              |    |
|   | Config 2         |      | 52                          |    | 66                              |    |
|   | Config 3         |      | 106                         |    | 66                              |    |
| DRx Cycle                                 |                  | ms   | Not Applicable              |    |                                 |    |
| PDSCH Reference measurement channel       | Config 1         |      | SR.1.1 FDD                  |    | SR3.1 TDD                       |    |
|   | Config 2         |      | SR.1.1 TDD                  |    | SR3.1 TDD                       |    |
|   | Config 3         |      | SR2.1 TDD                   |    | SR3.1 TDD                       |    |
| RMSI CORESET Reference Channel            | Config 1         |      | CR.1.1 FDD                  |    | CR3.1 TDD                       |    |
|   | Config 2         |      | CR.1.1 TDD                  |    | CR3.1 TDD                       |    |
|   | Config 3         |      | CR2.1 TDD                   |    | CR3.1 TDD                       |    |
| Control Channel RMC                       | Config 1         |      | CCR.1.1 FDD                 |    | CCR.3.1 TDD                     |    |
|   | Config 2         |      | CCR.1.1 TDD                 |    | CCR.3.1 TDD                     |    |
|   | Config 3         |      | CCR.2.1 TDD                 |    | CCR.3.1 TDD                     |    |
| OCNG Patterns                             |                  |      | OP.1                        |    |                                 |    |
| SSB configuration                         | Config 1,2       |      | SSB.1 FR1                   |    | SSB.3 FR2                       |    |
|   | Config 3         |      | SSB.2 FR1                   |    | SSB.3 FR2                       |    |
| SMTC configuration                        | Config 1,2       |      | SMTC.1                      |    | SMTC.1                          |    |
|   | Config 3         |      | SMTC.2                      |    | SMTC.1                          |    |
| SMTC configuration                        | Config 1,2       |      | SMTC.1                      |    | SMTC.1                          |    |
|   | Config 3         |      | SMTC.2                      |    | SMTC.1                          |    |
| PDSCH/PDCCH subcarrier spacing            | Config 1,2       | kHz  | 15 kHz                      |    | 120 kHz                         |    |
|   | Config 3         |      | 30 kHz                      |    | 120 kHz                         |    |
| PUCCH/PUSCH subcarrier spacing            | Config 1,2       | kHz  | 15 kHz                      |    | 120 kHz                         |    |
|   | Config 3         |      | 30 kHz                      |    | 120 kHz                         |    |
| PRACH configuration                       |                  |      | FR1 PRACH configuration 1   |    | FR2 PRACH configuration 1       |    |
| TRS configuration                         | Config 1         |      | TRS.1.1 FDD                 |    | TRS.2.1 TDD                     |    |
|   | Config 2         |      | TRS.1.1 TDD                 |    | TRS.2.1 TDD                     |    |
|   | Config 3         |      | TRS.1.2 TDD                 |    | TRS.2.1 TDD                     |    |
| PDSCH/PDCCH TCI state                     |                  |      | N/A                         |    | TCI.State.2                     |    |
| BWP configuraiton                         | Initial DL BWP   |      | DLBWP.0.1                   |    | DLBWP.0.1                       |    |
|   | Dedicated DL BWP |      | DLBWP.1.1                   |    | DLBWP.1.1                       |    |
|   | Initial UL BWP   |      | ULBWP.0.1                   |    | ULBWP.0.1                       |    |
|   | Dedicated UL BWP |      | ULBWP.1.1                   |    | ULBWP.1.1                       |    |
| EPRE ratio of PSS to SSS                  |                  | dB   | 0                           |    | 0                               |    |
| EPRE ratio of PBCH DMRS to SSS            |                  |      |                             |    |                                 |    |
| EPRE ratio of PBCH to PBCH DMRS           |                  |      |                             |    |                                 |    |
| EPRE ratio of PDCCH DMRS to SSS           |                  |      |                             |    |                                 |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |      |                             |    |                                 |    |
| EPRE ratio of PDSCH DMRS to SSS           |                  |      |                             |    |                                 |    |
| EPRE ratio of PDSCH to PDSCH              |                  |      |                             |    |                                 |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |      |                             |    |                                 |    |

|   |            |           |                              |                |
|---|------------|-----------|------------------------------|----------------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |            |           |                              |                |
| $N_{oc}$ <sup>Note2</sup>   |            | dBm/15kHz | Link only, see clause A.3.7A | -104.7         |
| $N_{oc}$ <sup>Note2</sup>   | Config 1,2 | dBm/SCS   |                              | -95.7          |
|   | Config 3   |           |                              | -95.7          |
| $\hat{E}_s / I_{ot}$  |            | dB        |                              | -Infinity   10 |
| $\hat{E}_s / N_{oc}$  |            | dB        |                              | -Infinity   10 |
| $I_o$ <sup>Note3</sup>  | Config 1,2 | dBm/BW    |                              | -66.7   -56.3  |
|   | Config 3   | dBm/BW    |                              | -66.7   -56.3  |
| Propagation condition   |            | -         |                              | AWGN           |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |            |           |                              |                |

A.7.3.1.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 572 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = [10] ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$  = 562 ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.5.2.

This gives a total of 572 ms.

A.7.3.1.2 Intra-frequency handover from FR2 to FR2; unknown target cell

A.7.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 intra frequency handover requirements specified in clause 6.1.1.4.

A.7.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.2.2-2, and A.7.3.1.2.2-3.

The test scenario comprises of carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.7.3.1.2.2-1: Intra-frequency handover from FR2 to FR2 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.1.2.2-2: General test parameters Intra-frequency handover from FR2 to FR2**

| Parameter                  |                   | Unit | Value     | Comment  |
|----------------------------|-------------------|------|-----------|--|
| Initial conditions         | Active cell       |      | Cell 1    |  |
|                            | Neighbouring cell |      | Cell 2    |  |
| Final condition            | Active cell       |      | Cell 2    |  |
| A4-Offset                  |                   | dBm  | -120      |  |
| Hysteresis                 |                   | dB   | 0         |  |
| Time To Trigger            |                   | s    | 0         |  |
| Filter coefficient         |                   |      | 0         | L3 filtering is not used                         |
| Access Barring Information |                   | -    | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   |      | 3 $\mu$ s | Synchronous cells                                |
| T1                         |                   | s    | 5         |  |
| T2                         |                   | s    | $\leq 10$ |  |

**Table A.7.3.1.2.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency handover test case**

| Parameter   |                  | Unit   | Cell 1                       |           | Cell 2 |    |
|---|------------------|--------|------------------------------|-----------|--------|----|
|   |                  |        | T1                           | T2        | T1     | T2 |
| Assumption for UE beams <sup>Note 6</sup>   |                  |        | Rough                        |           | Rough  |    |
| AoA setup   |                  |        | Setup 1 as defined in A.3.15 |           |        |    |
| NR RF Channel Number  |                  |        | 1                            |           | 1      |    |
| Duplex mode   |                  |        | TDD                          |           |        |    |
| TDD configuration   |                  |        | TDDConf.3.1                  |           |        |    |
| BW <sub>channel</sub>   |                  | MHz    | 100: N <sub>RB,c</sub> = 66  |           |        |    |
| BWP BW  |                  | MHz    | 100: N <sub>RB,c</sub> = 66  |           |        |    |
| Data RBs allocated  |                  |        | 66                           |           |        |    |
| DRx Cycle   |                  | ms     | Not Applicable               |           |        |    |
| PDSCH Reference measurement channel   |                  |        | SR3.1 TDD                    |           |        |    |
| RMSI CORESET Reference Channel  |                  |        | CR3.1 TDD                    |           |        |    |
| Control Channel RMC   |                  |        | CCR.3.1 TDD                  |           |        |    |
| OCNG Patterns   |                  |        | OP.1                         |           |        |    |
| SMTC Configuration  |                  |        | SMTC pattern 1               |           |        |    |
| SSB Configuration   |                  |        | SSB.3 FR2                    |           |        |    |
| PDSCH/PDCCH subcarrier spacing  |                  | kHz    | 120 kHz                      |           |        |    |
| PUCCH/PUSCH subcarrier spacing  |                  | kHz    | 120 kHz                      |           |        |    |
| PRACH configuration   |                  |        | FR2 PRACH configuration 1    |           |        |    |
| TRS configuration   |                  |        | TRS.2.1 TDD                  |           |        |    |
| PDSCH/PDCCH TCI state   |                  |        | TCI.State.2                  |           |        |    |
| BWP configuraiton   | Initial DL BWP   |        | DLBWP.0.1                    |           |        |    |
|   | Dedicated DL BWP |        | DLBWP.1.1                    |           |        |    |
|   | Initial UL BWP   |        | ULBWP.0.1                    |           |        |    |
|   | Dedicated UL BWP |        | ULBWP.1.1                    |           |        |    |
| EPRE ratio of PSS to SSS  | dB               | 0      |                              | 0         |        |    |
| EPRE ratio of PBCH DMRS to SSS  |                  |        |                              |           |        |    |
| EPRE ratio of PBCH to PBCH DMRS   |                  |        |                              |           |        |    |
| EPRE ratio of PDCCH DMRS to SSS   |                  |        |                              |           |        |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |                  |        |                              |           |        |    |
| EPRE ratio of PDSCH DMRS to SSS   |                  |        |                              |           |        |    |
| EPRE ratio of PDSCH to PDSCH  |                  |        |                              |           |        |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                  |        |                              |           |        |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |        |                              |           |        |    |
| N <sub>oc</sub> <sup>Note2</sup>  | dBm/15kHz        | -104.7 |                              |           |        |    |
| N <sub>oc</sub> <sup>Note2</sup>  | dBm/SCS          | -95.7  |                              |           |        |    |
| $\hat{E}_s / I_{ot}$  | dB               | 6      | -1.8                         | -Infinity | 0      |    |
| $\hat{E}_s / N_{oc}$  | dB               | 6      | 6                            | -Infinity | 7      |    |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/BW           | -59.7  | -56.7                        | -59.7     | -56.7  |    |
| Propagation condition   | -                | AWGN   |                              | AWGN      |        |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                  |        |                              |           |        |    |

|         |  |
|---------|--|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |
| Note 5: | As observed with 0 dBi gain antenna at the centre of the quiet zone  |
| Note 6: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |

### A.7.3.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 232 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{\text{interrupt}}$  = 222 ms in the test.  $T_{\text{interrupt}}$  is defined in clause 6.1.1.4.2.

This gives a total of 232 ms.

### A.7.3.1.3 Inter-frequency handover from FR2 to FR2; unknown target cell

#### A.7.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 inter frequency handover requirements specified in clause 6.1.1.4.

#### A.7.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.3.2-2, and A.7.3.1.3.2-3.

The test scenario comprises of carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.7.3.1.3.2-1: Inter-frequency handover from FR2 to FR2 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.1.3.2-2: General test parameters Inter-frequency handover from FR2 to FR2**

| Parameter                  | Unit              | Value     | Comment  |
|----------------------------|-------------------|-----------|--|
| Initial conditions         | Active cell       | Cell 1    |  |
|                            | Neighbouring cell | Cell 2    |  |
| Final condition            | Active cell       | Cell 2    |  |
| A4-Offset                  | dB                | -120      |  |
| Hysteresis                 | dB                | 0         |  |
| Time To Trigger            | s                 | 0         |  |
| Filter coefficient         |                   | 0         | L3 filtering is not used                         |
| Access Barring Information | -                 | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   | 3 $\mu$ s | Synchronous cells                                |
| T1                         | s                 | 5         |  |
| T2                         | s                 | $\leq 10$ |  |



Table A.7.3.1.3.2-3: Cell specific test parameters for NR FR2-FR2 Inter frequency handover test case

| Parameter                                 | Unit  | Cell 1                       |       | Cell 2    |       |
|---|---|------------------------------|-------|-----------|-------|
|   |   | T1                           | T2    | T1        | T2    |
| Assumption for UE beams <sup>Note 6</sup> |   | Rough                        |       | Rough     |       |
| AoA setup                                 |   | Setup 1 as defined in A.3.15 |       |           |       |
| NR RF Channel Number                      |   | 1                            |       | 2         |       |
| Duplex mode                               |   | TDD                          |       |           |       |
| TDD configuration                         |   | TDDConf.3.1                  |       |           |       |
| BW <sub>channel</sub>                     | MHz   | 100: N <sub>RB,c</sub> = 66  |       |           |       |
| BWP BW                                    | MHz   | 100: N <sub>RB,c</sub> = 66  |       |           |       |
| Data RBs allocated                        |   | 66                           |       |           |       |
| DRx Cycle                                 | ms  | Not Applicable               |       |           |       |
| PDSCH Reference measurement channel       |   | SR3.1 TDD                    |       |           |       |
| RMSI CORESET Reference Channel            |   | CR3.1 TDD                    |       |           |       |
| Control Channel RMC                       |   | CCR.3.1 TDD                  |       |           |       |
| OCNG Patterns                             |   | OP.1                         |       |           |       |
| SMTc Configuration                        |   | SMTc pattern 1               |       |           |       |
| SSB Configuration                         |   | SSB.3 FR2                    |       |           |       |
| PDSCH/PDCCH subcarrier spacing            | kHz   | 120 kHz                      |       |           |       |
| PUCCH/PUSCH subcarrier spacing            | kHz   | 120 kHz                      |       |           |       |
| PRACH configuration                       |   | FR2 PRACH configuration 1    |       |           |       |
| TRS configuration                         |   | TRS.2.1 TDD                  |       |           |       |
| PDSCH/PDCCH TCI state                     |   | TCI.State.2                  |       |           |       |
| BWP configuraiton                         | Initial DL BWP  | DLBWP.0.1                    |       |           |       |
|   | Dedicated DL BWP  | DLBWP.1.1                    |       |           |       |
|   | Initial UL BWP  | ULBWP.0.1                    |       |           |       |
|   | Dedicated UL BWP  | ULBWP.1.1                    |       |           |       |
| EPRE ratio of PSS to SSS                  | dB  | 0                            |       | 0         |       |
| EPRE ratio of PBCH DMRS to SSS            |   |                              |       |           |       |
| EPRE ratio of PBCH to PBCH DMRS           |   |                              |       |           |       |
| EPRE ratio of PDCCH DMRS to SSS           |   |                              |       |           |       |
| EPRE ratio of PDCCH to PDCCH DMRS         |   |                              |       |           |       |
| EPRE ratio of PDSCH DMRS to SSS           |   |                              |       |           |       |
| EPRE ratio of PDSCH to PDSCH              |   |                              |       |           |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |   |                              |       |           |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                              |       |           |       |
| N <sub>oc</sub> <sup>Note2</sup>          | dBm/15kHz   | -104.7                       |       | -104.7    |       |
| N <sub>oc</sub> <sup>Note2</sup>          | dBm/SCS   | -95.7                        |       | -95.7     |       |
| $\hat{E}_s / I_{ot}$                      | dB  | 5                            | 5     | -Infinity | 5     |
| $\hat{E}_s / N_{oc}$                      | dB  | 5                            | 5     | -Infinity | 5     |
| I <sub>o</sub> <sup>Note3</sup>           | dBm/BW  | -60.5                        | -60.5 | -66.7     | -60.5 |
| Propagation condition                     | -   | AWGN                         |       | AWGN      |       |
| Note 1:                                   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                              |       |           |       |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                              |       |           |       |
| Note 3:                                   | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                              |       |           |       |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |                              |       |           |       |
| Note 5:                                   | As observed with 0 dBi gain antenna at the centre of the quiet zone   |                              |       |           |       |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |                              |       |           |       |

### A.7.3.1.3.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 552 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{\text{interrupt}} = 542$  ms in the test.  $T_{\text{interrupt}}$  is defined in clause 6.1.1.4.2.

This gives a total of 552 ms.

### A.7.3.1.4 Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2

#### A.7.3.1.4.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR2 Inter-band inter-frequency synchronous DAPS handover requirements specified in clause 6.1.3.4.

#### A.7.3.1.4.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.4.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.4.2-2, A.7.3.1.4.2-3 and A.7.3.1.4.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A4 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0). Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A4. After receiving the Event A4, the test system shall send a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying source cell release sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.7.3.1.4.2-1: Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations   |

**Table A.7.3.1.4.2-2: General test parameters for Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2**

| Parameter                  |                   | Unit    | Value                      | Comment   |
|----------------------------|-------------------|---------|----------------------------|---|
| Initial conditions         | Active cell       |         | Cell 1                     |   |
|                            | Neighbouring cell |         | Cell 2                     |   |
| Final condition            | Active cell       |         | Cell 2                     |   |
| A4-Threshold               |                   | dBm     | -120                       |   |
| Hysteresis                 |                   | dB      | 0                          |   |
| Time To Trigger            |                   | s       | 0                          |   |
| Filter coefficient         |                   |         | 0                          | L3 filtering is not used  |
| Access Barring Information |                   | -       | Not Sent                   | No additional delays in random access procedure.                                |
| Time offset between cells  |                   | $\mu$ s | 33                         | Synchronous cells   |
| T1                         |                   | s       | 5                          |   |
| T2                         |                   | s       | <5                         |   |
| T3                         |                   | s       | <0.5                       |   |
| T4                         |                   | ms      | $10+T_{\text{interrupt2}}$ | $T_{\text{interrupt2}}$ as defined in Table 6.1.3.4.2-2 for synchronous DAPS HO |
| T5                         |                   | ms      | 100                        |   |

**Table A.7.3.1.4.2-3: Cell specific test parameters for Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2 (Cell 1 in FR1)**

| Parameter                                |                  | Unit        | Cell 1                             |    |    |    |    |
|--|------------------|-------------|------------------------------------|----|----|----|----|
|  |                  |             | T1                                 | T2 | T3 | T4 | T5 |
| NR RF Channel Number                     |                  |             | 1                                  |    |    |    |    |
| Duplex mode                              | Config 1         |             | FDD                                |    |    |    |    |
|  | Config 2,3       |             | TDD                                |    |    |    |    |
| TDD configuration                        | Config 1         |             | Not Applicable                     |    |    |    |    |
|  | Config 2         |             | TDDConf.1.1                        |    |    |    |    |
|  | Config 3         |             | TDDConf.2.1                        |    |    |    |    |
| BW <sub>channel</sub>                    | Config 1         | MHz         | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 2         |             | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 3         |             | 40: N <sub>RB,c</sub> = 106        |    |    |    |    |
| BWP BW                                   | Config 1         | MHz         | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 2         |             | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 3         |             | 40: N <sub>RB,c</sub> = 106        |    |    |    |    |
| TRS configuration                        | Config 1         |             | TRS.1.1 FDD                        |    |    |    |    |
|  | Config 2         |             | TRS.1.1 TDD                        |    |    |    |    |
|  | Config 3         |             | TRS.1.2 TDD                        |    |    |    |    |
| DRx Cycle                                |                  | ms          | Not Applicable                     |    |    |    |    |
| PDSCH Reference measurement channel      | Config 1         |             | SR.1.1 FDD                         |    |    |    |    |
|  | Config 2         |             | SR.1.1 TDD                         |    |    |    |    |
|  | Config 3         |             | SR2.1 TDD                          |    |    |    |    |
| CORESET Reference Channel                | Config 1         |             | CR.1.1 FDD                         |    |    |    |    |
|  | Config 2         |             | CR.1.1 TDD                         |    |    |    |    |
|  | Config 3         |             | CR2.1 TDD                          |    |    |    |    |
| OCNG Patterns                            |                  |             | OCNG pattern 1                     |    |    |    |    |
| CSI-RS configuration for CSI reporting   | Config 1         |             | CSI-RS.1.1 FDD                     |    |    |    |    |
|  | Config 2         |             | CSI-RS.1.1 TDD                     |    |    |    |    |
|  | Config 3         |             | CSI-RS.2.1 TDD                     |    |    |    |    |
| SSB Configuration                        | Config 1,2       |             | SSB.1 FR1                          |    |    |    |    |
|  | Config 3         |             | SSB.2 FR1                          |    |    |    |    |
| SMTc Configuration                       | Config 1,2       |             | SMTc.1                             |    |    |    |    |
|  | Config 3         |             | SMTc.2                             |    |    |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz         | 15 kHz                             |    |    |    |    |
|  | Config 3         |             | 30 kHz                             |    |    |    |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz         | 15 kHz                             |    |    |    |    |
|  | Config 3         |             | 30 kHz                             |    |    |    |    |
| PRACH configuration                      |                  |             | FR1 PRACH configuration 2          |    |    |    |    |
| BWP                                      | Initial DL BWP   |             | DLBWP.0.1                          |    |    |    |    |
|  | Dedicated DL BWP |             | DLBWP.1.3                          |    |    |    |    |
|  | Initial UL BWP   |             | ULBWP.0.1                          |    |    |    |    |
|  | Dedicated UL BWP |             | ULBWP.1.3                          |    |    |    |    |
| EPRE ratio of PSS to SSS                 |                  | dB          | 0                                  |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |             |                                    |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |             |                                    |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |             |                                    |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |             |                                    |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |             |                                    |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH             |                  |             |                                    |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |             |                                    |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |             |                                    |    |    |    |    |
| $N_{oc}^{Note2}$                         |                  | dBm/15kHz   | NA<br>Link only, see clause A.3.7A |    |    |    |    |
| $N_{oc}^{Note2}$                         | Config 1,2       | dBm/SCS     |                                    |    |    |    |    |
|  | Config 3         |             |                                    |    |    |    |    |
| $\hat{E}_s / I_{ot}$                     |                  | dB          |                                    |    |    |    |    |
| $\hat{E}_s / N_{oc}$                     |                  | dB          |                                    |    |    |    |    |
| $I_o^{Note3}$                            | Config 1,2       | dBm/9.36MHz |                                    |    |    |    |    |

|                       | Config 3   | dBm/<br>38.16MHz |      |
|-----------------------|--|------------------|------|
| Propagation condition |  | -                | AWGN |
| Note 1:               | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                  |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |      |
| Note 3:               | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |      |

**Table A.7.3.1.4.2-4: Cell specific test parameters for Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2 (Cell 2 in FR2)**

| Parameter  |                  | Unit        | Cell 2                       |        |        |        |        |
|--|------------------|-------------|------------------------------|--------|--------|--------|--------|
|  |                  |             | T1                           | T2     | T3     | T4     | T5     |
| Assumption for UE beams <sup>Note 6</sup>  |                  |             | Rough                        |        |        |        |        |
| AoA setup  |                  |             | Setup 1 as defined in A.3.15 |        |        |        |        |
| NR RF Channel Number   |                  |             | 2                            |        |        |        |        |
| Duplex mode  | Config 1,2,3     |             | TDD                          |        |        |        |        |
| TDD configuration  | Config 1,2,3     |             | TDDConf.3.1                  |        |        |        |        |
| BW <sub>channel</sub>  | Config 1,2,3     | MHz         | 100: N <sub>RB,c</sub> = 66  |        |        |        |        |
| BWP BW   | Config 1,2,3     | MHz         | 100: N <sub>RB,c</sub> = 66  |        |        |        |        |
| TRS configuration  | Config 1,2,3     |             | TRS.2.1 TDD                  |        |        |        |        |
| DRX Cycle  |                  | ms          | Not Applicable               |        |        |        |        |
| PDSCH Reference measurement channel  | Config 1,2,3     |             | SR3.1 TDD                    |        |        |        |        |
| CORESET Reference Channel  | Config 1,2,3     |             | CR3.1 TDD                    |        |        |        |        |
| OCNG Patterns  |                  |             | OCNG pattern 1               |        |        |        |        |
| CSI-RS configuration for CSI reporting   | Config 1,2,3     |             | CSI-RS.3.1 TDD               |        |        |        |        |
| SSB Configuration  | Config 1,2,3     |             | SSB.1 FR2                    |        |        |        |        |
| SMTC Configuration   |                  |             | SMTC.1                       |        |        |        |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1,2,3     | kHz         | 120 kHz                      |        |        |        |        |
| PUCCH/PUSCH subcarrier spacing   | Config 1,2,3     | kHz         | 120 kHz                      |        |        |        |        |
| PRACH configuration  |                  |             | FR2 PRACH configuration 2    |        |        |        |        |
| TCI configuration  |                  |             | CSI-RS.Config.0              |        |        |        |        |
| BWP  | Initial DL BWP   |             | DLBWP.0.1                    |        |        |        |        |
|  | Dedicated DL BWP |             | DLBWP.1.3                    |        |        |        |        |
|  | Initial UL BWP   |             | ULBWP.0.1                    |        |        |        |        |
|  | Dedicated UL BWP |             | ULBWP.1.3                    |        |        |        |        |
| EPRE ratio of PSS to SSS   |                  | dB          | 0                            |        |        |        |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |             |                              |        |        |        |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDSCH to PDSCH   |                  |             |                              |        |        |        |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |             |                              |        |        |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                  |             |                              |        |        |        |        |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/15kHz   | -104.7                       | -104.7 | -104.7 | -104.7 | -104.7 |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/SCS     | -95.7                        | -95.7  | -95.7  | -95.7  | -95.7  |
| $\hat{E}_s / I_{ot}$   |                  | dB          | -Infinity                    | 10     | 10     | 10     | 10     |
| $\hat{E}_s / N_{oc}$   |                  | dB          | -Infinity                    | 10     | 10     | 10     | 10     |
| $I_o$ <sup>Note3</sup>   |                  | dBm/9.36MHz | -66.7                        | -55.4  | -55.4  | -55.4  | -55.4  |
| Propagation condition  |                  | -           | AWGN                         |        |        |        |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                  |             |                              |        |        |        |        |



### A.7.3.1.4.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T3. During  $D_{\text{handover1}}$ , the interruption on Cell 1 shall not exceed  $T_{\text{interrupt1}}$  as defined in Table 6.1.3.4.2-1 for synchronous DAPS HO.

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

NOTE: The handover delay  $D_{\text{handover1}}$  can be expressed as:  $T_{\text{RRC\_procedure}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}}$ , where:

$T_{\text{RRC\_procedure}} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{\text{IU}} = 20$  ms in the test.  $T_{\text{IU}}$  is defined in clause 6.1.1.2.2.

$T_{\Delta} = 20$  ms in the test.  $T_{\Delta}$  is defined in clause 6.1.1.2.2.

$T_{\text{processing}} = 40$  ms in the test.  $T_{\text{processing}}$  is defined in clause 6.1.1.2.2.

$T_{\text{margin}} = 2$  ms in the test.  $T_{\text{margin}}$  is defined in clause 6.1.1.2.2.

This gives a total of 92 ms.

The UE shall complete to release Cell 1 less than  $(10 \text{ ms} + T_{\text{interrupt2}})$  from the beginning of time period T4. During  $D_{\text{handover2}}$ , the interruption on Cell 2 shall not exceed  $T_{\text{interrupt2}}$  as defined in Table 6.1.3.4.2-2 for synchronous DAPS HO.

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

NOTE: The handover delay  $D_{\text{handover2}}$  can be expressed as:  $T_{\text{RRC\_procedure}} + T_{\text{interrupt2}}$ , where:

$T_{\text{RRC\_procedure}} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

## A.7.3.1.5 Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2

### A.7.3.1.5.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR2 Inter-band inter-frequency asynchronous DAPS handover requirements specified in clause 6.1.3.4.

### A.7.3.1.5.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.5.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.5.2-2, A.7.3.1.5.2-3 and A.7.3.1.5.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A4 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0). Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A4. After receiving the Event A4, the test system shall send a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying source cell release sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.7.3.1.5.2-1: Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2 test configurations**

| Config   | Description  |
|--|--|
| 1  | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3  | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.7.3.1.5.2-2: General test parameters for Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2**

| Parameter                  | Unit              | Value                      | Comment   |
|----------------------------|-------------------|----------------------------|---|
| Initial conditions         | Active cell       | Cell 1                     |   |
|                            | Neighbouring cell | Cell 2                     |   |
| Final condition            | Active cell       | Cell 2                     |   |
| A4-Threshold               | dBm               | -120                       |   |
| Hysteresis                 | dB                | 0                          |   |
| Time To Trigger            | s                 | 0                          |   |
| Filter coefficient         |                   | 0                          | L3 filtering is not used  |
| Access Barring Information | -                 | Not Sent                   | No additional delays in random access procedure.                                  |
| Time offset between cells  | $\mu$ s           | 62.5                       | Asynchronous cells  |
| T1                         | s                 | 5                          |   |
| T2                         | s                 | <5                         |   |
| T3                         | s                 | <0.5                       |   |
| T4                         | ms                | $10+T_{\text{interrupt2}}$ | $T_{\text{interrupt2}}$ as defined in Table 6.1.3.4.2-2 for asynchronous DAPS HO. |
| T5                         | ms                | 100                        |   |

**Table A.7.3.1.5.2-3: Cell specific test parameters for Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2 (Cell 1 in FR1)**

| Parameter                                |                  | Unit                   | Cell 1                             |    |    |    |    |
|--|------------------|------------------------|------------------------------------|----|----|----|----|
|  |                  |                        | T1                                 | T2 | T3 | T4 | T5 |
| NR RF Channel Number                     |                  |                        | 1                                  |    |    |    |    |
| Duplex mode                              | Config 1         |                        | FDD                                |    |    |    |    |
|  | Config 2,3       |                        | TDD                                |    |    |    |    |
| TDD configuration                        | Config 1         |                        | Not Applicable                     |    |    |    |    |
|  | Config 2         |                        | TDDConf.1.1                        |    |    |    |    |
|  | Config 3         |                        | TDDConf.2.1                        |    |    |    |    |
| BW <sub>channel</sub>                    | Config 1         | MHz                    | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 2         |                        | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 3         |                        | 40: N <sub>RB,c</sub> = 106        |    |    |    |    |
| BWP BW                                   | Config 1         | MHz                    | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 2         |                        | 10: N <sub>RB,c</sub> = 52         |    |    |    |    |
|  | Config 3         |                        | 40: N <sub>RB,c</sub> = 106        |    |    |    |    |
| TRS configuration                        | Config 1         |                        | TRS.1.1 FDD                        |    |    |    |    |
|  | Config 2         |                        | TRS.1.1 TDD                        |    |    |    |    |
|  | Config 3         |                        | TRS.1.2 TDD                        |    |    |    |    |
| DRx Cycle                                |                  | ms                     | Not Applicable                     |    |    |    |    |
| PDSCH Reference measurement channel      | Config 1         |                        | SR.1.1 FDD                         |    |    |    |    |
|  | Config 2         |                        | SR.1.1 TDD                         |    |    |    |    |
|  | Config 3         |                        | SR2.1 TDD                          |    |    |    |    |
| CORESET Reference Channel                | Config 1         |                        | CR.1.1 FDD                         |    |    |    |    |
|  | Config 2         |                        | CR.1.1 TDD                         |    |    |    |    |
|  | Config 3         |                        | CR2.1 TDD                          |    |    |    |    |
| OCNG Patterns                            |                  |                        | OCNG pattern 1                     |    |    |    |    |
| CSI-RS configuration for CSI reporting   | Config 1         |                        | CSI-RS.1.1 FDD                     |    |    |    |    |
|  | Config 2         |                        | CSI-RS.1.1 TDD                     |    |    |    |    |
|  | Config 3         |                        | CSI-RS.2.1 TDD                     |    |    |    |    |
| SSB Configuration                        | Config 1,2       |                        | SSB.1 FR1                          |    |    |    |    |
|  | Config 3         |                        | SSB.2 FR1                          |    |    |    |    |
| SMTc Configuration                       | Config 1,2       |                        | SMTc.1                             |    |    |    |    |
|  | Config 3         |                        | SMTc.2                             |    |    |    |    |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz                    | 15 kHz                             |    |    |    |    |
|  | Config 3         |                        | 30 kHz                             |    |    |    |    |
| PUCCH/PUSCH subcarrier spacing           | Config 1,2       | kHz                    | 15 kHz                             |    |    |    |    |
|  | Config 3         |                        | 30 kHz                             |    |    |    |    |
| PRACH configuration                      |                  |                        | FR1 PRACH configuration 2          |    |    |    |    |
| BWP                                      | Initial DL BWP   |                        | DLBWP.0.1                          |    |    |    |    |
|  | Dedicated DL BWP |                        | DLBWP.1.3                          |    |    |    |    |
|  | Initial UL BWP   |                        | ULBWP.0.1                          |    |    |    |    |
|  | Dedicated UL BWP |                        | ULBWP.1.3                          |    |    |    |    |
| EPRE ratio of PSS to SSS                 |                  | dB                     | 0                                  |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS           |                  |                        |                                    |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS          |                  |                        |                                    |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS          |                  |                        |                                    |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |                        |                                    |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS          |                  |                        |                                    |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH             |                  |                        |                                    |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |                        |                                    |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |                        |                                    |    |    |    |    |
| N <sub>oc</sub> <sup>Note2</sup>         |                  | dBm/15kHz <sub>z</sub> | NA<br>Link only, see clause A.3.7A |    |    |    |    |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2       | dBm/SCS                |                                    |    |    |    |    |
|  | Config 3         |                        |                                    |    |    |    |    |
| $\hat{E}_s / I_{ot}$                     |                  | dB                     |                                    |    |    |    |    |
| $\hat{E}_s / N_{oc}$                     |                  | dB                     |                                    |    |    |    |    |

|                                 |  |                  |      |
|---------------------------------|--|------------------|------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2   | dBm/<br>9.36MHz  |      |
|                                 | Config 3   | dBm/<br>38.16MHz |      |
| Propagation condition           |  | -                | AWGN |
| Note 1:                         | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                  |      |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |      |
| Note 3:                         | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                  |      |

**Table A.7.3.1.5.2-4: Cell specific test parameters for Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2 (Cell 2 in FR2)**

| Parameter  |                  | Unit        | Cell 2                       |        |        |        |        |
|--|------------------|-------------|------------------------------|--------|--------|--------|--------|
|  |                  |             | T1                           | T2     | T3     | T4     | T5     |
| Assumption for UE beams <sup>Note 6</sup>  |                  |             | Rough                        |        |        |        |        |
| AoA setup  |                  |             | Setup 1 as defined in A.3.15 |        |        |        |        |
| NR RF Channel Number   |                  |             | 2                            |        |        |        |        |
| Duplex mode  | Config 1,2,3     |             | TDD                          |        |        |        |        |
| TDD configuration  | Config 1,2,3     |             | TDDConf.3.1                  |        |        |        |        |
| BW <sub>channel</sub>  | Config 1,2,3     | MHz         | 100: N <sub>RB,c</sub> = 66  |        |        |        |        |
| BWP BW   | Config 1,2,3     | MHz         | 100: N <sub>RB,c</sub> = 66  |        |        |        |        |
| TRS configuration  | Config 1,2,3     |             | TRS.2.1 TDD                  |        |        |        |        |
| DRX Cycle  |                  | ms          | Not Applicable               |        |        |        |        |
| PDSCH Reference measurement channel  | Config 1,2,3     |             | SR3.1 TDD                    |        |        |        |        |
| CORESET Reference Channel  | Config 1,2,3     |             | CR3.1 TDD                    |        |        |        |        |
| OCNG Patterns  |                  |             | OCNG pattern 1               |        |        |        |        |
| CSI-RS configuration for CSI reporting   | Config 1,2,3     |             | CSI-RS.3.1 TDD               |        |        |        |        |
| SSB Configuration  | Config 1,2,3     |             | SSB.1 FR2                    |        |        |        |        |
| SMTC Configuration   |                  |             | SMTC.1                       |        |        |        |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1,2,3     | kHz         | 120 kHz                      |        |        |        |        |
| PUCCH/PUSCH subcarrier spacing   | Config 1,2,3     | kHz         | 120 kHz                      |        |        |        |        |
| PRACH configuration  |                  |             | FR2 PRACH configuration 2    |        |        |        |        |
| TCI configuration  |                  |             | CSI-RS.Config.0              |        |        |        |        |
| BWP  | Initial DL BWP   |             | DLBWP.0.1                    |        |        |        |        |
|  | Dedicated DL BWP |             | DLBWP.1.3                    |        |        |        |        |
|  | Initial UL BWP   |             | ULBWP.0.1                    |        |        |        |        |
|  | Dedicated UL BWP |             | ULBWP.1.3                    |        |        |        |        |
| EPRE ratio of PSS to SSS   |                  | dB          | 0                            |        |        |        |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |             |                              |        |        |        |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |             |                              |        |        |        |        |
| EPRE ratio of PDSCH to PDSCH   |                  |             |                              |        |        |        |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |             |                              |        |        |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                  |             |                              |        |        |        |        |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/15kHz   | -104.7                       | -104.7 | -104.7 | -104.7 | -104.7 |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/SCS     | -95.7                        | -95.7  | -95.7  | -95.7  | -95.7  |
| $\hat{E}_s/I_{ot}$   |                  | dB          | -Infinity                    | 10     | 10     | 10     | 10     |
| $\hat{E}_s/N_{oc}$   |                  | dB          | -Infinity                    | 10     | 10     | 10     | 10     |
| $I_o$ <sup>Note3</sup>   |                  | dBm/9.36MHz | -66.7                        | -55.4  | -55.4  | -55.4  | -55.4  |
| Propagation condition  |                  | -           | AWGN                         |        |        |        |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                  |             |                              |        |        |        |        |

### A.7.3.1.5.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T3. During  $D_{\text{handover1}}$ , the interruption on Cell 1 shall not exceed  $T_{\text{interrupt1}}$  as defined in Table 6.1.3.4.2-1 for asynchronous DAPS HO.

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

NOTE: The handover delay  $D_{\text{handover1}}$  can be expressed as:  $T_{\text{RRC\_procedure}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}}$ , where:

$T_{\text{RRC\_procedure}} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

$T_{\text{IU}} = 20$  ms in the test.  $T_{\text{IU}}$  is defined in clause 6.1.1.2.2.

$T_{\Delta} = 20$  ms in the test.  $T_{\Delta}$  is defined in clause 6.1.1.2.2.

$T_{\text{processing}} = 40$  ms in the test.  $T_{\text{processing}}$  is defined in clause 6.1.1.2.2.

$T_{\text{margin}} = 2$  ms in the test.  $T_{\text{margin}}$  is defined in clause 6.1.1.2.2.

This gives a total of 792 ms.

The UE shall complete to release Cell 1 less than  $(10 \text{ ms} + T_{\text{interrupt2}})$  from the beginning of time period T4. During  $D_{\text{handover2}}$ , the interruption on Cell 2 shall not exceed  $T_{\text{interrupt2}}$  as defined in Table 6.1.3.4.2-2 for asynchronous DAPS HO.

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

NOTE: The handover delay  $D_{\text{handover2}}$  can be expressed as:  $T_{\text{RRC\_procedure}} + T_{\text{interrupt2}}$ , where:

$T_{\text{RRC\_procedure}} = 10$  ms and is specified in clause 12 in TS 38.331 [2].

## A.7.3.2 RRC Connection Mobility Control

### A.7.3.2.1 SA: RRC Re-establishment

#### A.7.3.2.1.1 Intra-frequency RRC Re-establishment in FR2

##### A.7.3.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.1.1-1, table A.7.3.2.1.1.1-2 and table A.7.3.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

**Table A.7.3.2.1.1.1-1: Supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2**

| Parameter                  |                 | Unit | Test configuration | Value                     | Comment  |
|----------------------------|-----------------|------|--------------------|---------------------------|--|
| Initial condition          | Active cell     |      | 1                  | Cell1                     |  |
|                            | Neighbour cells |      | 1                  | Cell2                     |  |
| Final condition            | Active cell     |      | 1                  | Cell2                     |  |
| RF Channel Number          |                 |      | 1                  | 1                         |  |
| Time offset between cells  |                 |      | 1                  | 3 $\mu$ s                 | Synchronous cells  |
| N310                       |                 | -    | 1                  | 1                         | Maximum consecutive out-of-sync indications from lower layers  |
| N311                       |                 | -    | 1                  | 1                         | Minimum consecutive in-sync indications from lower layers  |
| T310                       |                 | ms   | 1                  | 0                         | Radio link failure timer; T310 is disabled   |
| T311                       |                 | ms   | 1                  | 5000                      | RRC re-establishment timer   |
| Access Barring Information |                 | -    | 1                  | Not Sent                  | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | SSB.1 FR2                 |  |
| SMTC configuration         |                 |      | 1                  | SMTC pattern 1            |  |
| DRX cycle length           |                 | s    | 1                  | OFF                       |  |
| PRACH configuration        |                 |      | 1                  | FR2 PRACH configuration 1 | Table A.3.8.3.1-1  |
| T1                         |                 | s    | 1                  | 5                         |  |
| T2                         |                 | s    | 1                  | 4.84                      | Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 ) |
| T3                         |                 | s    | 1                  | 5                         |  |



**Table A.7.3.2.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2**

| Parameter  | Unit          | Test configuration | Cell 1                      |           |           | Cell 2                      |        |        |
|--|---------------|--------------------|-----------------------------|-----------|-----------|-----------------------------|--------|--------|
|  |               |                    | T1                          | T2        | T3        | T1                          | T2     | T3     |
| Assumption for UE beams <sup>Note 4</sup>  |               |                    | Rough                       |           |           | Rough                       |        |        |
| TDD configuration  |               | 1                  | TDDConf.3.1                 |           |           | TDDConf.3.1                 |        |        |
| BW <sub>channel</sub>  | MHz           | 1                  | 100: N <sub>RB,c</sub> = 66 |           |           | 100: N <sub>RB,c</sub> = 66 |        |        |
| Data RBs allocated   |               | 1                  | 24                          |           |           | 24                          |        |        |
| PDSCH RMC configuration  |               | 1                  | SR.3.1 TDD                  |           |           | N/A                         |        |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.3.1 TDD                  |           |           | CR.3.1 TDD                  |        |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.3.1 TDD                 |           |           | CCR.3.1 TDD                 |        |        |
| TRS configuration  |               | 1                  | TRS.2.1 TDD                 |           |           | N/A                         |        |        |
| PDSCH/PDCCH TCI state  |               | 1                  | TCI.State.2                 |           |           | N/A                         |        |        |
| OCNG Pattern   |               | 1                  | OP.1 defined in A.3.2.1     |           |           | OP.1 defined in A.3.2.1     |        |        |
| Initial DL BWP configuration   |               | 1                  | DLBWP.0.1                   |           |           | DLBWP.0.1                   |        |        |
| Initial UL BWP configuration   |               | 1                  | ULBWP.0.1                   |           |           | ULBWP.0.1                   |        |        |
| RLM-RS   |               | 1                  | SSB                         |           |           | SSB                         |        |        |
| AoA setup  |               | 1                  | Setup 1 defined in A.3.15.1 |           |           | Setup 1 defined in A.3.15.1 |        |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1                  | -0.12                       | -infinity | -infinity | -3.46                       | 2      | 2      |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | 1                  | -104.7                      |           |           |                             |        |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1                  | -95.7                       |           |           |                             |        |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 4                           | -infinity | -infinity | 2                           | 2      | 2      |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1                  | -91.7                       | -infinity | -infinity | -93.7                       | -93.7  | -93.7  |
| Io   | dBm/95.04 MHz | 1                  | -59.64                      | -62.59    | -62.59    | -59.94                      | -62.59 | -62.59 |
| Propagation Condition  |               | 1                  | AWGN                        |           |           |                             |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |               |                    |                             |           |           |                             |        |        |

### A.7.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{\text{re-establish\_delay}} = T_{\text{UL\_grant}} + T_{\text{UE\_re-establish\_delay}}$$

Where:

$T_{\text{UL\_grant}}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{\text{UL\_grant}}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 \text{ ms} + T_{identify\_intra\_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

$$N_{freq} = 1$$

$$T_{identify\_intra\_NR} = 3520 \text{ ms}$$

$T_{SI} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

$T_{PRACH} = 15 \text{ ms}$ ; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

### A.7.3.2.1.2 Inter-frequency RRC Re-establishment in FR2

#### A.7.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.2.1-1, table A.7.3.2.1.2.1-2 and table A.7.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

**Table A.7.3.2.1.2.1-1: Supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.1.2.1-2: General test parameters for NR inter-frequency RRC Re-establishment test case in FR2**

| Parameter                  |                 | Unit | Test configuration | Value                     | Comment   |
|----------------------------|-----------------|------|--------------------|---------------------------|---|
| Initial condition          | Active cell     |      | 1                  | Cell1                     |   |
|                            | Neighbour cells |      | 1                  | Cell2                     |   |
| Final condition            | Active cell     |      | 1                  | Cell2                     |   |
| RF Channel Number          |                 |      | 1                  | 1, 2                      |   |
| Time offset between cells  |                 |      | 1                  | 3 $\mu$ s                 | Synchronous cells   |
| N310                       |                 | -    | 1                  | 1                         | Maximum consecutive out-of-sync indications from lower layers   |
| N311                       |                 | -    | 1                  | 1                         | Minimum consecutive in-sync indications from lower layers   |
| T310                       |                 | ms   | 1                  | 0                         | Radio link failure timer; T310 is disabled  |
| T311                       |                 | ms   | 1                  | 5000                      | RRC re-establishment timer  |
| Access Barring Information |                 | -    | 1                  | Not Sent                  | No additional delays in random access procedure.  |
| SSB configuration          |                 |      | 1                  | SSB.1 FR2                 |   |
| SMTC configuration         |                 |      | 1                  | SMTC pattern 1            |   |
| DRX cycle length           |                 | s    | 1                  | OFF                       |   |
| PRACH configuration        |                 |      | 1                  | FR2 PRACH configuration 1 | Table A.3.8.3.1-1   |
| T1                         |                 | s    | 1                  | 5                         |   |
| T2                         |                 | s    | 1                  | 4.84                      | Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133) |
| T3                         |                 | s    | 1                  | 6                         |   |

**Table A.7.3.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR2**

| Parameter   | Unit          | Test configuration | Cell 1                                |           |           | Cell 2                      |           |        |
|---|---------------|--------------------|---------------------------------------|-----------|-----------|-----------------------------|-----------|--------|
|   |               |                    | T1                                    | T2        | T3        | T1                          | T2        | T3     |
| Assumption for UE beams <sup>Note 4</sup>   |               |                    | Rough                                 |           |           | Rough                       |           |        |
| AoA setup   |               | 1                  | Setup 3 as specified in clause A.3.15 |           |           |                             |           |        |
|   |               |                    | AoA1                                  |           |           | AoA2                        |           |        |
| TDD configuration   |               | 1                  | TDDConf.3.1                           |           |           | TDDConf.3.1                 |           |        |
| BW <sub>channel</sub>   | MHz           | 1                  | 100: N <sub>RB,c</sub> = 66           |           |           | 100: N <sub>RB,c</sub> = 66 |           |        |
| Data RBs allocated  |               | 1                  | 24                                    |           |           | 24                          |           |        |
| PDSCH RMC configuration   |               | 1                  | SR.3.1 TDD                            |           |           | N/A                         |           |        |
| RMSI CORESET RMC configuration  |               | 1                  | CR.3.1 TDD                            |           |           | CR.3.1 TDD                  |           |        |
| Dedicated CORESET RMC configuration   |               | 1                  | CCR.3.1 TDD                           |           |           | CCR.3.1 TDD                 |           |        |
| TRS configuration   |               | 1                  | TRS.2.1 TDD                           |           |           | N/A                         |           |        |
| PDSCH/PDCCH TCI state   |               | 1                  | TCI.State.2                           |           |           | N/A                         |           |        |
| OCNG Pattern  |               | 1                  | OP.1 defined in A.3.2.1               |           |           | OP.1 defined in A.3.2.1     |           |        |
| Initial DL BWP configuration  |               | 1                  | DLBWP.0.1                             |           |           | DLBWP.0.1                   |           |        |
| Initial UL BWP configuration  |               | 1                  | ULBWP.0.1                             |           |           | ULBWP.0.1                   |           |        |
| RLM-RS  |               | 1                  | SSB                                   |           |           | SSB                         |           |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/15 kHz    | 1                  | -92.1                                 |           |           | -92.1                       |           |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/SCS       | 1                  | -83.1                                 |           |           | -83.1                       |           |        |
| $\hat{E}_s / N_{oc}$  | dB            | 1                  | 0                                     | -infinity | -infinity | -infinity                   | -infinity | 0      |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note 5</sup>  | dB            | 1                  | -1.01                                 | -infinity | -infinity | -infinity                   | -infinity | -1.01  |
| SSB_RP <sup>Note3</sup>   | dBm/SCS       | 1                  | -83.1                                 | -infinity | -infinity | -infinity                   | -infinity | -83.1  |
| Io  | dBm/95.04 MHz | 1                  | -55.46                                | -58.51    | -58.51    | -58.51                      | -58.51    | -55.46 |
| Propagation Condition   |               | 1                  | AWGN                                  |           |           | AWGN                        |           |        |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>E_s/I_{ot}</math>, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 5: Calculation of <math>E_s/I_{ot\_BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MBs</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |               |                    |                                       |           |           |                             |           |        |

#### A.7.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{\text{re-establish\_delay}} = T_{\text{UL\_grant}} + T_{\text{UE\_re-establish\_delay}}$$

Where:

$T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 \text{ ms} + T_{identify\_intra\_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

$$N_{freq} = 2$$

$$T_{identify\_intra\_NR} = 1600 \text{ ms}$$

$$T_{identify\_inter\_NR} = 2080 \text{ ms}$$

$T_{SI} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

$T_{PRACH} = 15 \text{ ms}$ ; it is the additional delay caused by the random access procedure.

This gives a total of 5025 ms, allow 6 s in the test case.

### A.7.3.2.1.3 Intra-frequency RRC Re-establishment in FR2 without serving cell timing

#### A.7.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.3.1-1, table A.7.3.2.1.3.1-2 and table A.7.3.2.1.3.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

**Table A.7.3.2.1.3.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2**

| Parameter                  |                 | Unit | Test configuration | Value                     | Comment   |
|----------------------------|-----------------|------|--------------------|---------------------------|---|
| Initial condition          | Active cell     |      | 1                  | Cell1                     |   |
|                            | Neighbour cells |      | 1                  | Cell2                     |   |
| Final condition            | Active cell     |      | 1                  | Cell2                     |   |
| RF Channel Number          |                 |      | 1                  | 1                         |   |
| Time offset between cells  |                 |      | 1                  | 3 $\mu$ s                 | Synchronous cells   |
| N310                       |                 | -    | 1                  | 1                         | Maximum consecutive out-of-sync indications from lower layers   |
| N311                       |                 | -    | 1                  | 1                         | Minimum consecutive in-sync indications from lower layers   |
| T310                       |                 | ms   | 1                  | 6000                      | Radio link failure timer configured by <i>RLF-TimersAndConstants</i>  |
| T311                       |                 | ms   | 1                  | 5000                      | RRC re-establishment timer  |
| Access Barring Information |                 | -    | 1                  | Not Sent                  | No additional delays in random access procedure.  |
| SSB configuration          |                 |      | 1                  | SSB.1 FR2                 |   |
| SMTC configuration         |                 |      | 1                  | SMTC pattern 1            |   |
| DRX cycle length           |                 | s    | 1                  | OFF                       |   |
| PRACH configuration        |                 |      | 1                  | FR2 PRACH configuration 1 | Table A.3.8.3.1-1   |
| T1                         |                 | s    | 1                  | 5                         |   |
| T2                         |                 | s    | 1                  | 10.84                     | Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133) |
| T3                         |                 | s    | 1                  | 5                         |   |

**Table A.7.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2**

| Parameter  | Unit          | Test configuration | Cell 1                      |           |           | Cell 2                      |           |        |
|--|---------------|--------------------|-----------------------------|-----------|-----------|-----------------------------|-----------|--------|
|  |               |                    | T1                          | T2        | T3        | T1                          | T2        | T3     |
| Assumption for UE beams <sup>Note 4</sup>  |               |                    | Rough                       |           |           | Rough                       |           |        |
| TDD configuration  |               | 1                  | TDDConf.3.1                 |           |           | TDDConf.3.1                 |           |        |
| PDSCH RMC configuration  |               | 1                  | SR.3.1 TDD                  |           |           | N/A                         |           |        |
| RMSI CORESET RMC configuration   |               | 1                  | CR.3.1 FDD                  |           |           | CR.3.1 FDD                  |           |        |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.3.1 FDD                 |           |           | CCR.3.1 FDD                 |           |        |
| TRS configuration  |               | 1                  | TRS.2.1 TDD                 |           |           | N/A                         |           |        |
| PDSCH/PDCCH TCI state  |               | 1                  | TCI.State.2                 |           |           | N/A                         |           |        |
| OCNG Pattern   |               | 1                  | OP.1 defined in A.3.2.1     |           |           | OP.1 defined in A.3.2.1     |           |        |
| Initial DL BWP configuration   |               | 1                  | DLBWP.0.1                   |           |           | DLBWP.0.1                   |           |        |
| Initial UL BWP configuration   |               | 1                  | ULBWP.0.1                   |           |           | ULBWP.0.1                   |           |        |
| RLM-RS   |               | 1                  | SSB                         |           |           | SSB                         |           |        |
| AoA setup  |               | 1                  | Setup 1 defined in A.3.15.1 |           |           | Setup 1 defined in A.3.15.1 |           |        |
| $\hat{E}_s/I_{\alpha}$   | dB            | 1                  | 5                           | -infinity | -infinity | -infinity                   | -infinity | 5      |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz     | 1                  | -104.7                      |           |           |                             |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1                  | -95.7                       |           |           |                             |           |        |
| $\hat{E}_s/N_{oc}$   | dB            | 1                  | 5                           | -infinity | -infinity | -infinity                   | -infinity | 5      |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1                  | -90.7                       | -infinity | -infinity | -infinity                   | -infinity | -90.7  |
| $I_o$  | dBm/95.04 MHz | 1                  | -60.52                      | -66.71    | -60.52    | -60.52                      | -66.71    | -60.52 |
| Propagation Condition  |               | 1                  | AWGN                        |           |           |                             |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |               |                    |                             |           |           |                             |           |        |

### A.7.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{\text{re-establish\_delay}} = T_{\text{UL\_grant}} + T_{\text{UE\_re-establish\_delay}}$$

Where:

$T_{\text{UL\_grant}}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{\text{UL\_grant}}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 \text{ ms} + T_{identify\_intra\_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

$$N_{freq} = 1$$

$$T_{identify\_intra\_NR} = 3520 \text{ ms}$$

$T_{SI} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

$T_{PRACH} = 15 \text{ ms}$ ; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

### A.7.3.2.2 Random Access

#### A.7.3.2.2.1 4-step RA type contention based random access test in FR2 for NR Standalone

##### A.7.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.1.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.1.1-2 and Table A.7.3.2.2.1.1-3.

**Table A.7.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR2 for NR Standalone**

| Config | Description   |
|--------|---|
| 1      | NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |



**Table A.7.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for NR Standalone**

| Parameter   |          | Unit     | Test-1   | Comments  |
|---|----------|----------|--|---|
| SSB Configuration   | Config 1 |          | SSB.1 FR2  | As defined in A.3.10  |
| CSI-RS for tracking   | Config 1 |          | TRS.2.1 TDD  |   |
| Duplex Mode for Cell 1  | Config 1 |          | TDD  |   |
| TDD Configuration   | Config 1 |          | TDDConf.3.1  | As defined in A.3.1.4   |
| BW <sub>channel</sub>   | Config 1 | MHz      | 100: N <sub>RB,c</sub> = 66                        |   |
| Data RBs allocated  | Config 1 |          | 24   |   |
| OCNG Pattern <sup>Note 1</sup>  |          |          | OCNG pattern 1                                     | As defined in A.3.2.1.  |
| PDSCH Reference Channel <sup>Note 2</sup>   | Config 1 |          | SR.3.1 TDD   | As defined in A.3.1.1.  |
| RMSI CORESET Reference Channel  | Config 1 |          | CR.3.1 TDD   | As defined in A.3.1.2   |
| NR RF Channel Number  |          |          | 1  |   |
| EPRE ratio of PSS to SSS  |          | dB       | 0  |   |
| EPRE ratio of PBCH_DMRS to SSS  |          | dB       |  |   |
| EPRE ratio of PBCH to PBCH_DMRS   |          | dB       |  |   |
| EPRE ratio of PDCCH_DMRS to SSS   |          | dB       |  |   |
| EPRE ratio of PDCCH to PDCCH_DMRS   |          | dB       |  |   |
| EPRE ratio of PDSCH_DMRS to SSS   |          | dB       |  |   |
| EPRE ratio of PDSCH to PDSCH_DMRS   |          | dB       |  |   |
| ss-PBCH-BlockPower  |          | dBm/ SCS |  | +20 + $\Delta_{UL}$   |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ )   |          | dBm      | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19]  |
| PRACH Configuration   |          |          | FR2 PRACH configuration 1                          | As defined in A.3.8.3, with exceptions as defined below   |
| rsrp-ThresholdSSB   |          | dBm      | RSRP_69 + $\Delta_{DL}$                            | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process <sup>Note 4</sup> |
| preambleReceivedTargetPower   |          | dBm      | -100   | As defined in TS 38.331 [2]   |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> <p>Note 3: The <math>\Delta_{UL}</math> value is calculated as <math>-\text{ROUND}(\text{PPRACH0} - 1)</math>, where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, <math>\text{preambleReceivedTargetPower} = -100\text{dBm}</math> and <math>\text{ss-PBCH-BlockPower} = 20\text{dBm}</math>. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.</p> <p>Note 4: The <math>\Delta_{DL}</math> value is calculated as <math>(\text{RSRP}_{\text{REP}} - \text{RSRP}_{76})</math>, where RSRP<sub>REP</sub> is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP<sub>x</sub>, x is treated as a positive integer value.</p> |          |          |  |   |

**Table A.7.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for NR Standalone**

| Parameter  |                      | Unit          | Test-1  | Comments   |
|--|----------------------|---------------|---------|--|
| AoA setup  |                      |               | Setup 1 | As defined in A.3.15.1   |
| Assumption for UE beams <sup>Note 3</sup>  |                      |               | Rough   |  |
| SSB with index 0   | Es <sup>Note1</sup>  | dBm/SCS       | -80.6   | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -80.6   |  |
|  | Es/lot <sub>BB</sub> | dB            | 21.09   |  |
|  | lo                   | dBm/95.04 MHz | -56.01  | lo in symbols containing SSB index 0   |
| SSB with index 1   | Es <sup>Note1</sup>  | dBm/SCS       | -95.0   | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -95.0   |  |
|  | Es/lot <sub>BB</sub> | dB            | 6.69    |  |
|  | lo                   | dBm/95.04 MHz | -70.41  | lo in symbols containing SSB index 1   |
| Propagation Condition  |                      | -             | AWGN    |  |
| Note 1: No artificial noise is applied in this test.   |                      |               |         |  |
| Note 2: Void.  |                      |               |         |  |
| Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                      |               |         |  |

#### A.7.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.7.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.7.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

#### A.7.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### A.7.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

#### A.7.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

### A.7.3.2.2.2 4-step RA type non-contention based random access test in FR2 for NR Standalone

#### A.7.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.2.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.2.1-2 and Table A.7.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2). Test 2 is only applicable to UE which supports csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

**Table A.7.3.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for NR Standalone**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.2.1-2: General test parameters for non-contention based random access test in FR2 for NR Standalone**

| Parameter   |  | Unit     | Test-1   | Test-2   | Comments  |
|---|--|----------|--|--|---|
| SSB Configuration                                       | Config 1   |          | SSB.1 FR2  | SSB.1 FR2  | As defined in A.3.10  |
| CSI-RS for tracking                                     | Config 1   |          | TRS.2.1 TDD  | TRS.2.1 TDD  |   |
| CSI-RS Configuration                                    | Config 1   |          | N/A  | CSI-RS.3.1 TDD                                     | As defined in A.3.1.4   |
| Duplex Mode for Cell 2                                  | Config 1   |          | TDD  | TDD  |   |
| TDD Configuration                                       | Config 1   |          | TDDConf.3.1  | TDDConf.3.1  |   |
| BW <sub>channel</sub>                                   | Config 1   | MHz      | 100: N <sub>RB,c</sub> = 66                        | 100: N <sub>RB,c</sub> = 66                        |   |
| Data RBs allocated                                      | Config 1   |          | 24   | 24   |   |
| OCNG Pattern <sup>Note 1</sup>                          |  |          | OP.3   | OP.3   | As defined in A.3.2.1.  |
| PDSCH Reference Channel <sup>Note 2</sup>               | Config 1   |          | SR3.1 TDD  | SR3.1 TDD  | As defined in A.3.1.1.  |
| NR RF Channel Number                                    |  |          | 1  | 1  |   |
| EPRE ratio of PSS to SSS                                |  | dB       | 0  | 0  |   |
| EPRE ratio of PBCH_DMRS to SSS                          |  | dB       |  |  |   |
| EPRE ratio of PBCH to PBCH_DMRS                         |  | dB       |  |  |   |
| EPRE ratio of PDCCH_DMRS to SSS                         |  | dB       |  |  |   |
| EPRE ratio of PDCCH to PDCCH_DMRS                       |  | dB       |  |  |   |
| EPRE ratio of PDSCH_DMRS to SSS                         |  | dB       |  |  |   |
| EPRE ratio of PDSCH to PDSCH_DMRS                       |  | dB       |  |  |   |
| ss-PBCH-BlockPower                                      |  | dBm/ SCS | +20 + $\Delta_{UL}$                                | +20 + $\Delta_{UL}$                                | As defined in TS 38.331 [2]. $\Delta_{UL}$ is derived from the uplink calibration process <sup>Note 3</sup>     |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ ) |  | dBm      | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19]  |
| PRACH Configuration                                     |  |          | FR2 PRACH configuration 2                          | FR2 PRACH configuration 3                          | As defined in A.3.8.3, with exceptions as defined below.  |
| rsrp-ThresholdSSB                                       |  | dBm      | RSRP_69 + $\Delta_{DL}$                            | RSRP_69 + $\Delta_{DL}$                            | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process <sup>Note 4</sup> |
| preambleReceivedTargetPower                             |  | dBm      | -100   | -100   | As defined in TS 38.331 [2]   |
| Note 1:   | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.   |          |  |  |   |
| Note 2:   | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |          |  |  |   |
| Note 3:   | The $\Delta_{UL}$ value is calculated as $-\text{ROUND}(\text{PPRACH0} - 1)$ , where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, $\text{preambleReceivedTargetPower} = -100\text{dBm}$ and $\text{ss-PBCH-BlockPower} = 20\text{dBm}$ . These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.                                |          |  |  |   |
| Note 4:   | The $\Delta_{DL}$ value is calculated as $(\text{RSRP}_{\text{REP}} - \text{RSRP}_{76})$ , where $\text{RSRP}_{\text{REP}}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value $\text{RSRP}_x$ , x is treated as a positive integer value. |          |  |  |   |

**Table A.7.3.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for NR Standalone**

| Parameter  |                        | Unit              | Test-1  | Test-2  | Comments   |
|--|------------------------|-------------------|---------|---------|--|
| AoA setup  |                        |                   | Setup 1 | Setup 1 | As defined in A.3.15.1   |
| Assumption for UE beams <sup>Note 3</sup>  |                        |                   | Rough   | Rough   |  |
| SSB with index 0   | $E_s$ <sup>Note1</sup> | dBm/SC<br>S       | -80.6   | -80.6   | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP                 | dBm/SC<br>S       | -80.6   | -80.6   |  |
|  | $E_s/10_{\text{dB}}$   | dB                | 21.09   | 21.09   |  |
|  | $10$                   | dBm/95.0<br>4 MHz | -56.01  | -56.01  | $10$ in symbols containing SSB index 0   |
| SSB with index 1   | $E_s$ <sup>Note1</sup> | dBm/SC<br>S       | -95.0   | -95.0   | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|  | SSB_RP                 | dBm/SC<br>S       | -95.0   | -95.0   |  |
|  | $E_s/10_{\text{dB}}$   | dB                | 6.69    | 6.69    |  |
|  | $10$                   | dBm/95.0<br>4 MHz | -70.41  | -70.41  | $10$ in symbols containing SSB index 1   |
| Propagation Condition  |                        | -                 | AWGN    | AWGN    |  |
| Note 1: No artificial noise is applied in this test.   |                        |                   |         |         |  |
| Note 2: void.  |                        |                   |         |         |  |
| Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                        |                   |         |         |  |

#### A.7.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.7.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.1 for SSB-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.7.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.1 for CSI-RS-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.2.3 2-step RA type contention based random access test in FR2 for NR Standalone

#### A.7.3.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.3.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.3.1-2 and Table A.7.3.2.2.3.1-3.

**Table A.7.3.2.2.3.1-1: Supported test configurations for 2-step RA type contention based random access test in FR2 for NR Standalone**

| Config | Description   |
|--------|---|
| 1      | NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.3.1-2: General test parameters for 2-step RA type contention based random access test in FR2 for NR Standalone**

| Parameter   |   | Unit     | Test-1   | Comments  |
|---|---|----------|--|---|
| SSB Configuration                                       | Config 1  |          | SSB.1 FR2  | As defined in A.3.10  |
| Duplex Mode for Cell 1                                  | Config 1  |          | TDD  |   |
| TDD Configuration                                       | Config 1  |          | TDDConf.3.1  | As defined in A.3.1.4   |
| BW <sub>channel</sub>                                   | Config 1  | MHz      | 100: N <sub>RB,c</sub> = 24                        |   |
| OCNG Pattern <sup>Note 1</sup>                          |   |          | OCNG pattern 1                                     | As defined in A.3.2.1.  |
| PDSCH Reference Channel <sup>Note 2</sup>               | Config 1  |          | SR.3.1 TDD   | As defined in A.3.1.1.  |
| RMSI CORESET Reference Channel                          | Config 1  |          | CR.3.1 TDD   | As defined in A.3.1.2   |
| NR RF Channel Number                                    |   |          | 1  |   |
| EPRE ratio of PSS to SSS                                |   | dB       | 0  |   |
| EPRE ratio of PBCH_DMRS to SSS                          |   | dB       |  |   |
| EPRE ratio of PBCH to PBCH_DMRS                         |   | dB       |  |   |
| EPRE ratio of PDCCH_DMRS to SSS                         |   | dB       |  |   |
| EPRE ratio of PDCCH to PDCCH_DMRS                       |   | dB       |  |   |
| EPRE ratio of PDSCH_DMRS to SSS                         |   | dB       |  |   |
| EPRE ratio of PDSCH to PDSCH_DMRS                       |   | dB       |  |   |
| ss-PBCH-BlockPower                                      |   | dBm/ SCS | +20 + $\Delta_{UL}$                                | As defined in TS 38.331 [2].<br>$\Delta_{UL}$ is derived from the uplink calibration process <sup>Note 3</sup>  |
| Configured UE transmitted power ( $P_{C_{MAX, f, c}}$ ) |   | dBm      | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19]  |
| MsgA Configuration                                      |   |          | FR2 MsgA configuration 1                           | As defined in A.3.20.3, with exceptions as defined below  |
| <i>msgA-RSRP-ThresholdSSB</i>                           |   | dBm      | RSRP_69 + $\Delta_{DL}$                            | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process <sup>Note 4</sup> |
| preambleReceivedTargetPower                             |   | dBm      | -100   | As defined in TS 38.331 [2]   |
| Note 1:   | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  |          |  |   |
| Note 2:   | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  |          |  |   |
| Note 3:   | The $\Delta_{UL}$ value is calculated as $-\text{ROUND}(\text{PMsgA0} - 1)$ , where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, <i>msgA-PreambleReceivedTargetPower</i> = -100dBm and <i>ss-PBCH-BlockPower</i> = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.                                       |          |  |   |
| Note 4:   | The $\Delta_{DL}$ value is calculated as $(\text{RSRP}_{\text{REP}} - \text{RSRP}_{76})$ , where RSRP <sub>REP</sub> is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP <sub>x</sub> , x is treated as a positive integer value. |          |  |   |



**Table A.7.3.2.2.3.1-3: OTA-related test parameters for 2-step RA type contention based random access test in FR2 for NR Standalone**

| Parameter  |                      | Unit          | Test-1   | Comments  |
|--|----------------------|---------------|----------|---|
| AoA setup  |                      |               | Setup 2b | As defined in A.3.15.1  |
| Assumption for UE beams <sup>Note 2</sup>  |                      |               | Rough    |   |
| SSB with index 0   | Es <sup>Note1</sup>  | dBm/SCS       | -80.6    | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -80.6    |   |
|  | Es/lot <sub>BB</sub> | dB            | 21.09    |   |
|  | Io                   | dBm/95.04 MHz | -56.01   | Io in symbols containing SSB index 0  |
| SSB with index 1   | Es <sup>Note1</sup>  | dBm/SCS       | -95.0    | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -95.0    |   |
|  | Es/lot <sub>BB</sub> | dB            | 6.69     |   |
|  | Io                   | dBm/95.04 MHz | -70.41   | Io in symbols containing SSB index 1  |
| Propagation Condition  |                      | -             | AWGN     |   |
| Note 1: No artificial noise is applied in this test.   |                      |               |          |   |
| Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                      |               |          |   |

#### A.7.3.2.2.3.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.7.3.2.2.3.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.7.3.2.2.3.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.1.2 the System Simulator shall transmit a MsgB containing a fallbackRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA PRACH shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.1.3 the System Simulator shall transmit a MsgB containing a fallbackRAR message and Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA PRACH shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.4 2-step RA type non-contention based random access test in FR2 for NR Standalone

##### A.7.3.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.4.1-1. UE capable of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.4.1-2 and Table A.7.3.2.2.4.1-3.

**Table A.7.3.2.2.4.1-1: Supported test configurations for non-contention based random access test for 2-step RA type in FR2 for NR Standalone**

| Config | Description   |
|--------|---|
| 1      | NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.2.4.1-2: General test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone**

| Parameter   |          | Unit        | Test-1   | Comments   |
|---|----------|-------------|--|--|
| SSB Configuration   | Config 1 |             | SSB.1 FR2  | As defined in A.3.10   |
| Duplex Mode for Cell 2  | Config 1 |             | TDD  |  |
| TDD Configuration   | Config 1 |             | TDDConf.3.1  |  |
| BW <sub>channel</sub>   | Config 1 | MHz         | 100: N <sub>RB,c</sub> = 24                        |  |
| OCNG Pattern <sup>Note 1</sup>  |          |             | OP.3   | As defined in A.3.2.1.   |
| PDSCH Reference Channel <sup>Note 2</sup>   | Config 1 |             | SR3.1 TDD  | As defined in A.3.1.1.   |
| NR RF Channel Number  |          |             | 1  |  |
| EPRE ratio of PSS to SSS  |          | dB          | 0  |  |
| EPRE ratio of PBCH_DMRS to SSS  |          | dB          |  |  |
| EPRE ratio of PBCH to PBCH_DMRS   |          | dB          |  |  |
| EPRE ratio of PDCCH_DMRS to SSS   |          | dB          |  |  |
| EPRE ratio of PDCCH to PDCCH_DMRS   |          | dB          |  |  |
| EPRE ratio of PDSCH_DMRS to SSS   |          | dB          |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS   |          | dB          |  |  |
| ss-PBCH-BlockPower  |          | dBm/<br>SCS | +20 + $\Delta_{UL}$                                | As defined in TS 38.331 [2]. $\Delta_{UL}$ is derived from the uplink calibration process <sup>Note 3</sup>                |
| Configured UE transmitted power (P <sub>C<sub>MAX,f,c</sub></sub> )   |          | dBm         | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19]   |
| MsgA Configuration  |          |             | FR2 MsgA configuration 2                           | As defined in A.3.20.3, with exceptions as defined below.  |
| msgA-RSRP-ThresholdSSB  |          | dBm         | RSRP <sub>69</sub> + $\Delta_{DL}$                 | RSRP <sub>69</sub> corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process <sup>Note 4</sup> |
| msgA-PreambleReceivedTargetPower  |          | dBm         | -100   | As defined in TS 38.331 [2]  |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.</p> <p>Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.</p> <p>Note 3: The <math>\Delta_{UL}</math> value is calculated as <math>-\text{ROUND}(\text{P}_{\text{MsgA0}} - 1)</math>, where <math>\text{P}_{\text{MsgA0}}</math> is the measured first MsgA PRACH power with -80.6dBm/SCS applied, <math>\text{msgA-PreambleReceivedTargetPower} = -100\text{dBm}</math> and <math>\text{ss-PBCH-BlockPower} = 20\text{dBm}</math>. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.</p> <p>Note 4: The <math>\Delta_{DL}</math> value is calculated as <math>(\text{RSRP}_{\text{REP}} - \text{RSRP}_{76})</math>, where <math>\text{RSRP}_{\text{REP}}</math> is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP<sub>x</sub>, x is treated as a positive integer value.</p> |          |             |  |  |

**Table A.7.3.2.2.4.1-3: OTA-related test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone**

| Parameter  |                      | Unit          | Test-1  | Comments  |
|--|----------------------|---------------|---------|---|
| AoA setup  |                      |               | Setup 1 | As defined in A.3.15.1  |
| Assumption for UE beams <sup>Note 2</sup>  |                      |               | Rough   |   |
| SSB with index 0   | Es <sup>Note 1</sup> | dBm/SCS       | -80.6   | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -80.6   |   |
|  | Es/lot <sub>BB</sub> | dB            | 21.09   |   |
|  | lo                   | dBm/95.04 MHz | -56.01  | lo in symbols containing SSB index 0  |
| SSB with index 1   | Es <sup>Note 1</sup> | dBm/SCS       | -95.0   | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|  | SSB_RP               | dBm/SCS       | -95.0   |   |
|  | Es/lot <sub>BB</sub> | dB            | 6.69    |   |
|  | lo                   | dBm/95.04 MHz | -70.41  | lo in symbols containing SSB index 1  |
| Propagation Condition  |                      | -             | AWGN    |   |
| Note 1: No artificial noise is applied in this test.   |                      |               |         |   |
| Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |                      |               |         |   |

#### A.7.3.2.2.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.7.3.2.2.4.2.1 MsgA Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.3.2.1 for MsgA transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.7.3.2.2.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.2.2 the System Simulator shall transmit a MsgB containing a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble after 3 MsgA transmissions have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB if the MsgB contains a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA transmission power if all received Random Access Response Reception has not been considered as successful.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy

specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.2.3 the System Simulator shall transmit a MsgB corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.3 SA: RRC Connection Release with Redirection

#### A.7.3.2.3.1 Redirection from NR in FR2 to NR in FR2

##### A.7.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

##### A.7.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.7.3.2.3.1.2-2, and A.7.3.2.3.1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

**Table A.7.3.2.3.1.2-1: Redirection from NR to NR test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case**

| Parameter                  | Unit              | Value     | Comment  |
|----------------------------|-------------------|-----------|--|
| Initial conditions         | Active cell       | Cell 1    |  |
|                            | Neighbouring cell | Cell 2    |  |
| Final condition            | Active cell       | Cell 2    |  |
| Filter coefficient         |                   | 0         | L3 filtering is not used                         |
| Access Barring Information | -                 | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells  |                   | 3 $\mu$ s | Synchronous cells                                |
| T1                         | s                 | 5         |  |
| T2                         | s                 | 3.2       |  |

**Table A.7.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter   |                  | Unit      | Cell 1                       |       | Cell 2    |       |
|---|------------------|-----------|------------------------------|-------|-----------|-------|
|   |                  |           | T1                           | T2    | T1        | T2    |
| Assumption for UE beams <sup>Note 6</sup>   |                  |           | Rough                        |       | Rough     |       |
| AoA setup   |                  |           | Setup 1 as defined in A.3.15 |       |           |       |
| NR RF Channel Number  |                  |           | 1                            |       | 2         |       |
| Duplex mode   |                  |           | TDD                          |       |           |       |
| TDD configuration   |                  |           | TDDConf.3.1                  |       |           |       |
| $BW_{channel}$  |                  | MHz       | 100: $N_{RB,c} = 66$         |       |           |       |
| BWP BW  |                  | MHz       | 100: $N_{RB,c} = 66$         |       |           |       |
| Data RBs allocated  |                  |           | 66                           |       |           |       |
| DRx Cycle   |                  | ms        | Not Applicable               |       |           |       |
| PDSCH Reference measurement channel   |                  |           | SR3.1 TDD                    |       |           |       |
| RMSI CORESET Reference Channel  |                  |           | CR3.1 TDD                    |       |           |       |
| Control Channel RMC   |                  |           | CCR.3.1 TDD                  |       |           |       |
| OCNG Patterns   |                  |           | OP.1                         |       |           |       |
| SMTc configuration  |                  |           | SMTc.1 FR2                   |       |           |       |
| SSB Configuration   |                  |           | SSB.3 FR2                    |       |           |       |
| PDSCH/PDCCH subcarrier spacing  |                  | kHz       | 120 kHz                      |       |           |       |
| PUCCH/PUSCH subcarrier spacing  |                  | kHz       | 120 kHz                      |       |           |       |
| PRACH configuration   |                  |           | FR2 PRACH configuration 1    |       |           |       |
| TRS configuration   |                  |           | TRS.2.1 TDD                  |       |           |       |
| PDSCH/PDCCH TCI state   |                  |           | TCI.State.2                  |       |           |       |
| BWP configuration   | Initial DL BWP   |           | DLBWP.0.1                    |       |           |       |
|   | Dedicated DL BWP |           | DLBWP.1.1                    |       |           |       |
|   | Initial UL BWP   |           | ULBWP.0.1                    |       |           |       |
|   | Dedicated UL BWP |           | ULBWP.1.1                    |       |           |       |
| EPRE ratio of PSS to SSS  |                  | dB        | 0                            |       | 0         |       |
| EPRE ratio of PBCH DMRS to SSS  |                  |           |                              |       |           |       |
| EPRE ratio of PBCH to PBCH DMRS   |                  |           |                              |       |           |       |
| EPRE ratio of PDCCH DMRS to SSS   |                  |           |                              |       |           |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |                  |           |                              |       |           |       |
| EPRE ratio of PDSCH DMRS to SSS   |                  |           |                              |       |           |       |
| EPRE ratio of PDSCH to PDSCH  |                  |           |                              |       |           |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                  |           |                              |       |           |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |           |                              |       |           |       |
| $N_{oc}$ <sup>Note2</sup>   |                  | dBm/15kHz | -104.7                       |       | -104.7    |       |
| $N_{oc}$ <sup>Note2</sup>   |                  | dBm/SCS   | -95.7                        |       | -95.7     |       |
| $\hat{E}_s/I_{ot}$  |                  | dB        | 5                            | 5     | -Infinity | 5     |
| $\hat{E}_s/N_{oc}$  |                  | dB        | 5                            | 5     | -Infinity | 5     |
| $I_o$ <sup>Note3</sup>  |                  | dBm/BW    | -60.5                        | -60.5 | -66.7     | -60.5 |
| Propagation condition   |                  | -         | AWGN                         |       | AWGN      |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                  |           |                              |       |           |       |

### A.7.3.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{\text{connection\_release\_redirect\_NR}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-NR}} + T_{\text{SI-NR}} + T_{\text{RACH}},$$

where:

$T_{\text{RRC\_procedure\_delay}} = 110$  ms in the test.

$T_{\text{identify-NR}} = 1760$  ms in the test.

$T_{\text{SI-NR}} = 1280$  ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

$T_{\text{RACH}} = 10$  ms in the test.

This gives a total of 3160 ms.

## A.7.3.3 Conditional Handover

### A.7.3.3.1 Intra-frequency conditional handover from FR2 to FR2

#### A.7.3.3.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 intra frequency conditional handover requirements specified in clause 6.1.4.4.

#### A.7.3.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.3.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.3.2.2-2, and A.7.3.3.2.2-3.

The test scenario comprises of two cells. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. NR shall configure a condition implying handover to cell 2 during T1, at a time earlier than  $T_{\text{RRC}}$  before the beginning of T2. Starting T2, cell 2 becomes detectable.

**Table A.7.3.3.1.2-1: Intra-frequency conditional handover from FR2 to FR2 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.3.1.2-2: General test parameters for conditional Intra-frequency handover from FR2 to FR2**

| Parameter                  |                   | Unit | Value     | Comment  |
|----------------------------|-------------------|------|-----------|--|
| Initial conditions         | Active cell       |      | Cell 1    |  |
|                            | Neighbouring cell |      | Cell 2    |  |
| Final condition            | Active cell       |      | Cell 2    |  |
| A3-Offset for condition    |                   | dBm  | -1        | Trigger HO to cell which may be measured as -1dB relative to cell 1. Actual SS-RSRP is 5dB stronger. |
| Hysteresis                 |                   | dB   | 0         |  |
| Time To Trigger            |                   | s    | 0         |  |
| Filter coefficient         |                   |      | 0         | L3 filtering is not used   |
| Access Barring Information |                   | -    | Not Sent  | No additional delays in random access procedure.   |
| Time offset between cells  |                   |      | 3 $\mu$ s | Synchronous cells  |
| T1                         |                   | s    | 5         |  |
| T2                         |                   | s    | $\leq 2$  |  |



**Table A.7.3.3.1-2-3: Cell specific test parameters for NR FR2-FR2 conditional Intra frequency handover test case**

| Parameter  |                  | Unit      | Cell 1                       |       | Cell 2    |       |
|--|------------------|-----------|------------------------------|-------|-----------|-------|
|  |                  |           | T1                           | T2    | T1        | T2    |
| NR RF Channel Number   |                  |           | 1                            |       | 1         |       |
| AoA setup  |                  |           | Setup 1 as defined in A.3.15 |       |           |       |
| Assumption for UE beams <sup>Note 6</sup>  |                  |           | Rough                        |       |           |       |
| Duplex mode  |                  |           | TDD                          |       |           |       |
| TDD configuration  |                  |           | TDDConf.3.1                  |       |           |       |
| BW <sub>channel</sub>  |                  | MHz       | 100: N <sub>RB,c</sub> = 66  |       |           |       |
| BWP BW   |                  | MHz       | 100: N <sub>RB,c</sub> = 66  |       |           |       |
| DRx Cycle  |                  | ms        | Not Applicable               |       |           |       |
| PDSCH Reference measurement channel  |                  |           | SR3.1 TDD                    |       |           |       |
| CORESET Reference Channel  |                  |           | CR3.1 TDD                    |       |           |       |
| OCNG Patterns  |                  |           | OCNG pattern 1               |       |           |       |
| SMTC Configuration   |                  |           | SMTC pattern 1               |       |           |       |
| SSB Configuration  |                  |           | SSB.1 FR2                    |       |           |       |
| PDSCH/PDCCH subcarrier spacing   |                  | kHz       | 120 kHz                      |       |           |       |
| PUCCH/PUSCH subcarrier spacing   |                  | kHz       | 120 kHz                      |       |           |       |
| PRACH configuration  |                  |           | FR2 PRACH configuration 1    |       |           |       |
| TRS configuration  |                  |           | TRS.2.1 TDD                  |       |           |       |
| TCI configuration  |                  |           | CSI-RS.Config.0              |       |           |       |
| BWP configuration  | Initial DL BWP   |           | DLBWP.0.1                    |       |           |       |
|  | Dedicated DL BWP |           | DLBWP.1.1                    |       |           |       |
|  | Initial UL BWP   |           | ULBWP.0.1                    |       |           |       |
|  | Dedicated UL BWP |           | ULBWP.1.1                    |       |           |       |
| EPRE ratio of PSS to SSS   |                  | dB        | 0                            |       | 0         |       |
| EPRE ratio of PBCH DMRS to SSS   |                  |           |                              |       |           |       |
| EPRE ratio of PBCH to PBCH DMRS  |                  |           |                              |       |           |       |
| EPRE ratio of PDCCH DMRS to SSS  |                  |           |                              |       |           |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |           |                              |       |           |       |
| EPRE ratio of PDSCH DMRS to SSS  |                  |           |                              |       |           |       |
| EPRE ratio of PDSCH to PDSCH   |                  |           |                              |       |           |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |           |                              |       |           |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                  |           |                              |       |           |       |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/15kHz | -104.7                       |       | -104.7    |       |
| $N_{oc}$ <sup>Note2</sup>  | Config 1         | dBm/SCS   | -95.7                        |       | -95.7     |       |
| $\hat{E}_s/I_{otBB}$ <sup>Note 8</sup>   |                  | dB        | 5.03                         | -5.41 | -Infinity | 3.81  |
| $\hat{E}_s/N_{oc}$   |                  | dB        | 6                            | 6     | -Infinity | 11    |
| $I_o$ <sup>Note3</sup>   | Config 1         | dBm/BW    | -59.7                        | -54.2 | -59.7     | -54.2 |
| Propagation condition  |                  | -         | AWGN                         |       |           |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 7: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 8: Calculation of <math>E_s/I_{otBB}</math> includes the effect of UE internal noise up to the value assumed for the associated REFSENS requirement in TS 38.101-2 [19] clause 7.3.2, and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta_{MBS}</math> specified in TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                  |           |                              |       |           |       |

### A.7.3.3.1.2.3 Test Requirements

$T_{RRC} + T_{Event\_DU}$  occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{measure} + T_{interrupt} + T_{CHO\_execution} = 1600 + 62 + 10 = 1672$  ms (power class 1) or  $1080 + 62 + 10 = 1152$  (PC2/3/4)  $62$  ms =  $1152$  ms (power classes 2,3 and 4) from the start of T2 and the interruption during T2 shall not exceed  $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} = 40 + 20 + 2 = 62$  ms excluding any transmissions which do not occur due to scheduling restrictions.

### A.7.3.3.2 Inter-frequency conditional handover from FR2 to FR2; unknown target cell

#### A.7.3.3.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 inter frequency conditional handover requirements specified in clause 6.1.4.4.

#### A.7.3.3.2.2 Test Parameters

Supported test configurations are shown in table A.7.3.3.2-1. Both conditional handover delay and interruption length are tested by using the parameters in table A.7.3.3.2-2, and A.7.3.3.2-3.

The test scenario comprises of two carriers and one cell on each carrier. Gap pattern ID gp0 is configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. NR shall configure a condition implying handover to cell 2 during T1, at a time earlier than  $T_{RRC}$  before the beginning of T2. At the start of T2, cell 2 becomes detectable and meets the handover condition.

**Table A.7.3.3.2.2-1: Inter-frequency conditional handover from FR2 to FR2 test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.3.2.2-2: General test parameters Inter-frequency conditional handover from FR2 to FR2**

| Parameter                       | Unit              | Value     | Comment  |
|---------------------------------|-------------------|-----------|--|
| Initial conditions              | Active cell       | Cell 1    |  |
|                                 | Neighbouring cell | Cell 2    |  |
| Final condition                 | Active cell       | Cell 2    |  |
| A3-Offset for handovercondition | dB                | FFS       |  |
| Hysteresis                      | dB                | 0         |  |
| Time To Trigger                 | s                 | 0         |  |
| Filter coefficient              |                   | 0         | L3 filtering is not used                         |
| Access Barring Information      | -                 | Not Sent  | No additional delays in random access procedure. |
| Time offset between cells       |                   | 3 $\mu$ s | Synchronous cells                                |
| T1                              | s                 | 5         |  |
| T2                              | s                 | $\leq 7$  |  |

**Table A.7.3.3.2-3: Cell specific test parameters for NR FR2-FR2 Inter frequency conditional handover test case**

| Parameter  |                  | Unit      | Cell 1                       |       | Cell 2    |       |
|--|------------------|-----------|------------------------------|-------|-----------|-------|
|  |                  |           | T1                           | T2    | T1        | T2    |
| NR RF Channel Number   |                  |           | 1                            |       | 2         |       |
| AoA setup  |                  |           | Setup 1 as defined in A.3.15 |       |           |       |
| Assumption for UE beams <sup>Note 6</sup>  |                  |           | Rough                        |       |           |       |
| Duplex mode  |                  |           | TDD                          |       |           |       |
| TDD configuration  |                  |           | TDDConf.3.1                  |       |           |       |
| BW <sub>channel</sub>  |                  | MHz       | 100: N <sub>RB,c</sub> = 66  |       |           |       |
| BWP BW   |                  | MHz       | 100: N <sub>RB,c</sub> = 66  |       |           |       |
| DRx Cycle  |                  | ms        | Not Applicable               |       |           |       |
| Gap pattern ID   |                  |           | gp0                          |       |           |       |
| PDSCH Reference measurement channel  |                  |           | SR3.1 TDD                    |       |           |       |
| CORESET Reference Channel  |                  |           | CR3.1 TDD                    |       |           |       |
| OCNG Patterns  |                  |           | OCNG pattern 1               |       |           |       |
| SMTC Configuration   |                  |           | SMTC pattern 1               |       |           |       |
| SSB Configuration  |                  |           | SSB.1 FR2                    |       |           |       |
| PDSCH/PDCCH subcarrier spacing   |                  | kHz       | 120 kHz                      |       |           |       |
| PUCCH/PUSCH subcarrier spacing   |                  | kHz       | 120 kHz                      |       |           |       |
| PRACH configuration  |                  |           | FR2 PRACH configuration 1    |       |           |       |
| TRS configuration  |                  |           | TRS.2.1 TDD                  |       |           |       |
| TCI configuration  |                  |           | CSI-RS.Config.0              |       |           |       |
| BWP configuraiton  | Initial DL BWP   |           | DLBWP.0.1                    |       |           |       |
|  | Dedicated DL BWP |           | DLBWP.1.1                    |       |           |       |
|  | Initial UL BWP   |           | ULBWP.0.1                    |       |           |       |
|  | Dedicated UL BWP |           | ULBWP.1.1                    |       |           |       |
| EPRE ratio of PSS to SSS   |                  | dB        | 0                            |       | 0         |       |
| EPRE ratio of PBCH DMRS to SSS   |                  |           |                              |       |           |       |
| EPRE ratio of PBCH to PBCH DMRS  |                  |           |                              |       |           |       |
| EPRE ratio of PDCCH DMRS to SSS  |                  |           |                              |       |           |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |           |                              |       |           |       |
| EPRE ratio of PDSCH DMRS to SSS  |                  |           |                              |       |           |       |
| EPRE ratio of PDSCH to PDSCH   |                  |           |                              |       |           |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |           |                              |       |           |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                  |           |                              |       |           |       |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/15kHz | -104.7                       |       | -104.7    |       |
| $N_{oc}$ <sup>Note2</sup>  | Config 1,2       | dBm/SCS   | -95.7                        |       | -95.7     |       |
|  | Config 3         |           | -95.7                        |       | -95.7     |       |
| $\hat{E}_s / I_{ot}$   |                  | dB        | 5                            | 5     | -Infinity | 5     |
| $\hat{E}_s / N_{oc}$   |                  | dB        | 5                            | 5     | -Infinity | 5     |
| $I_o$ <sup>Note3</sup>   | Config 1,2       | dBm/BW    | -60.5                        | -60.5 | -66.7     | -60.5 |
|  | Config 3         | dBm/BW    | -60.5                        | -60.5 | -66.7     | -60.5 |
| Propagation condition  |                  | -         | AWGN                         |       |           |       |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                  |           |                              |       |           |       |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                  |           |                              |       |           |       |
| Note 3: $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                  |           |                              |       |           |       |
| Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                  |           |                              |       |           |       |
| Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  |                  |           |                              |       |           |       |
| Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                  |           |                              |       |           |       |

### A.7.3.3.2.3 Test Requirements

$T_{RRC} + T_{Event\_DU}$  occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{measure} + T_{interrupt} + T_{CHO\_execution} = 6720+62+10\text{ms}=6792$  ms (power class 1) or  $4160+62+10\text{ms}=4232\text{ms}$  (power classes 2,3 and 4) from the start of T2 and the interruption during T2 shall not exceed  $T_{interrupt}=T_{processing} + T_{IU} + T_{\Delta} + T_{margin} =40+20+2 = 62\text{ms}$  excluding any transmissions which do not occur due to scheduling restrictions. excluding any transmissions which do not occur due to scheduling restrictions.

## A.7.4 Timing

### A.7.4.1 UE transmit timing

#### A.7.4.1.1 NR UE Transmit Timing Test for FR2

##### A.7.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 7.4.1.1.1-1.

**Table A.7.4.1.1.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

For this test a single NR cell is used. Tables A.7.4.1.1.1-2 and A.7.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.7.4.1.1.1-3.

**Table A.7.4.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter  | Unit | Config | Test1                       | Test2                       |
|--|------|--------|-----------------------------|-----------------------------|
| SSB ARFCN  |      | 1      | Freq1                       | Freq1                       |
| TDD configuration  |      | 1      | TDDConf.3.1                 |                             |
| BW <sub>channel</sub>  | MHz  | 1      | 100: N <sub>RB,c</sub> = 66 |                             |
| Data RBs allocated   |      | 1      | 66                          |                             |
| Initial BWP Configuration  |      | 1      | DLBWP.0.1<br>ULBWP.0.1      |                             |
| Dedicated BWP Configuration  |      | 1      | DLBWP.1.1<br>ULBWP.1.1      |                             |
| TRS Configuration  |      | 1      | TRS.2.1 TDD                 |                             |
| PDSCH/PDCCH TCI state  |      | 1      | TCI.State.2                 |                             |
| DRx Cycle  | ms   | 1      | N/A                         | DRX.8 <sup>Note5</sup>      |
| PDSCH Reference measurement channel  |      | 1      | SR.3.3 TDD                  |                             |
| RMSI CORESET Reference Channel   |      | 1      | CR.3.2 TDD                  |                             |
| Dedicated CORESET Reference Channel  |      | 1      | CCR.3.7 TDD                 |                             |
| OCNG Patterns  |      | 1      | OP.1                        |                             |
| SSB Configuration  |      | 1      | SSB.4 FR2                   |                             |
| SMTC Configuration   |      | 1      | SMTC.1                      |                             |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 1      | 120                         |                             |
| EPRE ratio of PSS to SSS   | dB   | 1      | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |      |        |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS  |      |        |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS  |      |        |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |        |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS  |      |        |                             |                             |
| EPRE ratio of PDSCH to PDSCH   |      |        |                             |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |      |        |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |      |        |                             |                             |
| Propagation condition  |      |        |                             |                             |
| SRS Config   |      | 1      | SRSCConf.1 <sup>Note6</sup> | SRSCConf.2 <sup>Note6</sup> |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: DRx related parameters are given in Table A.3.3.8-1<br>Note 6: SRS configs are given in Table A.7.4.1.1-3 |      |        |                             |                             |

**Table A.7.4.1.1.1-2A: OTA related test parameters**

| Parameter   | Unit                           | Test 1                               | Test 2 |
|---|--------------------------------|--------------------------------------|--------|
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note6</sup>  |                                | Fine                                 |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -112                                 |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -100                                 |        |
| $\hat{E}_s/N_{oc}$  | dB                             | 4                                    |        |
| SSB_RP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -96                                  |        |
| $\hat{E}_s/I_{ot}$  | dB                             | 4                                    |        |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -68.5                                |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |

**Table A.7.4.1.1.1-3: SRS Configuration for Timing Accuracy Test**

|                 | Field                            | SRSCConf.1 | SRSCConf.2        | Comments                             |
|-----------------|----------------------------------|------------|-------------------|--------------------------------------|
| SRS-ResourceSet | srs-ResourceSetId                | 0          | 0                 |                                      |
|                 | srs-ResourceIdList               | 0          | 0                 |                                      |
|                 | resourceType                     | Periodic   | Periodic          |                                      |
|                 | Usage                            | Codebook   | Codebook          |                                      |
| SRS-Resource    | SRS-ResourceId                   | 0          | 0                 |                                      |
|                 | nrofSRS-Ports                    | Port1      | Port1             |                                      |
|                 | transmissionComb                 | n2         | n2                |                                      |
|                 | combOffset-n2                    | 0          | 0                 |                                      |
|                 | cyclicShift-n2                   | 0          | 0                 |                                      |
|                 | resourceMapping startPosition    | 0          | 0                 |                                      |
|                 | resourceMapping nrofSymbols      | n1         | n1                |                                      |
|                 | resourceMapping repetitionFactor | n1         | n1                |                                      |
|                 | freqDomainPosition               | 0          | 0                 |                                      |
|                 | freqDomainShift                  | 0          | 0                 |                                      |
|                 | freqHopping c-SRS                | 17         | 17                | Matches $N_{RB,c}$                   |
|                 | freqHopping b-SRS                | 0          | 0                 |                                      |
|                 | freqHopping b-hop                | 0          | 0                 |                                      |
|                 | groupOrSequenceHopping           | Neither    | Neither           |                                      |
|                 | resourceType                     | Periodic   | Periodic          |                                      |
|                 | periodicityAndOffset-p           | sl1, 0     | sl2560, 4         | Offset to align with DRx periodicity |
| sequenceId      | 0                                | 0          | Any 10 bit number |                                      |

**Table A.7.4.1.1.1-4: Void**

### A.7.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test:

- 1) Setup NR PCell according to parameters given in Table A.7.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_c$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 13792
  - b. The  $T_c$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.7.4.1.1.2-1

**Table A.7.4.1.1.2-1 Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value    |                     |
|--------------------------|---------------------|---------------------|
|                          | Test1               | Test2               |
| 240                      | +8*64T <sub>c</sub> | +4*64T <sub>c</sub> |

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_c$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_c$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

## A.7.4.2 UE timer accuracy

### A.7.4.3 Timing advance

#### A.7.4.3.1 SA FR2 timing advance adjustment accuracy

##### A.7.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

##### A.7.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.7.4.3.1.2-2, A.7.4.3.1.2-3 and A.7.4.3.1.2-4.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.7.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.7.4.3.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.3.2.1, the UE adjusts its uplink timing at slot  $n+k$  for a timing advance command received in slot  $n$ . This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

**Table A.7.4.3.1.2-1: Timing advance supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.4.3.1.2-2: General test parameters for timing advance**

| Parameter  | Unit | Value     | Comment   |
|--|------|-----------|---|
| RF channel number                                |      | 1         |   |
| Initial DL BWP                                   |      | DLBWP.0.1 | As specified in Table A.3.9.2.1-1   |
| Dedicated DL BWP                                 |      | DLBWP.1.1 | As specified in Table A.3.9.2.2-1   |
| Initial UL BWP                                   |      | ULBWP.0.1 | As specified in Table A.3.9.3.1-1   |
| Dedicated UL BWP                                 |      | ULBWP.1.1 | As specified in Table A.3.9.3.2-1   |
| Timing Advance Command ( $T_A$ ) value during T1 |      | 31        | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ( $T_A$ ) value during T2 |      | 39        | For 120 kHz SCS $N_{TA\_new} = N_{TA\_old} + 1024 * T_c$ (based on equation in clause 4.2 of TS 38.213 [3])   |
| T1   | s    | 5         |   |
| T2   | s    | 5         |   |



Table A.7.4.3.1.2-3: Cell specific test parameters for timing advance

| Parameter                                | Unit   | Test1                       |    |
|--|--|-----------------------------|----|
|  |  | T1                          | T2 |
| Duplex mode                              |  | TDD                         |    |
| TDD configuration                        |  | TDDConf.3.1                 |    |
| BW <sub>channel</sub>                    | MHz  | 100: N <sub>RB,c</sub> = 66 |    |
| BWP BW                                   | MHz  | 100: N <sub>RB,c</sub> = 66 |    |
| DRx Cycle                                | ms   | Not Applicable              |    |
| PDSCH Reference measurement channel      |  | SR.3.1 TDD                  |    |
| CORESET Reference Channel                |  | CR.3.1 TDD                  |    |
| OCNG Patterns                            |  | OCNG pattern 1              |    |
| TRS configuration                        |  | TRS.2.1 TDD                 |    |
| PDSCH/PDCCH TCI state                    |  | TCI.State.2                 |    |
| SMTC configuration                       |  | SMTC.1 FR2                  |    |
| SSB Configuration                        |  | SSB.3 FR2                   |    |
| PDSCH/PDCCH subcarrier spacing           | kHz  | 120 kHz                     |    |
| PUCCH/PUSCH subcarrier spacing           | kHz  | 120 kHz                     |    |
| EPRE ratio of PSS to SSS                 | dB   | 0                           |    |
| EPRE ratio of PBCH DMRS to SSS           |  |                             |    |
| EPRE ratio of PBCH to PBCH DMRS          |  |                             |    |
| EPRE ratio of PDCCH DMRS to SSS          |  |                             |    |
| EPRE ratio of PDCCH to PDCCH DMRS        |  |                             |    |
| EPRE ratio of PDSCH DMRS to SSS          |  |                             |    |
| EPRE ratio of PDSCH to PDSCH             |  |                             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |  |                             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |                             |    |
| Propagation condition                    |  |                             |    |
| Note 1:                                  | OCNG shall be used such that the resources in the cell in this test are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.                              |                             |    |
| Note 2:                                  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                             |    |
| Note 3:                                  | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                             |    |
| Note 4:                                  | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                             |    |
| Note 5:                                  | As observed with 0 dBi gain antenna at the centre of the quiet zone  |                             |    |

Table A.7.4.3.1.2-3A: OTA related test parameters

| Parameter   | Unit                           | Test 1                               |    |
|---|--------------------------------|--------------------------------------|----|
|   |                                | T1                                   | T2 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |    |
| Assumption for UE beams <sup>Note 6</sup>   |                                | Fine                                 |    |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -112                                 |    |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -103                                 |    |
| $\hat{E}_s/N_{oc}$  | dB                             | 4                                    |    |
| SS-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -99                                  |    |
| $\hat{E}_s/I_{ot}$  | dB                             | 4                                    |    |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -68.5                                |    |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |    |

**Table A.7.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance**

| Field  | Value       | Comment   |
|--|-------------|---|
| c-SRS  | 16          | Frequency hopping is disabled   |
| b-SRS  | 0           |   |
| b-hop  | 0           |   |
| freqDomainPosition   | 0           | Frequency domain position of SRS  |
| freqDomainShift  | 0           |   |
| groupOrSequenceHopping   | neither     | No group or sequence hopping  |
| SRS-PeriodicityAndOffset   | sl5=0       | Once every 5 slots  |
| pathlossReferenceRS  | ssb-Index=0 | SSB #0 is used for SRS path loss estimation   |
| usage  | Codebook    | Codebook based UL transmission  |
| startPosition  | 0           | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols  | n1          |   |
| repetitionFactor   | n1          |   |
| combOffset-n2  | 0           |   |
| cyclicShift-n2   | 0           | transmissionComb setting  |
| nrofSRS-Ports  | port1       | Number of antenna ports used for SRS transmission   |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |             |   |

### A.7.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e.  $k+1$  slots after the reception of the timing advance command, where  $k = 11$ .

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3.2.2.

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

## A.7.5 Signaling characteristics

### A.7.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

*Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.*

#### A.7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

##### A.7.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.7.5.1.1.1-1. The test parameters are given in Tables A.7.5.1.1.1-2, A.7.5.1.1.1-3, and A.7.5.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.7.5.1.1.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1, the UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

**Table A.7.5.1.1.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description                                       |
|---------------|---|
| 1             | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Table A.7.5.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

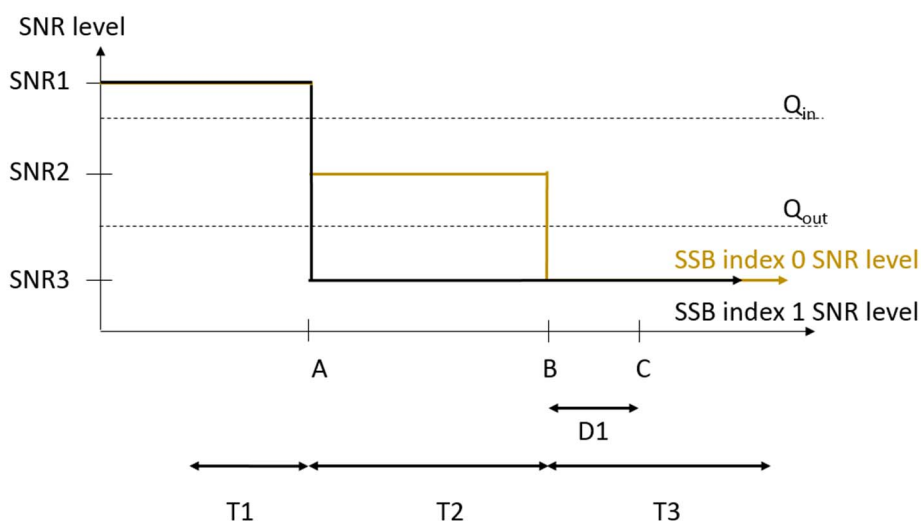
| Parameter   |  | Unit | Value<br>Test 1             |
|---|--|------|-----------------------------|
| Active PCell  |  |      | Cell 1                      |
| RF Channel Number   |  |      | 1                           |
| Duplex mode   | Config 1   |      | TDD                         |
| BW <sub>channel</sub>   | Config 1   |      | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated  | Config 1   |      | 24                          |
| DL initial BWP configuration  | Config 1   |      | DLBWP.0.1                   |
| DL dedicated BWP configuration  | Config 1   |      | DLBWP.1.1                   |
| UL initial BWP configuration  | Config 1   |      | ULBWP.0.1                   |
| UL dedicated BWP configuration  | Config 1   |      | ULBWP.1.1                   |
| TDD Configuration   | Config 1   |      | TDDConf.3.1                 |
| RMSI CORESET Reference Channel  | Config 1   |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | Config 1   |      | CCR.3.4 TDD                 |
| SSB Configuration   | Config 1   |      | SSB.1 FR2                   |
| SMTC Configuration  | Config 1   |      | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing  | Config 1   |      | 120 KHz                     |
| PRACH Configuration   | Config 1   |      | Table A.3.8.3.4             |
| SSB index assigned as RLM RS  | Config 1   |      | 0,1                         |
| OCNG parameters   |  |      | OP.5                        |
| CP length   |  |      | Normal                      |
| Out of sync transmission parameters   | DCI format   |      | 1-0                         |
|   | Number of Control OFDM symbols                                   |      | 2                           |
|   | Aggregation level  | CCE  | 8                           |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|   | DMRS precoder granularity  |      | REG bundle size             |
| REG bundle size   |  |      | 6                           |
| DRX   |  |      | OFF                         |
| Gap pattern ID  |  |      | gp0                         |
| Layer 3 filtering   |  |      | Enabled                     |
| T310 timer  |  | ms   | 0                           |
| T311 timer  |  | ms   | 1000                        |
| N310  |  |      | 1                           |
| N311  |  |      | 1                           |
| CSI-RS for CSI reporting  | Config 1   |      | CSI-RS.3.1 TDD              |
| reportConfigType  |  |      | periodic                    |
| reportQuantity  |  |      | cri-RI-PMI-CQI              |
| CSI reporting periodicity   |  | slot | 40                          |
| CSI reporting offset  |  | slot | 4                           |
| TCI states for PDCCH/PDSCH  |  |      | TCI.State.2                 |
| CSI-RS for tracking   | Config 1   |      | TRS.2.1 TDD                 |
| T1  |  | s    | 0.2                         |
| T2  |  | s    | 9.68                        |
| T3  |  | s    | 9.68                        |
| D1  |  | s    | 9.64                        |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |      |                             |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |      |                             |

**Table A.7.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter   |          | Unit          | Test 1                          |                      |     |                     |     |     |
|---|----------|---------------|---------------------------------|----------------------|-----|---------------------|-----|-----|
|   |          |               | T1                              | T2                   | T3  | T1                  | T2  | T3  |
| AoA setup   |          |               | Setup 3 defined in A.3.15       |                      |     |                     |     |     |
|   |          |               | AoA1                            |                      |     | AoA2                |     |     |
| Assumption for UE beams <sup>Note 5</sup>   |          |               | Rough                           |                      |     | Rough               |     |     |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB            | 4                               |                      |     | Not sent            |     |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB            | 0                               |                      |     |                     |     |     |
| EPRE ratio of PBCH DMRS to SSS  |          | dB            |                                 |                      |     |                     |     |     |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB            |                                 |                      |     |                     |     |     |
| EPRE ratio of PSS to SSS  |          | dB            |                                 |                      |     |                     |     |     |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB            |                                 |                      |     |                     |     |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB            |                                 |                      |     |                     |     |     |
| EPRE ratio of OCNG DMRS to SSS  |          | dB            |                                 |                      |     |                     |     |     |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB            |                                 |                      |     |                     |     |     |
| ssb-Index 0 SNR   | Config 1 | dB            | 2 <sup>Note 6</sup>             | -6 <sup>Note 6</sup> | -15 |                     |     |     |
| ssb-Index 1 SNR   | Config 1 |               | Not sent                        |                      |     | 2 <sup>Note 6</sup> | -15 | -15 |
| $N_{oc}$  | Config 1 | dBm/<br>15kHz | -92.1                           |                      |     | -92.1               |     |     |
| Time multiplexing of the downlink transmissions from each AoA   |          |               | Defined in Figure A.7.5.1.1.1-2 |                      |     |                     |     |     |
| Propagation condition   |          |               | TDL-A 30ns 75Hz                 |                      |     | TDL-A 30ns 75Hz     |     |     |
| Note 1: OCNG shall be used such that and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.<br>Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.<br>Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband |          |               |                                 |                      |     |                     |     |     |

**Table A.7.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode**

| Field     | Test 1 |
|-----------|--------|
|           | Value  |
| gapOffset | 0      |



**Figure A.7.5.1.1.1-1: SNR variation for out-of-sync testing**

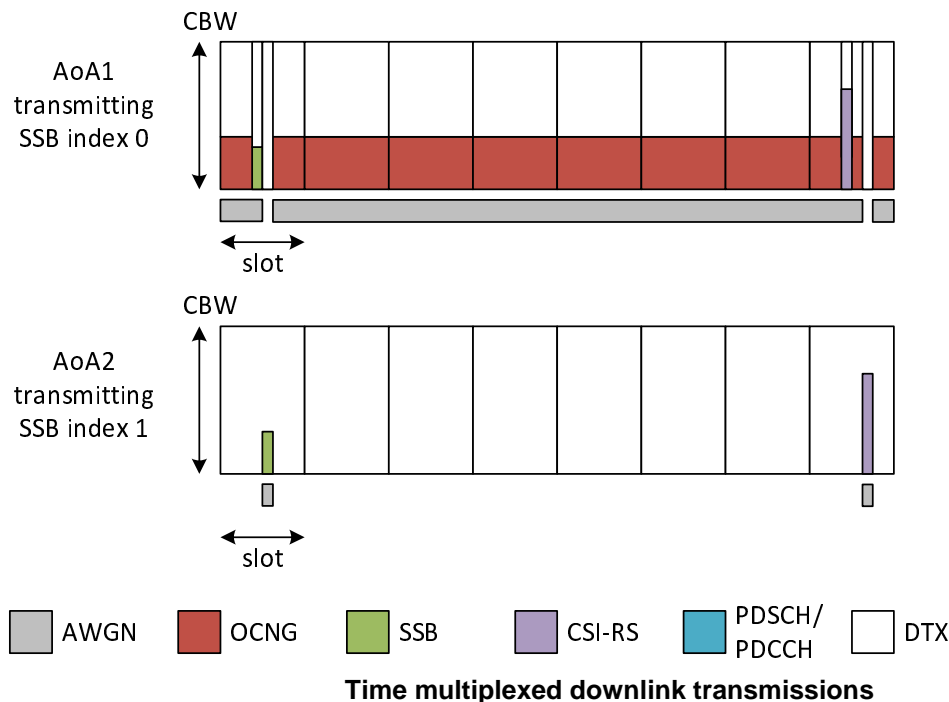


Figure A.7.5.1.1.1-2:

Time multiplexed downlink transmissions

A.7.5.1.1.2 Test Requirements

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

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

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

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

A.7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

A.7.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.7.5.1.2.1-1. The test parameters are given in Tables A.7.5.1.2.1-2, and A.7.5.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.7.5.1.2.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.7.5.1.2.1-1: Supported test configurations for FR2 PCell

| Configuration | Description                                       |
|---------------|---|
| 1             | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

**Table A.7.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode**

| Parameter                           |  | Unit | Value                       |
|-------------------------------------|--|------|-----------------------------|
|                                     |  |      | Test 1                      |
| Active PCell                        |  |      | Cell 1                      |
| RF Channel Number                   |  |      | 1                           |
| Duplex mode                         | Config 1   |      | TDD                         |
| BW <sub>channel</sub>               | Config 1   |      | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated                  | Config 1   |      | 24                          |
| DL initial BWP configuration        | Config 1   |      | DLBWP.0.1                   |
| DL dedicated BWP configuration      | Config 1   |      | DLBWP.1.1                   |
| UL initial BWP configuration        | Config 1   |      | ULBWP.0.1                   |
| UL dedicated BWP configuration      | Config 1   |      | ULBWP.1.1                   |
| TDD Configuration                   | Config 1   |      | TDDConf.3.1                 |
| RMSI CORESET Reference Channel      | Config 1   |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel | Config 1   |      | CCR.3.1 TDD                 |
| SSB Configuration                   | Config 1   |      | SSB.1 FR2                   |
| SMTC Configuration                  | Config 1   |      | SMTC.3                      |
| PDSCH/PDCCH subcarrier spacing      | Config 1   |      | 120 KHz                     |
| PRACH Configuration                 | Config 1   |      | Table A.3.8.3.4             |
| SSB index assigned as RLM RS        | Config 1   |      | 0,1                         |
| OCNG parameters                     |  |      | OP.5                        |
| CP length                           |  |      | Normal                      |
| In sync transmission parameters     | DCI format   |      | 1-0                         |
|                                     | Number of Control OFDM symbols                                   |      | 2                           |
|                                     | Aggregation level  | CCE  | 4                           |
|                                     | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                           |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                           |
|                                     | DMRS precoder granularity  |      | REG bundle size             |
| Out of sync transmission parameters | REG bundle size  |      | 6                           |
|                                     | DCI format   |      | 1-0                         |
|                                     | Number of Control OFDM symbols                                   |      | 2                           |
|                                     | Aggregation level  | CCE  | 8                           |
|                                     | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|                                     | DMRS precoder granularity  |      | REG bundle size             |
| REG bundle size                     |  | 6    |                             |
| DRX                                 |  |      | OFF                         |
| Gap pattern ID                      |  |      | N.A.                        |
| Layer 3 filtering                   |  |      | Enabled                     |
| T310 timer                          |  | ms   | 4000                        |
| T311 timer                          |  | ms   | 1000                        |
| N310                                |  |      | 1                           |
| N311                                |  |      | 1                           |
| CSI-RS for CSI reporting            | Config 1   |      | CSI-RS.3.1 TDD              |
| reportConfigType                    |  |      | periodic                    |
| reportQuantity                      |  |      | cri-RI-PMI-CQI              |
| CSI reporting periodicity           |  | slot | 40                          |
| CSI reporting offset                |  | slot | 4                           |
| TCI states for PDCCH/PDSCH          |  |      | TCI.State.2                 |
| CSI-RS for tracking                 | Config 1   |      | TRS.2.1 TDD                 |
| T1                                  |  | s    | 0.2                         |
| T2                                  |  | s    | 0.2                         |
| T3                                  |  | s    | 1.88                        |
| T4                                  |  | s    | 0.2                         |



|   |   |      |
|---|---|------|
| T5  | s | 3.84 |
| D1  | s | 3.8  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |   |      |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |   |      |

**Table A.7.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter  | Unit     | Test 1                    |                                 |                      |     |      |                     |                     |     |     |     |     |
|--|----------|---------------------------|---------------------------------|----------------------|-----|------|---------------------|---------------------|-----|-----|-----|-----|
|  |          | T1                        | T2                              | T3                   | T4  | T5   | T1                  | T2                  | T3  | T4  | T5  |     |
| oA setup   |          | Setup 3 defined in A.3.15 |                                 |                      |     |      |                     |                     |     |     |     |     |
| Assumption for UE beams <sup>Note 5</sup>  |          | AoA1<br>Rough             |                                 |                      |     |      | AoA2<br>Rough       |                     |     |     |     |     |
| PRE ratio of PDCCH DMRS to SSS   | dB       | 0                         |                                 |                      |     |      | Not sent            |                     |     |     |     |     |
| PRE ratio of PDCCH to PDCCH DMRS   | dB       | 0                         |                                 |                      |     |      |                     |                     |     |     |     |     |
| PRE ratio of PBCH DMRS to SSS  | dB       |                           |                                 |                      |     |      |                     |                     |     |     |     |     |
| PRE ratio of PBCH to PBCH DMRS   | dB       |                           |                                 |                      |     |      |                     |                     |     |     |     |     |
| PRE ratio of PSS to SSS  | dB       |                           |                                 |                      |     |      |                     |                     |     |     |     |     |
| PRE ratio of PDSCH DMRS to SSS   | dB       |                           |                                 |                      |     |      |                     |                     |     |     |     |     |
| PRE ratio of PDSCH to PDSCH DMRS   | dB       |                           |                                 |                      |     |      |                     |                     |     |     |     |     |
| PRE ratio of OCNG DMRS to SSS  | dB       |                           |                                 |                      |     |      |                     |                     |     |     |     |     |
| PRE ratio of OCNG to OCNG DMRS   | dB       |                           |                                 |                      |     |      |                     |                     |     |     |     |     |
| Sub-Index 0 SNR  | Config 1 | dB                        | <sup>2</sup> Note 6             | <sup>-6</sup> Note 6 | -15 | -4.5 | <sup>2</sup> Note 6 |                     |     |     |     |     |
| Sub-Index 1 SNR  | Config 1 |                           | Not sent                        |                      |     |      |                     | <sup>2</sup> Note 6 | -15 | -15 | -15 | -15 |
| $V_{oc}$   | Config 1 | dBm/<br>15kHz             | -92.1                           |                      |     |      |                     | -92.1               |     |     |     |     |
| Time multiplexing of the downlink transmissions from each AoA  |          |                           | Defined in Figure A.7.5.1.2.1-2 |                      |     |      |                     |                     |     |     |     |     |
| Propagation condition  |          |                           | TDL-A 30ns 75Hz                 |                      |     |      |                     | TDL-A 30ns 75Hz     |     |     |     |     |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on a bands, the SNR during T3 is A.3.6.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |          |                           |                                 |                      |     |      |                     |                     |     |     |     |     |

**Table A.7.5.1.2.1-4: Void**

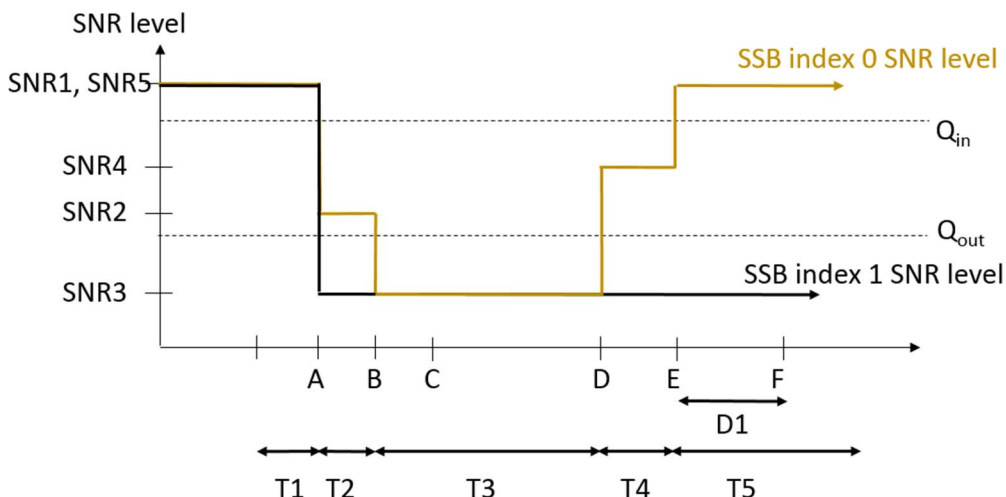


Figure A.7.5.1.2.1-1: SNR variation for in-sync testing

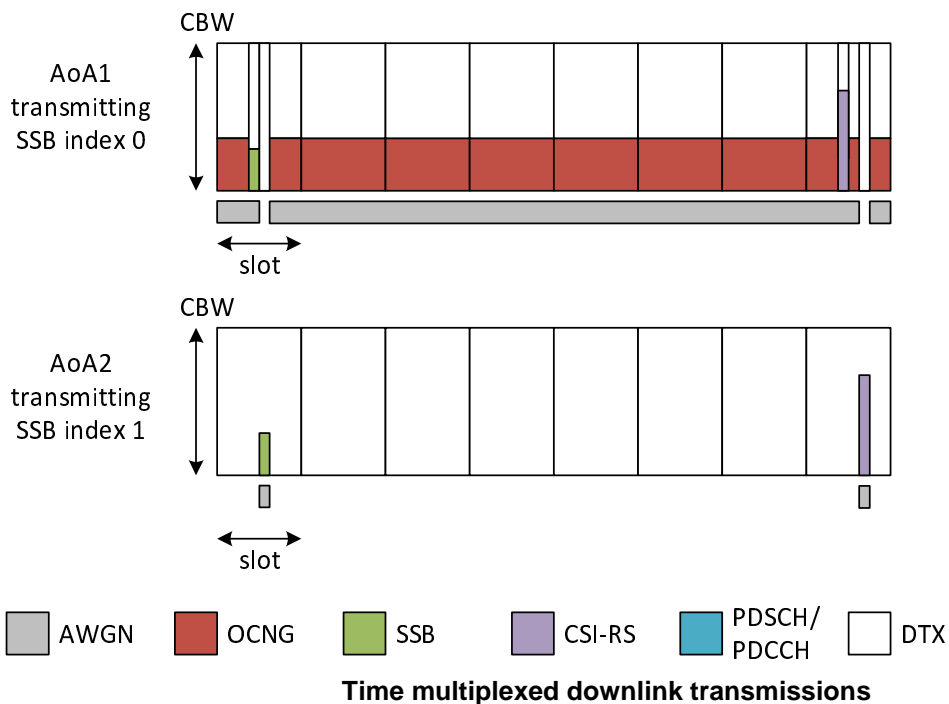


Figure A.7.5.1.2.1-2:

A.7.5.1.2.2 Test Requirements

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

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

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

### A.7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

#### A.7.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.7.5.1.3.1-1. The test parameters are given in Tables A.7.5.1.3.1-2, and A.7.5.1.3.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.7.5.1.3.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description                                       |
|---------------|---|
| 1             | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

Table A.7.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

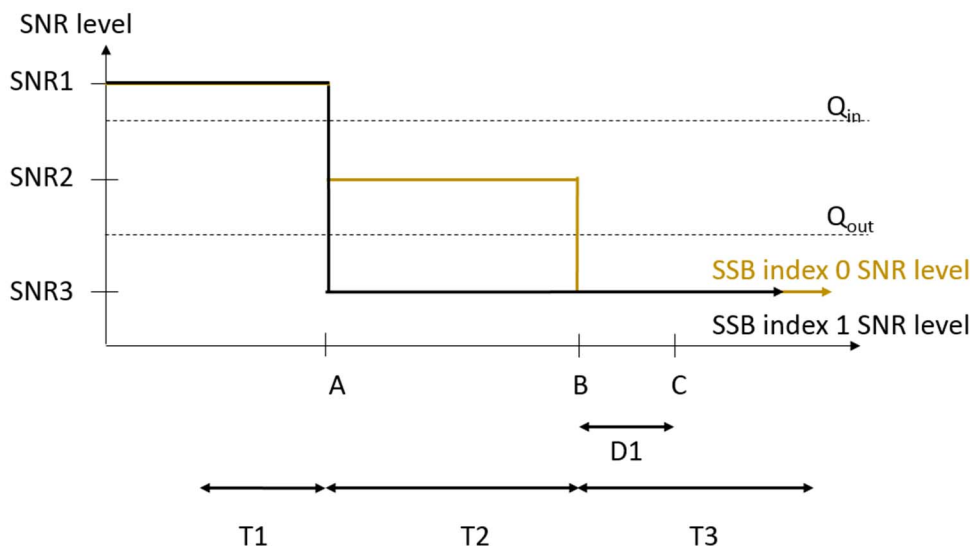
| Parameter   |  | Unit | Value<br>Test 1      |
|---|--|------|----------------------|
| Active PCell  |  |      | Cell 1               |
| RF Channel Number   |  |      | 1                    |
| Duplex mode   | Config 1   |      | TDD                  |
| $BW_{channel}$  | Config 1   |      | 100: $N_{RB,c} = 66$ |
| Data RBs allocated  | Config 1   |      | 66                   |
| DL initial BWP configuration  | Config 1   |      | DLBWP.0.1            |
| DL dedicated BWP configuration  | Config 1   |      | DLBWP.1.1            |
| UL initial BWP configuration  | Config 1   |      | ULBWP.0.1            |
| UL dedicated BWP configuration  | Config 1   |      | ULBWP.1.1            |
| TDD Configuration   | Config 1   |      | TDDConf.3.1          |
| RMSI CORESET Reference Channel  | Config 1   |      | CR.3.1 TDD           |
| Dedicated CORESET Reference Channel   | Config 1   |      | CCR.3.4 TDD          |
| SSB Configuration   | Config 1   |      | SSB.1 FR2            |
| SMTc Configuration  | Config 1   |      | SMTc.1               |
| PDSCH/PDCCH subcarrier spacing  | Config 1   |      | 120 KHz              |
| PRACH Configuration   | Config 1   |      | Table A.3.8.3.4      |
| SSB index assigned as RLM RS  | Config 1   |      | 0,1                  |
| OCNG parameters   |  |      | OP.1                 |
| CP length   |  |      | Normal               |
| Out of sync transmission parameters   | DCI format   |      | 1-0                  |
|   | Number of Control OFDM symbols                                   |      | 2                    |
|   | Aggregation level  | CCE  | 8                    |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                    |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                    |
|   | DMRS precoder granularity  |      | REG bundle size      |
|   |  |      | 6                    |
| DRX Configuration   |  |      | DRX.3                |
| Gap pattern ID  |  |      | N.A.                 |
| Layer 3 filtering   |  |      | <i>Enabled</i>       |
| T310 timer  |  | ms   | 0                    |
| T311 timer  |  | ms   | 1000                 |
| N310  |  |      | 1                    |
| N311  |  |      | 1                    |
| CSI-RS for CSI reporting  | Config 1   |      | CSI-RS.3.1 TDD       |
| reportConfigType  |  |      | periodic             |
| reportQuantity  |  |      | cri-RI-PMI-CQI       |
| CSI reporting periodicity   |  | slot | 40                   |
| CSI reporting offset  |  | slot | 4                    |
| TCI states for PDCCH/PDSCH  |  |      | TCI.State.2          |
| CSI-RS for tracking   | Config 1   |      | TRS.2.1 TDD          |
| T1  |  | s    | 0.2                  |
| T2  |  | s    | 14.48                |
| T3  |  | s    | 14.48                |
| D1  |  | s    | 14.44                |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |      |                      |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |      |                      |

**Table A.7.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter   |          | Unit       | Test 1                    |                      |     |
|---|----------|------------|---------------------------|----------------------|-----|
|   |          |            | T1                        | T2                   | T3  |
| AoA setup   |          |            | Setup 1 defined in A.3.15 |                      |     |
| Assumption for UE beams <sup>Note 5</sup>   |          |            | Rough                     |                      |     |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB         | 4                         |                      |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB         | 0                         |                      |     |
| EPRE ratio of PBCH DMRS to SSS  |          | dB         | 0                         |                      |     |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB         |                           |                      |     |
| EPRE ratio of PSS to SSS  |          | dB         |                           |                      |     |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB         |                           |                      |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB         |                           |                      |     |
| EPRE ratio of OCNG DMRS to SSS  |          | dB         |                           |                      |     |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB         |                           |                      |     |
| ssb-Index 0 SNR   | Config 1 | dB         | 2 <sup>Note 6</sup>       | -6 <sup>Note 6</sup> | -15 |
| ssb-Index 1 SNR   | Config 1 |            | 2 <sup>Note 6</sup>       | -15                  | -15 |
| $N_{oc}$  | Config 1 | dBm/15K Hz | -104.7dBm                 |                      |     |
| Propagation condition   |          |            | TDL-A 30ns 75Hz           |                      |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.</p> |          |            |                           |                      |     |

**Table A.7.5.1.3.1-4: Void**

**Table A.7.5.1.3.1-5: Void**



**Figure A.7.5.1.3.1-1: SNR variation for out-of-sync testing**

**A.7.5.1.3.2 Test Requirements**

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

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

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

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

#### A.7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

##### A.7.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables A.7.5.1.4.1-2, and A.7.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.7.5.1.4.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description                                       |
|---------------|---|
| 1             | TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz |

**Table A.7.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode**

| Parameter                           |  | Unit | Value                       |
|-------------------------------------|--|------|-----------------------------|
|                                     |  |      | Test 1                      |
| Active PCell                        |  |      | Cell 1                      |
| RF Channel Number                   |  |      | 1                           |
| Duplex mode                         | Config 1   |      | TDD                         |
| BW <sub>channel</sub>               | Config 1   |      | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated                  | Config 1   |      | 66                          |
| DL initial BWP configuration        | Config 1   |      | DLBWP.0.1                   |
| DL dedicated BWP configuration      | Config 1   |      | DLBWP.1.1                   |
| UL initial BWP configuration        | Config 1   |      | ULBWP.0.1                   |
| UL dedicated BWP configuration      | Config 1   |      | ULBWP.1.1                   |
| TDD Configuration                   | Config 1   |      | TDDConf.3.1                 |
| RMSI CORESET Reference Channel      | Config 1   |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel | Config 1   |      | CCR.3.1 TDD                 |
| SSB Configuration                   | Config 1   |      | SSB.1 FR2                   |
| SMTTC Configuration                 | Config 1   |      | SMTTC.3                     |
| PDSCH/PDCCH subcarrier spacing      | Config 1   |      | 120 KHz                     |
| PRACH Configuration                 | Config 1   |      | Table A.3.8.3.4             |
| SSB index assigned as RLM RS        | Config 1   |      | 0,1                         |
| OCNG parameters                     |  |      | OP.1                        |
| CP length                           |  |      | Normal                      |
| In sync transmission parameters     | DCI format   |      | 1-0                         |
|                                     | Number of Control OFDM symbols                                   |      | 2                           |
|                                     | Aggregation level  | CCE  | 4                           |
|                                     | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                           |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                           |
|                                     | DMRS precoder granularity  |      | REG bundle size             |
|                                     | REG bundle size  |      | 6                           |
| Out of sync transmission parameters | DCI format   |      | 1-0                         |
|                                     | Number of Control OFDM symbols                                   |      | 2                           |
|                                     | Aggregation level  | CCE  | 8                           |
|                                     | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                           |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 4                           |
|                                     | DMRS precoder granularity  |      | REG bundle size             |
|                                     | REG bundle size  |      | 6                           |
| DRX Configuration                   |  |      | DRX.11                      |
| Gap pattern ID                      |  |      | N.A.                        |
| Layer 3 filtering                   |  |      | Enabled                     |
| T310 timer                          |  | ms   | 4000                        |
| T311 timer                          |  | ms   | 1000                        |
| N310                                |  |      | 1                           |
| N311                                |  |      | 1                           |
| CSI-RS for CSI reporting            | Config 1   |      | CSI-RS.3.1 TDD              |
| reportConfigType                    |  |      | periodic                    |
| reportQuantity                      |  |      | cri-RI-PMI-CQI              |
| CSI reporting periodicity           |  | slot | 40                          |
| CSI reporting offset                |  | slot | 4                           |
| TCI states for PDCCH/PDSCH          |  |      | TCI.State.2                 |
| CSI-RS for tracking                 | Config 1   |      | TRS.2.1 TDD                 |
| T1                                  |  | s    | 0.2                         |
| T2                                  |  | s    | 0.2                         |
| T3                                  |  | s    | 2.8                         |
| T4                                  |  | s    | 0.2                         |
| T5                                  |  | s    | 3.88                        |
| D1                                  |  | s    | 3.84                        |



Note 1: All configurations are assigned to the UE prior to the start of time period T1.  
 Note 2: UE-specific PDCCH is not transmitted after T1 starts.

**Table A.7.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode**

| Parameter  |          | Unit          | Test 1                    |                       |     |      |                     |
|--|----------|---------------|---------------------------|-----------------------|-----|------|---------------------|
|  |          |               | T1                        | T2                    | T3  | T4   | T5                  |
| AoA setup  |          |               | Setup 1 defined in A.3.15 |                       |     |      |                     |
| Assumption for UE beams <sup>Note 5</sup>  |          |               | Rough                     |                       |     |      |                     |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB            | 0                         |                       |     |      |                     |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB            | 0                         |                       |     |      |                     |
| EPRE ratio of PBCH DMRS to SSS   |          | dB            | 0                         |                       |     |      |                     |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB            |                           |                       |     |      |                     |
| EPRE ratio of PSS to SSS   |          | dB            |                           |                       |     |      |                     |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB            |                           |                       |     |      |                     |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB            |                           |                       |     |      |                     |
| EPRE ratio of OCNG DMRS to SSS   |          | dB            |                           |                       |     |      |                     |
| EPRE ratio of OCNG to OCNG DMRS  |          | dB            |                           |                       |     |      |                     |
| ssb-Index 0 SNR  | Config 1 | dB            | <sup>2</sup> Note 6       | - <sup>6</sup> Note 6 | -15 | -4.5 | <sup>2</sup> Note 6 |
| ssb-Index 1 SNR  | Config 1 |               | <sup>2</sup> Note 6       | -15                   | -15 | -15  | -15                 |
| $N_{oc}$   | Config 1 | dBm/1<br>5KHz | -104.7dBm                 |                       |     |      |                     |
| Propagation condition  |          |               | TDL-A 30ns 75Hz           |                       |     |      |                     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3</p> <p>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.</p> |          |               |                           |                       |     |      |                     |

Table A.7.5.1.4.1-4: Void

Table A.7.5.1.4.1-5: Void

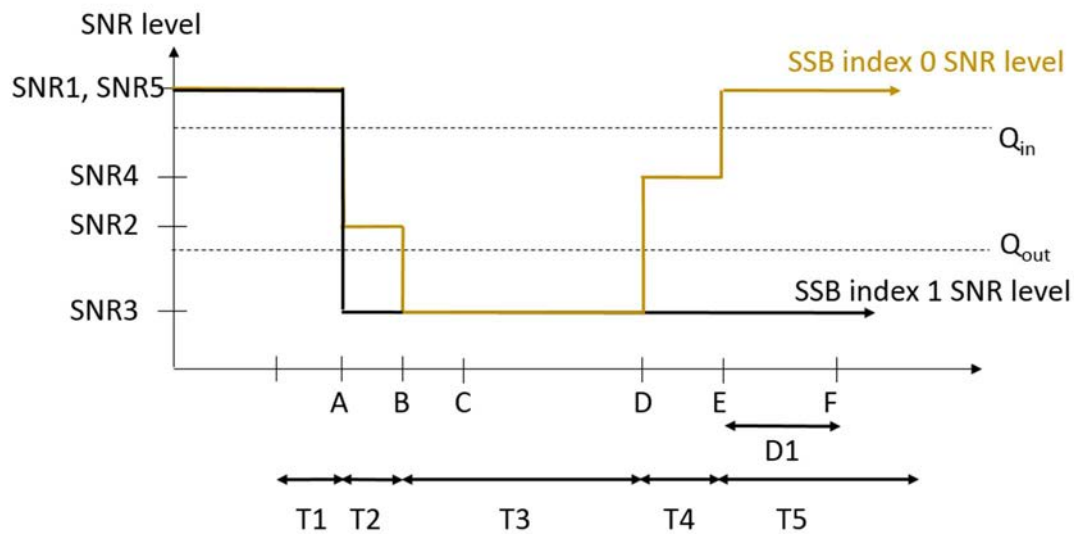


Figure A.7.5.1.4.1-1: SNR variation for in-sync testing

A.7.5.1.4.2 Test Requirements

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

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

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

A.7.5.1.5 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

A.7.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.5.1-1, A.7.5.1.5.1-2, A.7.5.1.5.1-3 and A.7.5.1.5.1-4 below. There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.5.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.7.5.1.5.1-1: Supported test configurations for FR2 PCell

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.5.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in non-DRX mode**

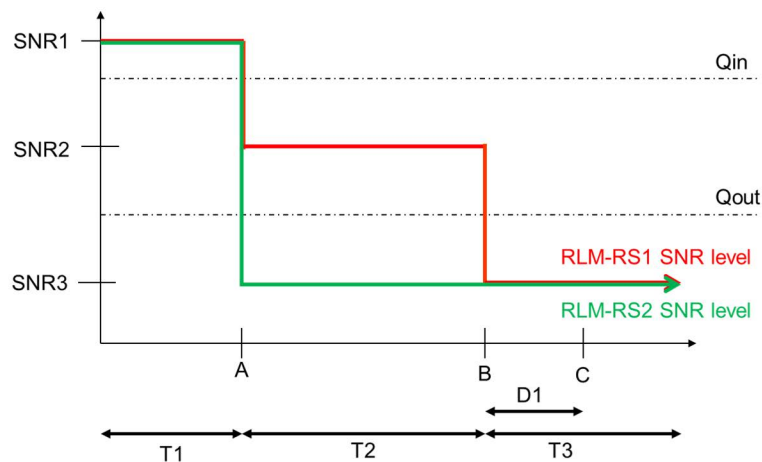
| Parameter   |   | Unit | Value  |
|---|---|------|--|
|   |   |      | Test 1   |
| Active PCell  |   |      | Cell 1   |
| RF Channel Number   |   |      | 1  |
| Duplex mode   | Config 1  |      | TDD  |
| TDD Configuration   | Config 1  |      | TDDConf.3.1  |
| BW <sub>channel</sub>   | Config 1  |      | 100: N <sub>RB,c</sub> = 66                              |
| Data RBs allocated  | Config 1  |      | 24   |
| BW <sub>occupied</sub>  | Config 1  |      | 24   |
| DL initial BWP configuration                                  | Config 1  |      | DLBWP.0.1  |
| DL dedicated BWP configuration                                | Config 1  |      | DLBWP.1.4  |
| UL initial BWP configuration                                  | Config 1  |      | ULBWP.0.1  |
| UL dedicated BWP configuration                                | Config 1  |      | ULBWP.1.4  |
| RMSI CORESET Reference Channel                                | Config 1  |      | CR.3.1 TDD   |
| Dedicated CORESET Reference Channel                           | Config 1  |      | CCR.3.4 TDD<br>CCR.3.6 TDD                               |
| SSB Configuration   | Config 1  |      | SSB.1 FR2  |
| SMTC Configuration  | Config 1  |      | SMTC.1   |
| PDSCH/PDCCH subcarrier spacing                                | Config 1  |      | 120 KHz  |
| CSI-RS for RLM  | Config 1  |      | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration   |   |      | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH                           |   |      | TCI.State.2  |
| TCI configuration for PDCCH#2                                 |   |      | TCI.State.3  |
| OCNG parameters   |   |      | OP.5   |
| CP length   |   |      | Normal   |
| Out of sync transmission parameters                           | DCI format  |      | 1-0  |
|   | Number of Control OFDM symbols                                      |      | 2  |
|   | Aggregation level   | CCE  | 8  |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4  |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4  |
|   | DMRS precoder granularity   |      | REG bundle size  |
| REG bundle size   |   |      | 6  |
| DRX   |   |      | OFF  |
| Gap pattern ID  |   |      | *gp0   |
| Layer 3 filtering   |   |      | Enabled  |
| T310 timer  |   | ms   | 0  |
| T311 timer  |   | ms   | 1000   |
| N310  |   |      | 1  |
| N311  |   |      | 1  |
| CSI-RS for CSI reporting                                      | Config 1  |      | CSI-RS.3.1 TDD   |
| reportConfigType  |   |      | periodic   |
| reportQuantity  |   |      | cri-RI-PMI-CQI   |
| CSI reporting periodicity                                     |   | slot | 40   |
| CSI reporting offset  |   | slot | 4  |
| T1  |   | s    | 0.2  |
| T2  |   | s    | 0.35   |
| T3  |   | s    | 0.35   |
| D1  |   | s    | 0.31   |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |      |  |

**Table A.7.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Parameter   |          | Unit      | Test 1                    |    |    |                   |    |    |                      |                       |     |
|---|----------|-----------|---------------------------|----|----|-------------------|----|----|----------------------|-----------------------|-----|
|   |          |           | T1                        | T2 | T3 | T1                | T2 | T3 |                      |                       |     |
| AoA setup   |          |           | Setup 3 defined in A.3.15 |    |    |                   |    |    |                      |                       |     |
|   |          |           | AoA1                      |    |    | AoA2              |    |    |                      |                       |     |
| Assumption for UE beams <sup>Note 10</sup>  |          |           | Rough                     |    |    | Rough             |    |    |                      |                       |     |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB        | 4                         |    |    | Not sent          |    |    |                      |                       |     |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB        | 0                         |    |    |                   |    |    |                      |                       |     |
| EPRE ratio of PBCH DMRS to SSS  |          | dB        |                           |    |    |                   |    |    |                      |                       |     |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB        |                           |    |    |                   |    |    |                      |                       |     |
| EPRE ratio of PSS to SSS  |          | dB        |                           |    |    |                   |    |    |                      |                       |     |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB        |                           |    |    |                   |    |    |                      |                       |     |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB        |                           |    |    |                   |    |    |                      |                       |     |
| EPRE ratio of OCNG DMRS to SSS  |          | dB        |                           |    |    |                   |    |    |                      |                       |     |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB        |                           |    |    |                   |    |    |                      |                       |     |
| SNR on RLM-RS1  | Config 1 | dB        |                           |    |    |                   |    |    | <sup>2</sup> Note 11 | <sup>-6</sup> Note 11 | -15 |
| SNR on RLM-RS2  | Config 1 |           |                           |    |    | Not sent          |    |    | <sup>2</sup> Note 11 | -14                   | -15 |
| $N_{oc}$  | Config 1 | dBm/15kHz | -92.1                     |    |    | -92.1             |    |    |                      |                       |     |
| Propagation condition   |          |           | TDL-C 300ns 100Hz         |    |    | TDL-C 300ns 100Hz |    |    |                      |                       |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.5.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |          |           |                           |    |    |                   |    |    |                      |                       |     |

**Table A.7.5.1.5.1-4: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Field   | Test 1 |
|---|--------|
|   | Value  |
| gapOffset   | 0      |
| Note 1: RLM RS is partially overlapped with measurement gap |        |



**Figure A.7.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing**

**A.7.5.1.5.2 Test Requirements**

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ( $D_1$  second after the start of the time duration T3) on the PCell.

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

**A.7.5.1.6 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

**A.7.5.1.6.1 Test Purpose and Environment**

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.6.1-1, A.7.5.1.6.1-2 and A.7.5.1.6.1-3 below. There is one cells, cell 1 which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.6.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. In the test, DRX configuration is not enabled. In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.7.5.1.6.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.6.1-2: General test parameters for FR2 PCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter                           |   | Unit | Value  |
|-------------------------------------|---|------|--|
|                                     |   |      | Test 1   |
| Active PCell                        |   |      | Cell 1   |
| RF Channel Number                   |   |      | 1  |
| Duplex mode                         | Config 1  |      | TDD  |
| TDD Configuration                   | Config 1  |      | TDDConf.3.1  |
| BW <sub>channel</sub>               | Config 1  |      | 100: N <sub>RB,c</sub> = 66                              |
| Data RBs allocated                  | Config 1  |      | 24   |
| BW <sub>occupied</sub>              | Config 1  |      | 24   |
| DL initial BWP configuration        | Config 1  |      | DLBWP.0.1  |
| DL dedicated BWP configuration      | Config 1  |      | DLBWP.1.4  |
| UL initial BWP configuration        | Config 1  |      | ULBWP.0.1  |
| UL dedicated BWP configuration      | Config 1  |      | ULBWP.1.4  |
| RMSI CORESET Reference Channel      | Config 1  |      | CR.3.1 TDD   |
| Dedicated CORESET Reference Channel | Config 1  |      | CCR.3.1 TDD<br>CCR.3.3 TDD                               |
| SSB Configuration                   | Config 1  |      | SSB.1 FR2  |
| SMTc Configuration                  | Config 1  |      | SMTc.1   |
| PDSCH/PDCCH subcarrier spacing      | Config 1  |      | 120 KHz  |
| CSI-RS for RLM                      | Config 1  |      | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration                   |   |      | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH |   |      | TCI.State.2  |
| TCI configuration for PDCCH#2       |   |      | TCI.State.3  |
| OCNG parameters                     |   |      | OP.5   |
| CP length                           |   |      | Normal   |
| Out of sync transmission parameters | DCI format  |      | 1-0  |
|                                     | Number of Control OFDM symbols                                      |      | 2  |
|                                     | Aggregation level   | CCE  | 8  |
|                                     | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4  |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4  |
|                                     | DMRS precoder granularity   |      | REG bundle size  |
|                                     | REG bundle size   |      | 6  |
| In sync transmission parameters     | DCI format  |      | 1-0  |
|                                     | Number of Control OFDM symbols                                      |      | 2  |
|                                     | Aggregation level   | CCE  | 4  |
|                                     | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0  |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0  |
|                                     | DMRS precoder granularity   |      | REG bundle size  |
|                                     | REG bundle size   |      | 6  |
| DRX                                 |   |      | OFF  |
| Gap pattern ID                      |   |      | N.A.   |
| Layer 3 filtering                   |   |      | Enabled  |
| T310 timer                          |   | ms   | 1000   |
| T311 timer                          |   | ms   | 1000   |
| N310                                |   |      | 1  |
| N311                                |   |      | 1  |
| CSI-RS for CSI reporting            | Config 1  |      | CSI-RS.3.1 TDD   |
| reportConfigType                    |   |      | periodic   |
| reportQuantity                      |   |      | cri-RI-PMI-CQI   |

|   |      |      |
|---|------|------|
| CSI reporting periodicity                                     | slot | 40   |
| CSI reporting offset  | slot | 4    |
| T1  | s    | 0.2  |
| T2  | s    | 0.2  |
| T3  | s    | 0.24 |
| T4  | s    | 0.2  |
| T5  | s    | 0.88 |
| D1  | s    | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |      |      |

**Table A.7.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter                                  | Unit     | Test 1                    |                      |                       |     |      |                      |                      |     |     |     |     |
|--|----------|---------------------------|----------------------|-----------------------|-----|------|----------------------|----------------------|-----|-----|-----|-----|
|  |          | T1                        | T2                   | T3                    | T4  | T5   | T1                   | T2                   | T3  | T4  | T5  |     |
| oA setup                                   |          | Setup 3 defined in A.3.15 |                      |                       |     |      |                      |                      |     |     |     |     |
|  |          | AoA1                      |                      |                       |     |      | AoA2                 |                      |     |     |     |     |
| Assumption for UE beams <sup>Note 10</sup> |          | Rough                     |                      |                       |     |      | Rough                |                      |     |     |     |     |
| PRE ratio of PDCCH DMRS to SSS             | dB       | 0                         |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of PDCCH to PDCCH DMRS           | dB       | 0                         |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of PBCH DMRS to SSS              | dB       |                           |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of PBCH to PBCH DMRS             | dB       |                           |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of PSS to SSS                    | dB       |                           |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of PDSCH DMRS to SSS             | dB       |                           |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of PDSCH to PDSCH DMRS           | dB       |                           |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of OCNG DMRS to SSS              | dB       | Not sent                  |                      |                       |     |      |                      |                      |     |     |     |     |
| PRE ratio of OCNG to OCNG DMRS             | dB       |                           |                      |                       |     |      |                      |                      |     |     |     |     |
| NR on RLM-RS1                              | Config 1 | dB                        | 2 <sup>Note 11</sup> | -6 <sup>Note 11</sup> | -15 | -4.5 | 2 <sup>Note 11</sup> |                      |     |     |     |     |
| NR on RLM-RS2                              | Config 1 |                           | Not sent             |                       |     |      |                      | 2 <sup>Note 11</sup> | -14 | -15 | -15 | -14 |
| $V_{oc}$                                   | Config 1 | dBm/15KHz                 | -92.1                |                       |     |      |                      | -92.1                |     |     |     |     |
| Propagation condition                      |          |                           | TDL-C 300ns 100Hz    |                       |     |      |                      | TDL-C 300ns 100Hz    |     |     |     |     |

- ote 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- ote 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- ote 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- ote 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- ote 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- ote 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- ote 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- ote 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.6.1 1.
- ote 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on a bands, the SNR during T3 is A.3.6.
- ote 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
- ote 11: This value allows up to 1dB degradation from applied SNR to UE baseband.



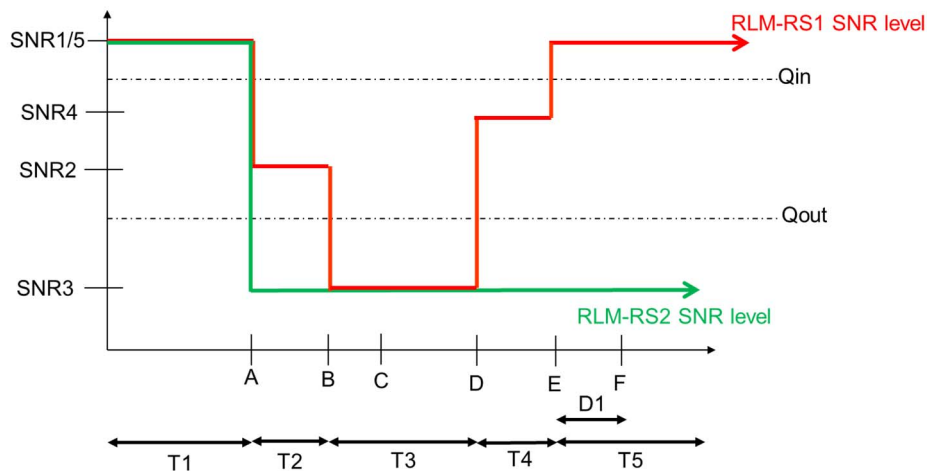


Figure A.7.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

A.7.5.1.6.2 Test Requirements

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

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

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

A.7.5.1.7 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

A.7.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.7.1-1, A.7.5.1.7.1-2, and A.7.5.1.7.1-3 below. There is one cell, cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.7.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.7.5.1.7.1-1: Supported test configurations for FR2 PCell

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.7.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in DRX mode**

| Parameter   |   | Unit | Value  |
|---|---|------|--|
|   |   |      | Test 1   |
| Active PCell  |   |      | Cell 1   |
| RF Channel Number   |   |      | 1  |
| Duplex mode   | Config 1  |      | TDD  |
| TDD Configuration   | Config 1  |      | TDDConf.3.1  |
| DL initial BWP configuration                                  | Config 1  |      | DLBWP.0.1  |
| DL dedicated BWP configuration                                | Config 1  |      | DLBWP.1.1  |
| UL initial BWP configuration                                  | Config 1  |      | ULBWP.0.1  |
| UL dedicated BWP configuration                                | Config 1  |      | ULBWP.1.1  |
| RMSI CORESET Reference Channel                                | Config 1  |      | CR.3.1 TDD   |
| Dedicated CORESET Reference Channel                           | Config 1  |      | CCR.3.4 TDD<br>CCR.3.6 TDD                               |
| SSB Configuration   | Config 1  |      | SSB.1 FR2  |
| SMTc Configuration  | Config 1  |      | SMTc.1   |
| PDSCH/PDCCH subcarrier spacing                                | Config 1  |      | 120 KHz  |
| CSI-RS for RLM  | Config 1  |      | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration   |   |      | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH                           |   |      | TCI.State.2  |
| TCI configuration for PDCCH#2                                 |   |      | TCI.State.3  |
| OCNG parameters   |   |      | OP.1   |
| CP length   |   |      | Normal   |
| Out of sync transmission parameters                           | DCI format  |      | 1-0  |
|   | Number of Control OFDM symbols                                      |      | 2  |
|   | Aggregation level   | CCE  | 8  |
|   | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4  |
|   | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4  |
|   | DMRS precoder granularity   |      | REG bundle size  |
| REG bundle size   |   |      | 6  |
| DRX   |   |      | DRX.3  |
| Gap pattern ID  |   |      | N.A.   |
| Layer 3 filtering   |   |      | <i>Enabled</i>   |
| T310 timer  |   | ms   | 0  |
| T311 timer  |   | ms   | 1000   |
| N310  |   |      | 1  |
| N311  |   |      | 1  |
| CSI-RS for CSI reporting                                      | Config 1  |      | CSI-RS.3.1 TDD   |
| reportConfigType  |   |      | periodic   |
| reportQuantity  |   |      | cri-RI-PMI-CQI   |
| CSI reporting periodicity                                     |   | slot | 40   |
| CSI reporting offset  |   | slot | 4  |
| T1  |   | s    | 0.2  |
| T2  |   | s    | 1.28   |
| T3  |   | s    | 1.28   |
| D1  |   | s    | 1.24   |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |      |  |

**Table A.7.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter  |          | Unit      | Test 1                    |                       |     |
|--|----------|-----------|---------------------------|-----------------------|-----|
|  |          |           | T1                        | T2                    | T3  |
| AoA setup  |          | dB        | Setup 1 defined in A.3.15 |                       |     |
| Assumption for UE beams <sup>Note 10</sup>   |          |           | Rough                     |                       |     |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB        | 4                         |                       |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB        | 0                         |                       |     |
| EPRE ratio of PBCH DMRS to SSS   |          | dB        |                           |                       |     |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB        |                           |                       |     |
| EPRE ratio of PSS to SSS   |          | dB        |                           |                       |     |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB        |                           |                       |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB        |                           |                       |     |
| EPRE ratio of OCNG DMRS to SSS   |          | dB        |                           |                       |     |
| EPRE ratio of OCNG to OCNG DMRS  |          | dB        |                           |                       |     |
| SNR on RLM-RS1   | Config 1 | dB        | 2 <sup>Note 11</sup>      | -6 <sup>Note 11</sup> | -15 |
| SNR on RLM-RS2   | Config 1 | dB        | 2 <sup>Note 11</sup>      | -14                   | -15 |
| $N_{oc}$   | Config 1 | dBm/15KHz | -104.7                    |                       |     |
| Propagation condition  |          |           | TDL-C 300ns 100Hz         |                       |     |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.7.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.</p> |          |           |                           |                       |     |

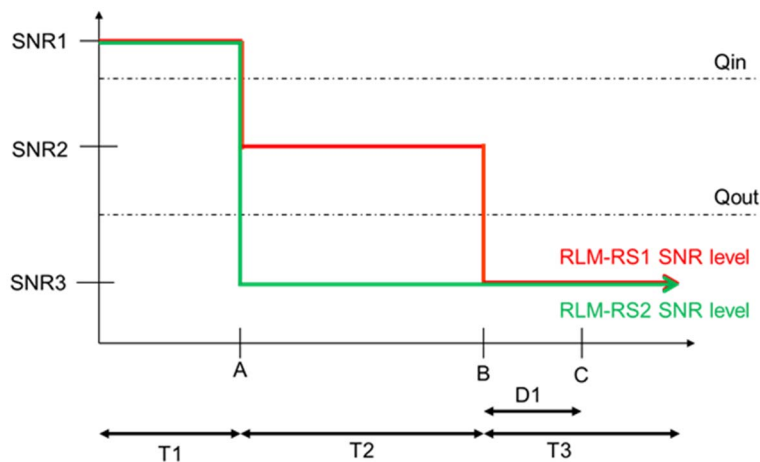


Figure A.7.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

A.7.5.1.7.2 Test Requirements

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ( $D_1$  seconds after the start of the time duration T3) on the PCell.

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

A.7.5.1.8 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

A.7.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.8.1-1, A.7.5.1.8.1-2, A.7.5.1.8.1-3 and A.7.5.1.8.1-4 below. There is one cells, cell 1 which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.8.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.7.5.1.8.1-1: Supported test configurations for FR2 PCell

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.1.8.1-2: General test parameters for FR2 PCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter                           |   | Unit | Value  |
|-------------------------------------|---|------|--|
|                                     |   |      | Test 1   |
| Active PCell                        |   |      | Cell 1   |
| RF Channel Number                   |   |      | 1  |
| Duplex mode                         | Config 1  |      | TDD  |
| TDD Configuration                   | Config 1  |      | TDDConf.3.1  |
| DL initial BWP configuration        | Config 1  |      | DLBWP.0.1  |
| DL dedicated BWP configuration      | Config 1  |      | DLBWP.1.1  |
| UL initial BWP configuration        | Config 1  |      | ULBWP.0.1  |
| UL dedicated BWP configuration      | Config 1  |      | ULBWP.1.1  |
| RMSI CORESET Reference Channel      | Config 1  |      | CR.3.1 TDD   |
| Dedicated CORESET Reference Channel | Config 1  |      | CCR.3.1 TDD<br>CCR.3.3 TDD                               |
| SSB Configuration                   | Config 1  |      | SSB.1 FR2  |
| SMTC Configuration                  | Config 1  |      | SMTC.1   |
| PDSCH/PDCCH subcarrier spacing      | Config 1  |      | 120 KHz  |
| CSI-RS for RLM                      | Config 1  |      | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration                   |   |      | TRS.2.1 TDD<br>TRS.2.2 TDD                               |
| TCI configuration for PDCCH#1/PDSCH |   |      | TCI.State.2  |
| TCI configuration for PDCCH#2       |   |      | TCI.State.3  |
| OCNG parameters                     |   |      | OP.1   |
| CP length                           |   |      | Normal   |
| Out of sync transmission parameters | DCI format  |      | 1-0  |
|                                     | Number of Control OFDM symbols                                      |      | 2  |
|                                     | Aggregation level   | CCE  | 8  |
|                                     | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 4  |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 4  |
|                                     | DMRS precoder granularity   |      | REG bundle size  |
|                                     | REG bundle size   |      | 6  |
| In sync transmission parameters     | DCI format  |      | 1-0  |
|                                     | Number of Control OFDM symbols                                      |      | 2  |
|                                     | Aggregation level   | CCE  | 4  |
|                                     | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy   | dB   | 0  |
|                                     | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB   | 0  |
|                                     | DMRS precoder granularity   |      | REG bundle size  |
|                                     | REG bundle size   |      | 6  |
| DRX                                 |   |      | DRX.3  |
| Gap pattern ID                      |   |      | *gp0   |
| Layer 3 filtering                   |   |      | Enabled  |
| T310 timer                          |   | ms   | 2000   |
| T311 timer                          |   | ms   | 1000   |
| N310                                |   |      | 1  |
| N311                                |   |      | 1  |
| CSI-RS for CSI reporting            | Config 1  |      | CSI-RS.3.1 TDD   |
| reportConfigType                    |   |      | periodic   |
| reportQuantity                      |   |      | cri-RI-PMI-CQI   |
| CSI reporting periodicity           |   | slot | 40   |
| CSI reporting offset                |   | slot | 4  |
| T1                                  |   | s    | 0.2  |

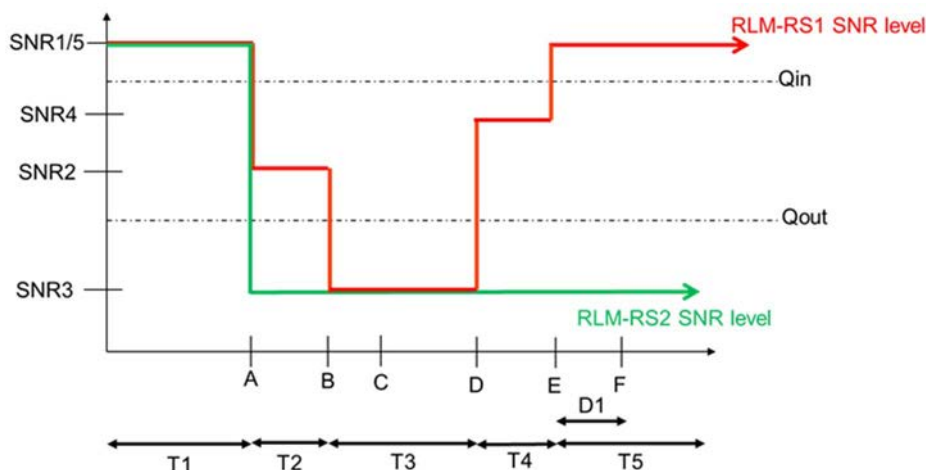
|   |   |      |
|---|---|------|
| T2  | s | 0.2  |
| T3  | s | 1.64 |
| T4  | s | 0.2  |
| T5  | s | 1.88 |
| D1  | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |      |

**Table A.7.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter   |          | Unit      | Test 1                    |    |    |    |    |                      |                       |     |      |                      |
|---|----------|-----------|---------------------------|----|----|----|----|----------------------|-----------------------|-----|------|----------------------|
|   |          |           | T1                        | T2 | T3 | T4 | T5 |                      |                       |     |      |                      |
| AoA setup   |          | dB        | Setup 1 defined in A.3.15 |    |    |    |    |                      |                       |     |      |                      |
| Assumption for UE beams <sup>Note 10</sup>  |          |           | Rough                     |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB        | 0                         |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB        | 0                         |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PBCH DMRS to SSS  |          | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PSS to SSS  |          | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of OCNG DMRS to SSS  |          | dB        |                           |    |    |    |    |                      |                       |     |      |                      |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB        | -104.7                    |    |    |    |    |                      |                       |     |      |                      |
| SNR on RLM-RS1  | Config 1 | dB        |                           |    |    |    |    | <sup>2</sup> Note 11 | -6 <sup>Note 11</sup> | -15 | -4.5 | <sup>2</sup> Note 11 |
| SNR on RLM-RS2  | Config 1 | dB        |                           |    |    |    |    | <sup>2</sup> Note 11 | -14                   | -15 | -15  | -14                  |
| $N_{oc}$  | Config 1 | dBm/15KHz | -104.7                    |    |    |    |    |                      |                       |     |      |                      |
| Propagation condition   |          |           | TDL-C 300ns 100Hz         |    |    |    |    |                      |                       |     |      |                      |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.      |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.   |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.   |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.   |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.8.1-1.                                       |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |          |           |                           |    |    |    |    |                      |                       |     |      |                      |
| Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.   |          |           |                           |    |    |    |    |                      |                       |     |      |                      |

**Table A.7.5.1.8.1-4: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in non-DRX mode**

| Field   | Test 1 |
|---|--------|
|   | Value  |
| gapOffset   | 0      |
| Note 1: RLM RS is partially overlapped with measurement gap |        |



**Figure A.7.5.1.8.1-1: SNR variation for CSI-RS in-sync testing**

**A.7.5.1.8.2 Test Requirements**

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

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

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

**A.7.5.1.9 UE Radio Link Monitoring Scheduling Restrictions on FR2**

**A.7.5.1.9.1 Test Purpose and Environment**

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly. The test case is only applicable to UE which supports pdccch-MonitoringAnyOccasions or pdccch-MonitoringAnyOccasionsWithSpanGap.

The test parameters are given in table A.7.5.1.9.1-1, table A.7.5.1.9.1-2 and table A.7.5.1.9.1-3 below. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

**Table A.7.5.1.9.1-1: Supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |



**Table A.7.5.1.9.1-2: General test parameters for NR RLM scheduling restriction test case in FR2**

| Parameter          | Unit | Test configuration | Value          | Comment   |
|--------------------|------|--------------------|----------------|---|
| RF Channel Number  |      | 1                  | 1              |   |
| SSB configuration  |      | 1                  | SSB.1 FR2      |   |
| SMTC configuration |      | 1                  | SMTC pattern 1 |   |
| DRX cycle length   | s    | 1                  | OFF            |   |
| T1                 | s    | 1                  | 5              | During T1 the UE is required to correctly transmit ACK/NACK |

Table A.7.5.1.9.1-3: Cell specific test parameters for NR RLM scheduling restriction test case in FR2

| Parameter  | Unit          | Test configuration | Cell 1                          |                  |
|--|---------------|--------------------|---------------------------------|------------------|
| AoA setup  |               | 1                  | Setup 3 defined in A.3.15.3     |                  |
|  |               |                    | AoA1                            | AoA2             |
| Assumption for UE beams <sup>Note 1</sup>  |               |                    | Rough                           | Rough            |
| TDD configuration  |               | 1                  | TDDConf.3.1                     |                  |
| BW <sub>channel</sub>  | MHz           | 1                  | 100: N <sub>RB,c</sub> = 66     |                  |
| Data RBs allocated   |               | 1                  | 24                              |                  |
| PDSCH Reference measurement channel  |               | 1                  | SR.3.2 TDD                      | Not sent         |
| RMSI CORESET RMC configuration   |               | 1                  | CR.3.1 TDD                      | Not sent         |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.3.2 TDD                     | Not sent         |
| TRS configuration  |               | 1                  | TRS.2.1 TDD                     | TRS.2.2 TDD      |
| PDCCH/PDSCH TCI state  |               | 1                  | TCI.State.2                     | N/A              |
| OCNG Pattern   |               | 1                  | OP.5 defined in A.3.2.1         | Not sent         |
| Initial DL BWP configuration   |               | 1                  | DLBWP.0.1                       |                  |
| Initial UL BWP configuration   |               | 1                  | ULBWP.0.1                       |                  |
| RLM-RS   |               | 1                  | SSB with index 0                | SSB with index 1 |
| $N_{oc}$   | dBm/15kHz     | 1                  | -92.1                           | -92.1            |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1                  | -83.1                           | -83.1            |
| $\hat{E}_s / N_{oc}$   | dB            | 1                  | 2                               | 2                |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note 4</sup>   | dB            | 1                  | 1                               | 1                |
| SSB_RP <sup>Note3</sup>  | dBm/SCS       | 1                  | -81.1                           | -81.1            |
| Io   | dBm/95.04 MHz | 1                  | -54.35                          | -54.35           |
| Time multiplexing of the downlink transmissions from each AoA  |               | 1                  | Defined in Figure A.7.5.1.9.1-1 |                  |
| Propagation Condition  |               | 1                  | AWGN                            | AWGN             |
| <p>Note 1: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Calculation of Es/Iot<sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_s</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |               |                    |                                 |                  |

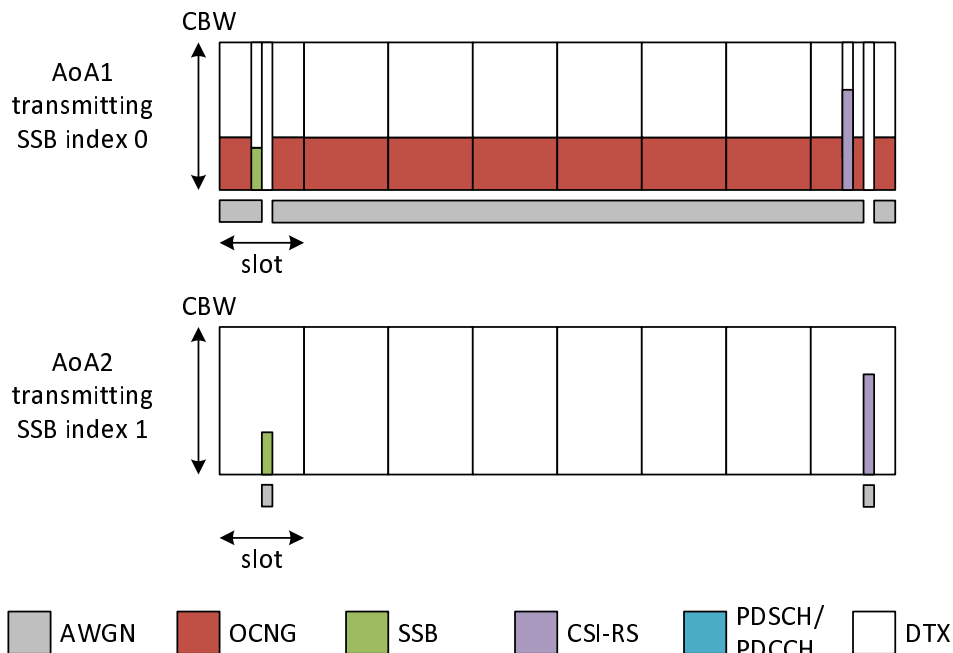


Figure A.7.5.1.9.1-1: Time multiplexed downlink transmissions

A.7.5.1.9.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.1.7.3.

A.7.5.2 Interruption

A.7.5.2.1 Interruptions during measurements on deactivated NR SCC in FR2

A.7.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations are shown in table A.7.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.7.5.2.1.1-2 and A.7.5.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, PCell is continuously scheduled in DL.

Table A.7.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD – TDD duplex mode |

**Table A.7.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR**

| <b>Parameter</b>                         | <b>Unit</b> | <b>Value</b> | <b>Comment</b>                               |
|--|-------------|--------------|--|
| RF Channel Number                        |             | 1, 2         | Two NR RF channels                           |
| Active PCell                             |             | Cell1        | PCell on NR RF channel number 1.             |
| Configured deactivated SCell             |             | Cell2        | Deactivated SCell on NR RF channel number 2. |
| CP length                                |             | Normal       | Applicable to Cell1 and Cell2                |
| DRX                                      |             | OFF          |  |
| Measurement gap pattern Id               |             | OFF          |  |
| SCell measurement cycle (measCycleSCell) | ms          | 640          |  |
| T1                                       | s           | 10           |  |

**Table A.7.5.2.1.1-3: NR cell specific test parameters for interruptions during measurements on deactivated NR SCC in standalone NR**

| Parameter  |  | Unit | Cell1                           | Cell2 |
|--|--|------|---------------------------------|-------|
| Frequency Range  |  |      | FR2                             |       |
| Duplex mode  |  |      | TDD                             |       |
| TDD configuration  |  |      | TDDConf.3.1                     |       |
| BW <sub>channel</sub>  |  |      | 100 MHz: N <sub>RB,c</sub> = 66 |       |
| Data RBs allocated   |  |      | 66                              |       |
| Initial DL BWP Configuration   |  |      | DLBWP.0.2 <sup>Note4</sup>      |       |
| Initial UL BWP Configuration   |  |      | ULBWP.0.2 <sup>Note6</sup>      |       |
| Downlink dedicated BWP Configuration   |  |      | DLBWP.1.1                       |       |
| Uplink dedicated BWP configuration   |  |      | ULBWP.1.1                       |       |
| PDSCH Reference measurement channel  |  |      | SR.3.1 TDD                      |       |
| RMSI CORESET parameters  |  |      | CR.3.1 TDD                      |       |
| Dedicated CORESET parameters   |  |      | CCR.3.1 TDD                     |       |
| OCNG Patterns  |  |      | OP.1                            |       |
| SMTc Configuration   |  |      | SMTc.1                          |       |
| SSB Configuration  |  |      | SSB.1 FR2                       |       |
| TCI State  |  |      | TCI.State.0                     |       |
| TRS Configuration  |  |      | TRS.2.1 TDD                     |       |
| Correlation Matrix and Antenna Configuration   |  |      | 1x2 Low                         |       |
| EPRE ratio of PSS to SSS   |  | dB   | 0                               | 0     |
| EPRE ratio of PBCH DMRS to SSS   |  |      |                                 |       |
| EPRE ratio of PBCH to PBCH DMRS  |  |      |                                 |       |
| EPRE ratio of PDCCH DMRS to SSS  |  |      |                                 |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |  |      |                                 |       |
| EPRE ratio of PDSCH DMRS to SSS  |  |      |                                 |       |
| EPRE ratio of PDSCH to PDSCH   |  |      |                                 |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |  |      |                                 |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |  |      |                                 |       |
| Time offset to Cell1 <sup>Note 3</sup>   |  | μs   | -                               | 3     |
| Propagation Condition  |  |      | AWGN                            |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of of TS 38.213 [3].</p> |  |      |                                 |       |

**Table A.7.5.2.1.1-4: OTA related test parameters for interruptions during measurements on deactivated NR SCC in standalone NR**

| Parameter   |              | Unit                              | Cell 1                             | Cell 2                              |
|---|--------------|-----------------------------------|------------------------------------|-------------------------------------|
| Angle of arrival configuration  |              |                                   | Setup1 according to table A.3.15.1 | Setup 1 according to table A.3.15.1 |
| Assumption for UE beams <sup>Note 6</sup>   |              |                                   | Rough                              | Rough                               |
| $N_{oc}$ <sup>Note1</sup>   | NR_TDD_FR2_A | dBm/15kHz                         | -104.7                             | -104.7                              |
|   | NR_TDD_FR2_B |                                   |                                    |                                     |
|   | NR_TDD_FR2_F |                                   |                                    |                                     |
|   | NR_TDD_FR2_G |                                   |                                    |                                     |
|   | NR_TDD_FR2_T |                                   |                                    |                                     |
|   | NR_TDD_FR2_Y |                                   |                                    |                                     |
| $N_{oc}$ <sup>Note1</sup>   | NR_TDD_FR2_A | dBm/SCS                           | -95.7                              | -95.7                               |
|   | NR_TDD_FR2_B |                                   |                                    |                                     |
|   | NR_TDD_FR2_F |                                   |                                    |                                     |
|   | NR_TDD_FR2_G |                                   |                                    |                                     |
|   | NR_TDD_FR2_T |                                   |                                    |                                     |
|   | NR_TDD_FR2_Y |                                   |                                    |                                     |
| SSB_RP <sup>Note2</sup>   | NR_TDD_FR2_A | dBm/120KH<br>$z$ <sup>Note3</sup> | -88.7                              | -88.7                               |
|   | NR_TDD_FR2_B |                                   |                                    |                                     |
|   | NR_TDD_FR2_F |                                   |                                    |                                     |
|   | NR_TDD_FR2_G |                                   |                                    |                                     |
|   | NR_TDD_FR2_T |                                   |                                    |                                     |
|   | NR_TDD_FR2_Y |                                   |                                    |                                     |
| $\hat{E}_s/N_{oc}$  |              | dB                                | 7                                  | 7                                   |
| $\hat{E}_s/I_{ot}$  |              | dB                                | 7                                  | 7                                   |
| $I_o$ <sup>Note2</sup>  | NR_TDD_FR2_A | dBm/95.04<br>MHz <sup>Note4</sup> | -58.92                             | -58.92                              |
|   | NR_TDD_FR2_B |                                   |                                    |                                     |
|   | NR_TDD_FR2_F |                                   |                                    |                                     |
|   | NR_TDD_FR2_G |                                   |                                    |                                     |
|   | NR_TDD_FR2_T |                                   |                                    |                                     |
|   | NR_TDD_FR2_Y |                                   |                                    |                                     |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |              |                                   |                                    |                                     |

#### A.7.5.2.1.2 Test Requirements

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table A.7.5.2.1.2-1.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table A.7.5.2.1.2-2.

**Table A.7.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 4                          |

**Table A.7.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|-------|---------------------|----------------------------|
| 3     | 0.125               | 8 + SMTC duration          |

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

## A.7.5.2.2 SA interruptions at NR SRS carrier-based switching

### A.7.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS, the UE can perform SRS carrier-based switching to a carrier not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission. The test will partly verify the interruption requirements on PCell in clause 8.2.2.2.9.

### A.7.5.2.2.2 Test Parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the FR2 PCell. Cell 2 is an activated FR2 SCell on the TDD SCC which operates in downlink without PUCCH/PUSCH. The UE is configured with the SRS switching between PCell and SCell. The test parameters for PCell and SCell are given in Tables A.7.5.2.2.2-2, A.7.5.2.2.2-3, and A.7.5.2.2.2-4 below. The test consists of two successive time periods, with duration of T1 and T2, respectively. Immediately at the beginning of T2, the UE is triggered for SRS switching. The UE shall be scheduled on PCell continuously throughout the test.

The test equipment verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell.

**Table A.7.5.2.2.2-1: Supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.7.5.2.2.2-2: General test parameters for SA interruptions at NR SRS carrier-based switching**

| Parameter         | Unit | Value  | Comment  |
|-------------------|------|--------|--|
| RF Channel Number |      | 1, 2   | Two NR radio channel (1, 2) are used for this test |
| Active PCell      |      | Cell 1 | Primary cell on NR RF channel number 1             |
| Configured SCell  |      | Cell 2 | Activated secondary cell on NR RF channel number 2 |
| CP length         |      | Normal |  |
| DRX               |      | OFF    | Continuous monitoring of PCell                     |
| T1                | s    | 5      |  |
| T2                | ms   | 100    | UE shall perform SRS switching during T2           |

**Table A.7.5.2.2-3: Cell-specific test parameters for SA interruptions at NR SRS carrier-based switching**

| Parameter  |          | Unit | Cell 1 | Cell 2                      |
|--|----------|------|--------|-----------------------------|
| Frequency Range  |          |      |        | FR2                         |
| Duplex mode  | Config 1 |      |        | TDD                         |
| TDD configuration  | Config 1 |      |        | TDDConf.3.1                 |
| $BW_{\text{channel}}$  | Config 1 | MHz  |        | 100: $N_{\text{RB},c} = 66$ |
| Downlink initial BWP Configuration   | Config 1 |      |        | DLBWP.0.1                   |
| Downlink dedicated BWP Configuration   | Config 1 |      |        | DLBWP.1.1                   |
| Uplink initial BWP configuration   | Config 1 |      |        | ULBWP.0.1                   |
| Uplink dedicated BWP configuration   | Config 1 |      |        | ULBWP.1.1                   |
| SRS configuration  | Config 1 |      |        | SRS.3 TDD                   |
| TRS configuration  | Config 1 |      |        | TRS.2.1 TDD                 |
| TCI state  | Config 1 |      |        | TCI.State.0                 |
| PDSCH Reference measurement channel  | Config 1 |      |        | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | Config 1 |      |        | CR.3.1 TDD                  |
| RMC CORESET Reference Channel  | Config 1 |      |        | CCR.3.1 TDD                 |
| OCNG Patterns  |          |      |        | OP.1                        |
| SSB Configuration  |          |      |        | SSB.1 FR2                   |
| SMTTC Configuration  | Config 1 |      |        | SMTTC.1                     |
| EPRE ratio of PSS to SSS   |          | dB   |        | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |          |      |        |                             |
| EPRE ratio of PBCH to PBCH DMRS  |          |      |        |                             |
| EPRE ratio of PDCCH DMRS to SSS  |          |      |        |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |          |      |        |                             |
| EPRE ratio of PDSCH DMRS to SSS  |          |      |        |                             |
| EPRE ratio of PDSCH to PDSCH   |          |      |        |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |          |      |        |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |          |      |        |                             |
| $\bar{E}_s/N_{oc}$   |          | dB   |        | 17                          |
| Propagation Condition  |          |      |        | AWGN                        |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. |          |      |        |                             |



Table A.7.5.2.2-4: OTA related test parameters

| Parameter   | Unit                            | Test 1                               |    |
|---|---------------------------------|--------------------------------------|----|
|   |                                 | T1                                   | T2 |
| Angle of arrival configuration  |                                 | Setup 1 according to clause A.3.15.1 |    |
| Assumption for UE beams <sup>Note 6</sup>   |                                 | Fine                                 |    |
| $N_{oc}$ <sup>Note 1</sup>  | dBm/15kHz <sup>Note 4</sup>     | -112                                 |    |
| $N_{oc}$ <sup>Note 1</sup>  | dBm/SCS <sup>Note 3</sup>       | -103                                 |    |
| $\hat{E}_s / N_{oc}$  | dB                              | 4                                    |    |
| SS-RSRP <sup>Note 2</sup>   | dBm/SCS <sup>Note 4</sup>       | -99                                  |    |
| $\hat{E}_s / I_{ot}$  | dB                              | 4                                    |    |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note 4</sup> | -68.5                                |    |
| <p>NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>NOTE 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.</p> <p>NOTE 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.</p> <p>NOTE 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |                                 |                                      |    |

### A.7.5.2.2.3 Test Requirements

During T2, interruption on PCell due to SRS carrier-based switching between Cell 1 and Cell 2 shall not exceed the required values specified in clause 8.2.2.2.9.

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

## A.7.5.3 SCell Activation and Deactivation Delay

### A.7.5.3.1 SCell Activation and deactivation for SCell in FR2 intra-band in non-DRX

#### A.7.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1 except the PCell and SCell are in FR2 intra-band.

The supported test configurations are shown in table A.7.5.3.1.1-1 below. The general test parameters are the same as defined in Table A.6.5.3.1.1-2 except those described in Tables A.7.5.3.1.1-2, and cell specific test parameters are described in Tables A.7.5.3.1.1-3. OTA related test parameters are shown in table A.7.5.3.1.1-4 below.

Table A.7.5.3.1.1-1: Supported test configurations for FR2 SCell activation case

| Configuration | Description   |
|---------------|---|
| 1             | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Table A.7.5.3.1.1-2: General test parameters for FR2 SCell activation case

| Parameter         | Unit | Value | Comment  |
|-------------------|------|-------|--|
| RF Channel Number |      | 1,2   | Two NR radio channels are used for this test, cell 1 and cell2 use RF channel 1 and 2, respectively. |

Table A.7.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case

| Parameter <sup>Note 5</sup>   | Unit | Cell 1                      |    |    | Cell 2 |    |    |
|---|------|-----------------------------|----|----|--------|----|----|
|   |      | T1                          | T2 | T3 | T1     | T2 | T3 |
| SSB ARFCN   |      | freq1                       |    |    | freq2  |    |    |
| Duplex mode   |      | TDD                         |    |    |        |    |    |
| TDD configuration   |      | TDDConf.3.1                 |    |    |        |    |    |
| Downlink initial BWP Configuration  |      | DLBWP.0.1                   |    |    |        |    |    |
| Downlink dedicated BWP Configuration  |      | DLBWP.1.1                   |    |    |        |    |    |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   |    |    |        |    |    |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   |    |    |        |    |    |
| TRS configuration   |      | TRS.2.1 TDD                 |    |    |        |    |    |
| TCI state   |      | TCI.State.0                 |    |    |        |    |    |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |    |    |        |    |    |
| Data RBs allocated  |      | 66                          |    |    |        |    |    |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  |    |    | -      |    |    |
| RMSI CORESET Parameters   |      | CR.3.1 TDD                  |    |    | -      |    |    |
| Dedicated CORESET Parameters  |      | CCR.3.1 TDD                 |    |    | -      |    |    |
| OCNG Patterns   |      | OP.1                        |    |    |        |    |    |
| SSB Configuration   |      | SSB.1 FR2                   |    |    |        |    |    |
| SMTc Configuration  |      | SMTc.1                      |    |    |        |    |    |
| CSI-RS configuration for CSI reporting  |      | CSI-RS.3.1 TDD              |    |    |        |    |    |
| reportConfigType  |      | periodic                    |    |    | N/A    |    |    |
| reportQuantity  |      | cri-RI-PMI-CQI              |    |    | N/A    |    |    |
| CSI reporting periodicity   | slot | 40                          |    |    | N/A    |    |    |
| CSI reporting offset  | slot | 4                           |    |    | N/A    |    |    |
| EPRE ratio of PSS to SSS  | dB   | 0                           |    |    |        |    |    |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |    |    |        |    |    |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |    |    |        |    |    |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |    |    |        |    |    |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |    |    |        |    |    |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |    |    |        |    |    |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |    |    |        |    |    |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |    |    |        |    |    |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |    |    |        |    |    |
| Propagation conditions  |      | AWGN                        |    |    |        |    |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |    |    |        |    |    |
| Note 2: Void  |      |                             |    |    |        |    |    |
| Note 3: Void  |      |                             |    |    |        |    |    |
| Note 4: Void  |      |                             |    |    |        |    |    |
| Note 5: Void  |      |                             |    |    |        |    |    |

Table A.7.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case

| Parameter  | Unit                           | Cell 1                              |    |    | Cell 2                              |    |    |
|--|--------------------------------|-------------------------------------|----|----|-------------------------------------|----|----|
|  |                                | T1                                  | T2 | T3 | T1                                  | T2 | T3 |
| Angle of arrival configuration   |                                | Setup 1 according to table A.3.15.1 |    |    | Setup 1 according to table A.3.15.1 |    |    |
| Assumption for UE beams <sup>Note 7</sup>  |                                | Rough                               |    |    | Rough                               |    |    |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -104.7                              |    |    | -104.7                              |    |    |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -95.7                               |    |    | -95.7                               |    |    |
| $\hat{E}_s / N_{oc}$   | dB                             | 7                                   |    |    | 7                                   |    |    |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -88.7                               |    |    | -88.7                               |    |    |
| $\hat{E}_s / I_{ot}$   | dB                             | 7                                   |    |    | 7                                   |    |    |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -58.92                              |    |    | -58.92                              |    |    |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: Void</p> <p>Note 6: Void</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |                                |                                     |    |    |                                     |    |    |

### A.7.5.3.1.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value  $T_{FirstSSB} + 5ms$  as defined in clause 8.3.

### A.7.5.3.2 SCell Activation and deactivation for FR1+FR2 inter-band with target SCell in FR2

#### A.7.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.7.5.3.1.1 except the PCell is in FR1 and SCell is in FR2.

The supported test configurations are defined in Table A.7.5.3.2.1-1. The general test parameters are the same as defined in Table A.6.5.3.1.1-2 except that the length of T2 is 2s. And cell specific test parameters are described in Tables A.7.5.3.2.1-2. OTA related test parameters are defined in Table A.7.5.3.2.1-3.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment 100ms after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2.

During T2, the test equipment monitors the L1-RSRP measurement reporting for the SCell. The time when test equipment receives a valid L1-RSRP report is denoted as slot  $m+T_{L1-RSRP}$ . In the next DL slot after slot  $m+T_{L1-RSRP}$ , the test equipment sends a MAC message for the activation of the TCI state of the RMC CORESET of the SCell. In the same slot, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell and PCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

**Table A.7.5.3.2.1-1: Supported test configurations for FR2 SCell activation case**

| <b>Configuration</b> | <b>Description</b>  |
|----------------------|---|
| 1                    | PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode<br>Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2                    | PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode<br>Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3                    | PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode<br>Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode  |
| Note:                | The UE is only required to pass in one of the supported test configurations   |

**Table A.7.5.3.2.1-2: Cell specific test parameters for FR2 SCell activation case**

| Parameter <sup>Note 5</sup>                       | Unit         | Cell 1         |                             |    | Cell 2      |                                  |                |
|---|--------------|----------------|-----------------------------|----|-------------|----------------------------------|----------------|
|   |              | T1             | T2                          | T3 | T1          | T2                               | T3             |
| SSB ARFCN   |              | Freq1          |                             |    | Freq2       |                                  |                |
| Duplex mode                                       | Config 1     | FDD            |                             |    | TDD         |                                  |                |
|   | Config 2,3   | TDD            |                             |    |             |                                  |                |
| TDD configuration                                 | Config 1     | Not Applicable |                             |    | TDDConf.3.1 |                                  |                |
|   | Config 2     | TDDConf.1.1    |                             |    |             |                                  |                |
|   | Config 3     | TDDConf.2.1    |                             |    |             |                                  |                |
| Downlink initial BWP Configuration                | Config 1,2,3 | DLBWP.0.1      |                             |    |             |                                  |                |
| Downlink dedicated BWP Configuration              | Config 1,2,3 | DLBWP.1.1      |                             |    |             |                                  |                |
| Uplink initial BWP configuration                  | Config 1,2,3 | ULBWP.0.1      |                             |    |             |                                  |                |
| Uplink dedicated BWP configuration                | Config 1,2,3 | ULBWP.1.1      |                             |    |             |                                  |                |
| TRS configuration                                 | Config 1,2,3 | N/A            |                             |    | TRS.2.1 TDD |                                  |                |
| TCI state   | Config 1,2,3 | TCI.State.0    |                             |    |             |                                  |                |
| BW <sub>channel</sub>                             | Config 1,2   | MHz            | 10: N <sub>RB,c</sub> = 52  |    |             | 100: N <sub>RB,c</sub> = 66      |                |
|   | Config 3     |                | 40: N <sub>RB,c</sub> = 106 |    |             |                                  |                |
| Data RBs allocated                                | Config 1,2   | 52             |                             |    | 66          |                                  |                |
|   | Config 3     | 106            |                             |    |             |                                  |                |
| PDSCH Reference measurement channel               | Config 1     | SR.1.1 FDD     |                             |    | -           |                                  |                |
|   | Config 2     | SR.1.1 TDD     |                             |    |             |                                  |                |
|   | Config 3     | SR.2.1 TDD     |                             |    |             |                                  |                |
| RMSI CORESET Parameters                           | Config 1     | CR.1.1 FDD     |                             |    | -           |                                  |                |
|   | Config 2     | CR.1.1 TDD     |                             |    |             |                                  |                |
|   | Config 3     | CR.2.1 TDD     |                             |    |             |                                  |                |
| Dedicated CORESET Parameters                      | Config 1     | CCR.1.1 FDD    |                             |    | -           |                                  |                |
|   | Config 2     | CCR.1.1 TDD    |                             |    |             |                                  |                |
|   | Config 3     | CCR.2.1 TDD    |                             |    |             |                                  |                |
| OCNG Patterns                                     |              | OP.1           |                             |    |             |                                  |                |
| SSB configuration                                 | Config 1,2   | SSB.1 FR1      |                             |    | SSB.3 FR2   |                                  |                |
|   | Config 3     | SSB.2 FR1      |                             |    |             |                                  |                |
| CSI-RS configuration for CSI reporting            | Config 1~3   | N/A            |                             |    | N/A         | CSI-RS.3.1 TDD <sup>Note 6</sup> | CSI-RS.3.1 TDD |
| reportConfigType for CSI reporting                |              | periodic       |                             |    | N/A         |                                  |                |
| reportConfigType for L1-RSRP                      |              | periodic       |                             |    | N/A         |                                  |                |
| reportQuantity for CSI reporting                  |              | cri-RI-PMI-CQI |                             |    | N/A         |                                  |                |
| reportQuantity for L1-RSRP                        |              | ssb-Index-RSRP |                             |    | N/A         |                                  |                |
| CSI reporting periodicity                         | Config 1,2   | slot           | 5                           |    |             | N/A                              |                |
|   | Config 3     |                | 10                          |    |             |                                  |                |
| L1-RSRP reporting periodicity <sup>Note 7</sup>   | Config 1,2   | slot           | 5                           |    |             | N/A                              |                |
|   | Config 3     |                | 10                          |    |             |                                  |                |
| CSI reporting offset                              | Config 1,2   | slot           | 2                           |    |             | N/A                              |                |
|   | Config 3     |                | 4                           |    |             |                                  |                |
| L1-RSRP reporting offset                          | Config 1,2   | slot           | 2                           |    |             | N/A                              |                |
|   | Config 3     |                | 4                           |    |             |                                  |                |
| SMTC configuration                                |              | SMTC.1         |                             |    |             |                                  |                |
| EPRE ratio of PSS to SSS                          | dB           | 0              |                             |    |             |                                  |                |
| EPRE ratio of PBCH_DMRS to SSS                    |              |                |                             |    |             |                                  |                |
| EPRE ratio of PBCH to PBCH_DMRS                   |              |                |                             |    |             |                                  |                |
| EPRE ratio of PDCCH_DMRS to SSS                   |              |                |                             |    |             |                                  |                |
| EPRE ratio of PDCCH to PDCCH_DMRS                 |              |                |                             |    |             |                                  |                |
| EPRE ratio of PDSCH_DMRS to SSS                   |              |                |                             |    |             |                                  |                |
| EPRE ratio of PDSCH to PDSCH_DMRS                 |              |                |                             |    |             |                                  |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |              |                |                             |    |             |                                  |                |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |              |                |                             |    |             |                                  |                |

|                        |   |                                     |      |
|------------------------|---|-------------------------------------|------|
| Propagation conditions |   | N/A<br>Link only, see clause A.3.7A | AWGN |
| Note 1:                | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                                     |      |
| Note 2:                | Void  |                                     |      |
| Note 3:                | Void  |                                     |      |
| Note 4:                | Void  |                                     |      |
| Note 5:                | All parameters apply for configuration 1 and 2  |                                     |      |
| Note 6:                | CSI-RS for CSI measurement is (re)configured in the next DL slot after slot $m+T_{L1-RSRP}$ during T2.  |                                     |      |
| Note 7:                | L1-RSRP measurement and reporting are configured to the the UE prior to the start of time period T1.  |                                     |      |

**Table A.7.5.3.2.1-3: OTA related test parameters for FR1 PCell activation case with FR2 SCell**

| Parameter                                 | Unit   | Cell 1                       |    |    | Cell 2                       |        |        |
|---|--|------------------------------|----|----|------------------------------|--------|--------|
|   |  | T1                           | T2 | T3 | T1                           | T2     | T3     |
| Angle of arrival configuration            |  | N/A                          |    |    | According to clause A.3.15.1 |        |        |
| Assumption for UE beams <sup>Note 7</sup> |  | N/A                          |    |    | Rough                        |        |        |
| $N_{oc}$ <sup>Note 1</sup>                | Config 1,2,3   | Link only, see clause A.3.7A |    |    | -104.7                       |        |        |
| $N_{oc}$ <sup>Note 1</sup>                | Config 1,2,3   |                              |    |    | -95.7                        |        |        |
| $\hat{E}_s / N_{oc}$                      | Config 1,2,3   |                              |    |    | -∞                           | 7      | 7      |
| $\hat{E}_s / I_{ca}$                      | Config 1,2,3   |                              |    |    | -∞                           | 7      | 7      |
| SSB_RP <sup>Note 2, Note 4</sup>          | Config 1,2,3   |                              |    |    | -∞                           | -88.7  | -88.7  |
| $I_o$ <sup>Note 2, Note 4</sup>           | Config 1,2,3   |                              |    |    | -66.68                       | -58.92 | -58.92 |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                              |    |    |                              |        |        |
| Note 2:                                   | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                              |    |    |                              |        |        |
| Note 3:                                   | Void   |                              |    |    |                              |        |        |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                              |    |    |                              |        |        |
| Note 5:                                   | Void   |                              |    |    |                              |        |        |
| Note 6:                                   | Void   |                              |    |    |                              |        |        |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3 and does not imit UE implementation or test system implementation.  |                              |    |    |                              |        |        |

**A.7.5.3.2.2 Test Requirements**

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PCell in the slot.

During T2 the UE shall start sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+ $T_{L1-RSRP}$ ), where  $T_{L1-RSRP}$  is no larger than

$$3ms + T_{FirstSSB\_MAX} + 15 * T_{SMTc\_MAX} + 8 * T_{TS} + T_{L1-RSRP, measure} + T_{L1-RSRP, report}$$

as defined in clause 8.3.2. For this test case,  $T_{FirstSSB\_MAX}=T_{SMTc\_MAX}=T_{TS}=20ms$ ;  $T_{L1-RSRP, measure}=160ms$  and  $T_{L1-RSRP, report}=5ms$ , which allows  $T_{L1-RSRP}$  680 ms.

During T2 the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot  $m + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR\ slot\ length}$ , where

-  $T_{HARQ}$  is defined in Table A.5.5.3.1.1-2

-  $T_{\text{activation\_time}} = 3\text{ms} + T_{\text{FirstSSB\_MAX}} + 15 * T_{\text{SMTc\_MAX}} + 8 * T_{\text{rs}} + T_{\text{L1-RSRP, measure}} + T_{\text{L1-RSRP, report}} + \max \{ (T_{\text{HARQ}} + T_{\text{uncertainty\_MAC}} + 5\text{ms} + T_{\text{FineTiming}}), (T_{\text{uncertainty\_RRC}} + T_{\text{RRC\_delay}}) \}$ , which allows 710 ms

-  $T_{\text{CSI\_Reporting}} = 10\text{ms}$

- NR slot length is 0.125ms for this test case.

During T3 the UE shall stop sending CSI reports for both SCells no later than slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3.

During T2 interruption of PCell during SCell activation shall not happen outside the slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms} + T_{\text{X}}}{\text{NR slot length}}$ , as defined in clause 8.3, where  $T_{\text{X}} = 20\text{ms}$ .

During T3 the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ , as defined in clause 8.3.

The interruption of PCell due to activation of SCell shall not be more than the values specified for SA in Clause 8.2.2.2.7.

### A.7.5.3.3 SCell Activation and deactivation for SCell in FR2 inter-band in non-DRX

#### A.7.5.3.3.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.7.5.3.1.1 except the PCell and SCell are in FR2 inter-band.

The supported test configurations are shown in table A.7.5.3.3.1-1 below. The general test parameters are described in Tables A.7.5.3.3.1-2, and cell specific test parameters are described in Tables A.7.5.3.3.1-3. OTA related test parameters are shown in table A.7.5.3.3.1-4 below.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell. A MAC message for activation of SCell is sent by the test equipment 100ms after the RRC message, in a slot # denoted m.

The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of Cell 2 is increased to same level as for cell 2. During T2, the test equipment monitors the L1-RSRP measurement reporting for the SCell. The time when test equipment receives a valid L1-RSRP report is denoted as slot  $m + T_{\text{L1-RSRP}}$ . In the next DL slot after slot  $m + T_{\text{L1-RSRP}}$ , the test equipment sends a MAC message for the activation of the TCI state of the RMC CORESET of the SCell. In the same slot, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell and PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

**Table A.7.5.3.3.1-1: Supported test configurations for FR2 SCell activation in FR2 inter-band**

| Configuration | Description   |
|---------------|---|
| 1             | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |



Table A.7.5.3.3.1-2: General test parameters for FR2 SCell activation in FR2 inter-band

| Parameter   | Unit    | Value                              | Comment   |
|---|---------|------------------------------------|---|
| RF Channel Number                                     |         | 1,2                                | Two NR radio channels are used for this test. RF channel number 1 is in band 1 and RF channel number 2 is in band 2, where bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2.                                 |
| Active PCell  |         | Cell 1                             | Primary cell on NR RF channel number 1.   |
| Configured deactivated SCell                          |         | Cell 2                             | Configured deactivated secondary cell on NR RF channel number 2.  |
| CP length   |         | Normal                             |   |
| DRX   |         | OFF                                | Continuous monitoring of primary cell   |
| CQI/PMI periodicity and offset configuration index    |         | 0                                  | CQI reporting for SCell every second subframe   |
| Cell-individual offset for cells on NR channel number | dB      | 0                                  | Individual offset for cells on primary component carrier.   |
| SCell measurement cycle (measCycleSCell)              | ms      | 160                                |   |
| Cell2 timing offset to cell1                          | $\mu$ s | $\leq 8$                           | A random value from 0 $\mu$ s to 8 $\mu$ s  |
| T1  | s       | 7                                  | During this time the PCell shall be known and the SCell configured and detected.  |
| T2  | s       | 2                                  | During this time the UE shall activate the SCell.   |
| T3  | s       | 1                                  | During this time the UE shall deactivate the SCell.   |
| T <sub>HARQ</sub>                                     | ms      | $k_1 \times \text{NR slot length}$ | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by <i>dl-DataToUL-ACK</i> , the value of $k$ should be the minimum value defined in TS 38.213 [3] depends on UE's capability |
| T <sub>CSI_Reporting</sub>                            | ms      | 2                                  | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]  |

**Table A.7.5.3.3.1-3: Cell specific test parameters for FR2 SCell activation in FR2 inter-band**

| Parameter <sup>Note 5</sup>   | Unit | T1                          |        | T2                          |                                     | T3                          |                |
|---|------|-----------------------------|--------|-----------------------------|-------------------------------------|-----------------------------|----------------|
|   |      | Cell 1                      | Cell 2 | Cell 1                      | Cell 2                              | Cell 1                      | Cell 2         |
| SSB ARFCN   |      | freq1                       | freq2  | freq1                       | freq2                               | freq1                       | freq2          |
| Duplex mode   |      | TDD                         |        | TDD                         |                                     | TDD                         |                |
| TDD configuration   |      | TDDConf.3.1                 |        | TDDConf.3.1                 |                                     | TDDConf.3.1                 |                |
| Downlink initial BWP Configuration  |      | DLBWP.0.1                   |        | DLBWP.0.1                   |                                     | DLBWP.0.1                   |                |
| Downlink dedicated BWP Configuration  |      | DLBWP.1.1                   |        | DLBWP.1.1                   |                                     | DLBWP.1.1                   |                |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   |        | ULBWP.0.1                   |                                     | ULBWP.0.1                   |                |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   |        | ULBWP.1.1                   |                                     | ULBWP.1.1                   |                |
| TRS configuration   |      | TRS.2.1 TDD                 |        | TRS.2.1 TDD                 |                                     | TRS.2.1 TDD                 |                |
| TCI state   |      | TCI.State.0                 |        | TCI.State.0                 |                                     | TCI.State.0                 |                |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |        | 100: N <sub>RB,c</sub> = 66 |                                     | 100: N <sub>RB,c</sub> = 66 |                |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  | -      | SR.3.1 TDD                  | -                                   | SR.3.1 TDD                  | -              |
| RMSI CORESET Parameters   |      | CR.3.1 TDD                  | -      | CR.3.1 TDD                  | -                                   | CR.3.1 TDD                  | -              |
| Dedicated CORESET Parameters  |      | CCR.3.1 TDD                 | -      | CCR.3.1 TDD                 | -                                   | CCR.3.1 TDD                 | -              |
| CSI-RS configuration  |      | NA                          | NA     | NA                          | CSI-RS.3.1 TDD<br><sup>Note 2</sup> | NA                          | CSI-RS.3.1 TDD |
| CSI reporting periodicity <sup>Note 3</sup>   |      | NA                          | 5      | NA                          | 5                                   | NA                          | 5              |
| OCNG Patterns   |      | OP.1                        |        |                             |                                     |                             |                |
| SSB Configuration   |      | SSB.1 FR2                   |        |                             |                                     |                             |                |
| SMTTC Configuration   |      | SMTTC.1                     |        |                             |                                     |                             |                |
| EPRE ratio of PSS to SSS  | dB   | 0                           |        |                             |                                     |                             |                |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |        |                             |                                     |                             |                |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |        |                             |                                     |                             |                |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |        |                             |                                     |                             |                |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |        |                             |                                     |                             |                |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |        |                             |                                     |                             |                |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |        |                             |                                     |                             |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |        |                             |                                     |                             |                |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      | AWGN                        |        |                             |                                     |                             |                |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: CSI-RS for CSI measurement is (re)configured in the next DL slot after slot <math>m+T_{L1-RSRP}</math> during T2.</p> <p>Note 3: L1-RSRP measurement and reporting are configured to the the UE prior to the start of time period T1.</p> |      |                             |        |                             |                                     |                             |                |

Table A.7.5.3.3.1-4: OTA related test parameters for FR2 SCell activation in FR2 inter-band

| Parameter <sup>Note 6</sup>               | Unit   | Cell 1                                |    |    | Cell 2 |    |    |
|---|--|---------------------------------------|----|----|--------|----|----|
|   |  | T1                                    | T2 | T3 | T1     | T2 | T3 |
| AoA setup                                 |  | Setup 3 as specified in clause A.3.15 |    |    |        |    |    |
|   |  | AoA1                                  |    |    | AoA2   |    |    |
| Assumption for UE beams <sup>Note 7</sup> |  | Rough                                 |    |    | Rough  |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sup>Note4</sup>   | -92.1                                 |    |    | -92.1  |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sup>Note3</sup>   | -83.1                                 |    |    | -83.1  |    |    |
| $\hat{E}_s / N_{oc}$                      | dB   | 0                                     |    |    | 0      |    |    |
| SS-RSRP <sup>Note2</sup>                  | dBm/SCS <sup>Note4</sup>   | -83.1                                 |    |    | -83.1  |    |    |
| $\hat{E}_s / I_{ot}$                      | dB   | 0                                     |    |    | 0      |    |    |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sup>Note4</sup>   | -51.1                                 |    |    | -51.1  |    |    |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                       |    |    |        |    |    |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                       |    |    |        |    |    |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                       |    |    |        |    |    |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                                       |    |    |        |    |    |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |                                       |    |    |        |    |    |
| Note 6:                                   | All parameters apply for configuration 1   |                                       |    |    |        |    |    |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |                                       |    |    |        |    |    |

### A.7.5.3.3.2 Test Requirements

During T2 the UE shall start sending CSI report for the SCell in the configured slots for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k). UE shall send the first CSI report for SCell after receiving at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k), or in the next available uplink resource for CSI reporting if the slot was subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PCell in the slot.

During T2, the UE shall start sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+ $T_{L1-RSRP}$ ), where  $T_{L1-RSRP}$  is no larger than  $3ms + T_{FirstSSB\_MAX} + 15 * T_{SMTC\_MAX} + 8 * T_{rs} + T_{L1-RSRP, measure} + T_{L1-RSRP, report}$  as defined in clause 8.3.2. For this test case,  $T_{FirstSSB\_MAX} = T_{SMTC\_MAX} = T_{rs} = 20ms$ ;  $T_{L1-RSRP, measure} = 480ms$  and  $T_{L1-RSRP, report} = 5ms$ , which allows  $T_{L1-RSRP} = 1000ms$ .

During T2, the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot  $m + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR\ slot\ length}$ , where

- $T_{HARQ}$  is defined in Table A.7.5.3.3.1-2
- $T_{activation\_time} = 3ms + T_{FirstSSB\_MAX} + 15 * T_{SMTC\_MAX} + 8 * T_{rs} + T_{L1-RSRP, measure} + T_{L1-RSRP, report} + \max \{ (T_{HARQ} + T_{uncertainty\_MAC} + 5ms + T_{FineTiming}), (T_{uncertainty\_RRC} + T_{RRC\_delay}) \}$ , which allows 1030ms
- $T_{CSI\_Reporting} = 10ms$
- NR slot length is 0.125ms for this test case.

During T2, the interruption of PCell during SCell activation shall not happen outside the slot  $m + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $m + 1 + \frac{T_{HARQ} + 3ms + T_X}{NR\ slot\ length}$ , where  $T_X = 20ms$ .

During T3, the UE shall stop sending CSI reports for SCell no later than slot  $n + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$ , as defined in clause 8.3.

During T3, the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot  $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $n + 1 + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$  as defined in clause 8.3.

### A.7.5.3.4 Direct SCell activation at SCell addition of known SCell in FR2

#### A.7.5.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the delay and interruption for direct SCell activation delay at SCell addition are within the requirements stated in clause 8.3.4.

The supported test configurations are shown in Table A.7.5.3.4.1-1 below. The general test parameters are given in Table A.7.5.3.4.1-2 and cell-specific test parameters in Table A.7.5.3.4.1-3. OTA related test parameters are shown in Table A.7.5.3.4.1-4.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two FR2 carriers and two NR cells. Before the test starts the UE is connected to Cell 1 (PCell) on carrier #1, but is not aware of Cell 2 on NR carrier #2. Cell 1 and Cell 2 have constant signal levels throughout the test. The UE is monitoring the PCell. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the Cell 2 is monitored by the UE. During T1, Cell 2 should be detected and measured by the UE such that it meets the condition for known cell defined in clause 8.3.4 for direct SCell activation.

Time period T2 starts when the *RRCReconfiguration* message for the configuration and activation of Cell 2 (the SCell), which is sent from the test equipment, is received at the UE antenna connector in a slot # denoted m. The test equipment shall set the parameter *sCellState* to *activated* for the SCell, which causes Cell 2 to become configured and activated.

Time period T3 starts at  $(m + N_{\text{direct}})$ , at which point UE shall be reporting a valid CQI for both PCell and SCell.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during the activation of SCell. The test equipment verifies the activation time by counting the slots from the time when the SCell activation message is sent until a CQI report with other than CQI index 0 is received.

**Table A.7.5.3.4.1-1: Supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.7.5.3.4.1-2: General test parameters**

| Parameter                                | Unit | Value  | Comment   |
|--|------|--|---|
| RF Channel Number                        |      | 1,2  | Two NR radio channels (1,2) in FR2 are used for this test   |
| Active PCell                             |      | Cell 1   | Primary cell on NR RF channel number 1.   |
| Configured and activated SCell           |      | Cell 2   | Configured and activated SCell on NR RF channel number 2.   |
| CP length                                |      | Normal   |   |
| DRX                                      |      | OFF  | Continuous monitoring of primary cell   |
| SCell measurement cycle (measCycleSCell) | ms   | 160  |   |
| T1                                       | s    | 7  | During this time the measurement for Cell 2 is configured, and Cell 2 is detected.  |
| T2                                       | s    | $N_{\text{direct}}$  | During this time the UE shall configure and activate Cell 2 as SCell.   |
| T3                                       | ms   | 100  | During this time the UE shall report valid CQI for both PCell and SCell.  |
| $T_{\text{HARQ}}$                        | ms   | $k_1 \times \text{NR slot length}$                         | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by <i>dl-DataToUL-ACK</i> if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3] |
| k  | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe}, \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [3]   |

**Table A.7.5.3.4.1-3: Cell specific test parameters**

| Parameter   |          | Unit | Cell 1                      |    |    | Cell 2         |    |    |
|---|----------|------|-----------------------------|----|----|----------------|----|----|
|   |          |      | T1                          | T2 | T3 | T1             | T2 | T3 |
| SSB ARFCN   |          |      | freq1                       |    |    | freq2          |    |    |
| Duplex mode   | Config 1 |      | TDD                         |    |    |                |    |    |
| TDD configuration   | Config 1 |      | TDDConf.3.1                 |    |    |                |    |    |
| BW <sub>channel</sub>   | Config 1 | MHz  | 100: N <sub>RB,c</sub> = 66 |    |    |                |    |    |
| DL initial BWP configuration  | Config 1 |      | DLBWP.0.1                   |    |    |                |    |    |
| DL dedicated BWP configuration  | Config 1 |      | DLBWP.1.1                   |    |    |                |    |    |
| UL initial BWP configuration  | Config 1 |      | ULBWP.0.1                   |    |    |                |    |    |
| UL dedicated BWP configuration  | Config 1 |      | ULBWP.1.1                   |    |    |                |    |    |
| Timing offset to Cell 1   |          | ms   | Not Applicable              |    |    | 0              |    |    |
| PDSCH Reference measurement channel   | Config 1 |      | SR.3.1 TDD                  |    |    | SR.3.1 TDD     |    |    |
| RMSI CORESET Reference Channel  | Config 1 |      | CR.3.1 TDD                  |    |    | CR.3.1 TDD     |    |    |
| RMC CORESET Reference Channel   | Config 1 |      | CCR.3.1 TDD                 |    |    | CCR.3.1 TDD    |    |    |
| TRS configuration   | Config 1 |      | TRS.2.1 TDD                 |    |    | TRS.2.1 TDD    |    |    |
| CSI-RS configuration  | Config 1 |      | CSI-RS.3.1 TDD              |    |    | CSI-RS.3.1 TDD |    |    |
| CSI reporting periodicity   | Config 1 | ms   | 5                           |    |    | 5              |    |    |
| OCNG Patterns   |          |      | OP.1                        |    |    |                |    |    |
| SMTC configuration  |          |      | SMTC.1                      |    |    |                |    |    |
| SSB configuration   | Config 1 |      | SSB.1 FR2                   |    |    | SSB.1 FR2      |    |    |
| EPRE ratio of PSS to SSS  |          | dB   | 0                           |    |    |                |    |    |
| EPRE ratio of PBCH DMRS to SSS  |          |      |                             |    |    |                |    |    |
| EPRE ratio of PBCH to PBCH DMRS   |          |      |                             |    |    |                |    |    |
| EPRE ratio of PDCCH DMRS to SSS   |          |      |                             |    |    |                |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |          |      |                             |    |    |                |    |    |
| EPRE ratio of PDSCH DMRS to SSS   |          |      |                             |    |    |                |    |    |
| EPRE ratio of PDSCH to PDSCH  |          |      |                             |    |    |                |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |          |      |                             |    |    |                |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |          |      |                             |    |    |                |    |    |
| Propagation condition   |          | -    | AWGN                        |    |    |                |    |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |          |      |                             |    |    |                |    |    |

**Table A.7.5.3.4.1-4: OTA related test parameters**

| Parameter <sup>Note 6</sup> | Unit | Cell 1 |    |    | Cell 2 |    |    |
|-----------------------------|------|--------|----|----|--------|----|----|
|                             |      | T1     | T2 | T3 | T1     | T2 | T3 |

| Angle of arrival configuration            |  | Setup 1 according to A.3.15.1 |         |
|---|--|-------------------------------|---------|
| Assumption for UE beams <sup>Note 7</sup> |  | Rough                         | Rough   |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sup>Note4</sup>   | -112                          | -112    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sup>Note3</sup>   | -102.97                       | -102.97 |
| $\hat{E}_s/N_{oc}$                        | dB   | 14                            | 14      |
| SS-RSRP <sup>Note2</sup>                  | dBm/SCS <sup>Note4</sup>   | -88.97                        | -88.97  |
| $\hat{E}_s/I_{ot}$                        | dB   | 14                            | 14      |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sup>Note4</sup>   | -59.81                        | -59.81  |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                               |         |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |         |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                               |         |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                               |         |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |                               |         |
| Note 6:                                   | All parameters apply for configuration 1   |                               |         |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                               |         |

#### A.7.5.3.4.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot  $(m+k)$ . UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PCell in the slot.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot  $m + \frac{N_{direct}}{NR\ slot\ length}$ , where

$$N_{direct} = T_{RRC\_Process} + T_1 + T_{activation\_time} + T_{CSI\_Reporting} - 3ms,$$

- $T_{RRC\_Process} = 16ms$ , which is the RRC procedure delay defined for SCell addition in clause 12 of TS 38.331 [2],
- $T_1$  is the delay from slot  $m + T_{RRC\_Process}$  until the transmission of *RRCReconfigurationComplete* message,
- $T_{activation\_time} = T_{FirstSSB} + 5ms = 25ms$ ,
- $T_{CSI\_Reporting} = 10ms$

This gives a total of  $N_{direct} = 16 + T_1 + 25 + 10 - 3 = (48 + T_1)$  ms, and NR slot length is 0.125ms.

During T3 the UE shall send CSI reports for SCell with non-zero CQI index and continue to send CSI reports for SCell with non-zero CQI index until the end of T3.

During T2 interruption of PCell during SCell activation shall not happen outside the window from slot  $m+1$  to slot  $m+1 + \frac{T_{RRC\_Process} + T_1 + T_X}{NR\ slot\ length}$  as defined in clause 8.3.4, where  $T_X = 20ms$ .

The interruption of PCell due to activation of SCell shall not be more than the values specified for NR SA in clause 8.2.2.2.11.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot  $m + \frac{N_{direct}}{NR\ slot\ length}$  as defined in clause 8.3.4 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### A.7.5.3.5 Direct SCell activation at handover with known SCell in FR2

#### A.7.5.3.5.1 Test Purpose and Environment

This test is to verify the requirements specified in sub clause 8.3.5 for the FR2 handover with direct SCell activation.

The test scenario comprises of three FR2 cells, one source PCell (Cell 1), one target PCell (Cell 2) and one SCell (Cell 3). The test consists of three successive time periods, with time durations of T1, T2, and T3 respectively.

At the start of time duration T1, the UE is in connected mode with PCell (Cell 1). Both Cell 2 and Cell 3 are known to UE and UE is reporting CQI for all Cell 1.

Time period T2 starts when UE receives a handover command that initiate handover of UE to Cell2 and also activates Cell 3. This is done using an *RRCConnectionReconfiguration* message with parameter *sCellState* set to *activated* for the Cell 3. The message is sent from the test equipment to the UE and is received in a slot number  $n$  at the UE antenna connector. The UE shall accomplish the handover, addition and activation of the SCell no later than slot  $(n + \frac{N_{direct}}{NR\ slot\ length})$ .

Time period T3 starts at  $(n + \frac{N_{direct}}{NR\ slot\ length})$ , at which point UE shall be reporting a valid CSI for both Cell 2 and Cell 3 as given in tables A.7.5.3.5.1-1 and A.7.5.3.5.1-2.

**Table A.7.5.3.5.1-1: Supported test configurations for FR2 handover with direct SCell activation case**

| Configuration | Description  |
|---------------|--|
| 1             | SCell: NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.5.3.5.1-2: General test parameters for FR2 handover with direct SCell activation case**

| Parameter                 | Unit           | Value     | Comment  |
|---------------------------|----------------|-----------|--|
| RF Channel Number         |                | 1, 2, 3   | Three NR radio channels are used for this test, Cell 1, Cell2 and Cell 3 use RF channel 1, 2 and 3 respectively. |
| A4-Offset                 | dBm            | -120      |  |
| Time offset between cells |                | 3 $\mu$ s | Synchronous cells  |
| Initial conditions        | Source cell    | Cell 1    | Source Cell  |
|                           | Target cell    | Cell 2    | Neighbour cell   |
|                           | SCell          | Cell 3    | SCell is not added and activated   |
| Final condition           | Source cell    | Cell 2    | Cell 2 is Source cell after handover   |
|                           | Neighbour cell | Cell 1    | Neighbour cell   |
|                           | SCell          | Cell 3    | SCell is added and activated   |

**Table A.7.5.3.5.1-3: Cell specific test parameters for FR2 SCell activation case**

| Parameter <sup>Note 5</sup>   | Unit | T1                          |        |        | T2                          |        |        | T3                          |        |        |
|---|------|-----------------------------|--------|--------|-----------------------------|--------|--------|-----------------------------|--------|--------|
|   |      | Cell 1                      | Cell 2 | Cell 3 | Cell 1                      | Cell 2 | Cell 3 | Cell 1                      | Cell 2 | Cell 3 |
| SSB ARFCN   |      | freq1                       | freq2  | freq3  | freq1                       | freq2  | freq3  | freq1                       | freq2  | freq3  |
| Duplex mode   |      | TDD                         |        |        | TDD                         |        |        | TDD                         |        |        |
| TDD configuration   |      | TDDConf.3.1                 |        |        | TDDConf.3.1                 |        |        | TDDConf.3.1                 |        |        |
| Downlink initial BWP Configuration  |      | DLBWP.0.1                   |        |        | DLBWP.0.1                   |        |        | DLBWP.0.1                   |        |        |
| Downlink dedicated BWP Configuration  |      | DLBWP.1.1                   |        |        | DLBWP.1.1                   |        |        | DLBWP.1.1                   |        |        |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   |        |        | ULBWP.0.1                   |        |        | ULBWP.0.1                   |        |        |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   |        |        | ULBWP.1.1                   |        |        | ULBWP.1.1                   |        |        |
| TRS configuration   |      | TRS.2.1 TDD                 |        |        | TRS.2.1 TDD                 |        |        | TRS.2.1 TDD                 |        |        |
| TCI state   |      | TCI.State.0                 |        |        | TCI.State.0                 |        |        | TCI.State.0                 |        |        |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |        |        | 100: N <sub>RB,c</sub> = 66 |        |        | 100: N <sub>RB,c</sub> = 66 |        |        |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  | -      |        | SR.3.1 TDD                  | -      |        | SR.3.1 TDD                  |        |        |
| RMSI CORESET Parameters   |      | CR.3.1 TDD                  | -      |        | CR.3.1 TDD                  | -      |        | CR.3.1 TDD                  |        |        |
| Dedicated CORESET Parameters  |      | CCR.3.1 TDD                 | -      |        | CCR.3.1 TDD                 | -      |        | CCR.3.1 TDD                 |        |        |
| OCNG Patterns   |      | OP.1                        |        |        |                             |        |        |                             |        |        |
| SSB Configuration   |      | SSB.1 FR2                   |        |        |                             |        |        |                             |        |        |
| SMTTC Configuration   |      | SMTTC.1                     |        |        |                             |        |        |                             |        |        |
| PRACH configuration   |      | FR2 PRACH configuration 1   |        |        |                             |        |        |                             |        |        |
| EPRE ratio of PSS to SSS  | dB   | 0                           |        |        |                             |        |        |                             |        |        |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |        |        |                             |        |        |                             |        |        |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |        |        |                             |        |        |                             |        |        |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |        |        |                             |        |        |                             |        |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |        |        |                             |        |        |                             |        |        |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |        |        |                             |        |        |                             |        |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |        |        |                             |        |        |                             |        |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |        |        |                             |        |        |                             |        |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |        |        |                             |        |        |                             |        |        |
| Propagation conditions  |      | AWGN                        |        |        |                             |        |        |                             |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Void</p> |      |                             |        |        |                             |        |        |                             |        |        |



Table A.7.5.3.5.1-4: OTA related test parameters for FR2 SCell activation case

| Parameter <sup>Note 6</sup>               | Unit   | Cell 1                              |    |    | Cell 2                              |    |    | Cell 3                              |    |    |
|---|--|-------------------------------------|----|----|-------------------------------------|----|----|-------------------------------------|----|----|
|   |  | T1                                  | T2 | T3 | T1                                  | T2 | T3 | T1                                  | T2 | T3 |
| Angle of arrival configuration            |  | Setup 1 according to table A.3.15.1 |    |    | Setup 1 according to table A.3.15.1 |    |    | Setup 1 according to table A.3.15.1 |    |    |
| Assumption for UE beams <sup>Note 7</sup> |  | Rough                               |    |    | Rough                               |    |    | Rough                               |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sup>Note4</sup>   | -112                                |    |    | -112                                |    |    | -112                                |    |    |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sup>Note3</sup>   | -102.97                             |    |    | -102.97                             |    |    | -102.97                             |    |    |
| $\hat{E}_s/N_{oc}$                        | dB   | 14                                  |    |    | 14                                  |    |    | 14                                  |    |    |
| SS-RSRP <sup>Note2</sup>                  | dBm/SCS <sup>Note4</sup>   | -88.97                              |    |    | -88.97                              |    |    | -88.97                              |    |    |
| $\hat{E}_s/I_{ot}$                        | dB   | 14                                  |    |    | 14                                  |    |    | 14                                  |    |    |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sup>Note4</sup>   | -88.80                              |    |    | -88.80                              |    |    | -88.80                              |    |    |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                     |    |    |                                     |    |    |                                     |    |    |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                     |    |    |                                     |    |    |                                     |    |    |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                     |    |    |                                     |    |    |                                     |    |    |
| Note 4:                                   | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone   |                                     |    |    |                                     |    |    |                                     |    |    |
| Note 5:                                   | As observed with 0dBi gain antenna at the centre of the quiet zone   |                                     |    |    |                                     |    |    |                                     |    |    |
| Note 6:                                   | Void   |                                     |    |    |                                     |    |    |                                     |    |    |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |                                     |    |    |                                     |    |    |                                     |    |    |

### A.7.5.3.5.2 Test Requirements

The UE shall be capable to transmit valid CSI report for PCell (Cell 2) and to the directly activated SCell1 no later than in slot  $n + N_{direct}$ .

The SCell activation delay,  $N_{direct}$ , can be expressed as:  $N_{direct} = T_{RRC\_process} + T_{interrupt} + T_2 + T_3 + T_{activation\_time} + T_{CSI\_Reporting} - 3ms$ ; Where:

$T_{RRC\_Process}$ : RRC procedure delay defined in clause 12 of TS 38.331 and it is equal to 16ms,

$T_{interrupt}$ : Interruption time during handover as specified in clause 6.1.1. The value to be verified in the test is 52 ms ( $T_{interrupt} = 0$  ms for  $T_{search} + 10ms$  for  $T_{IU} + 20$  ms for  $T_{processing} + 20ms$  for  $T_{\Delta} + 2$  ms for  $T_{margin}$  ms) by assuming known SCell and SMTC.1 configuration.

$T_2$ : Delay from slot  $n + \frac{T_{RRC\_Process} + T_{interrupt}}{NR\ slot\ length}$  until UE has obtained a valid TA command for the target PCell,

$T_3$ : Delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to  $k+1$  slot, where  $k$  is defined in clause 4.2 in TS 38.213,

$T_{activation\_time}$  and  $T_{CSI\_Reporting}$  are specified in clause 8.3.2, where the following definitions of  $T_{FirstSSB}$  and  $T_{FirstSSB\_MAX}$  as defined in section 8.3.5 shall apply:

During time period T2 of the test, the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $n + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR\ slot\ length}$ ,  $T_{activation\_time} = T_{SMTC\_SCell} + 5ms$ , as defined in clause 8.3.

During time period T3 of the test, the UE shall stop sending CSI reports for SCell at latest in a slot  $m + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$ , as defined in clause 8.3.

During time period T2 of the test, interruption of PCell / PSCell during SCell activation shall not happen outside the slot  $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to  $n + 1 + \frac{T_{HARQ} + 3ms + T_X}{NR\ slot\ length} + N_{interruption}$ , as defined in clause 8.3.

During time period T3 of the test, the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot  $m + 1 + \frac{T_{\text{HARQ}}}{NR \text{ slot length}}$  to  $m + 1 + \frac{T_{\text{HARQ}} + 3\text{ms}}{NR \text{ slot length}}$ , as defined in clause 8.3.

The interruption on any activated serving cell shall not be more than the values specified for SA in clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During time period T2 of the test, if there are no uplink resources for reporting the valid CSI in a slot  $\frac{T_{\text{HARQ}} + T_{\text{activation\_time}} + T_{\text{CSI\_Reporting}}}{NR \text{ slot length}}$  as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

#### A.7.5.4 Void

### A.7.5.5 Beam Failure Detection and Link recovery procedures

#### A.7.5.5.1 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.7.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.1.1-1, A.7.5.5.1.1-2, A.7.5.5.1.1-3 and A.7.5.5.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.1.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.7.5.5.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

**Table A.7.5.5.1.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description  |
|---------------|--|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth                                |
| 2             | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth                                |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR2 |

**Table A.7.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Test Config. | Unit | Value  | Comment |
|-----------|--------------|------|--------|---------|
|           |              |      | Test 1 |         |

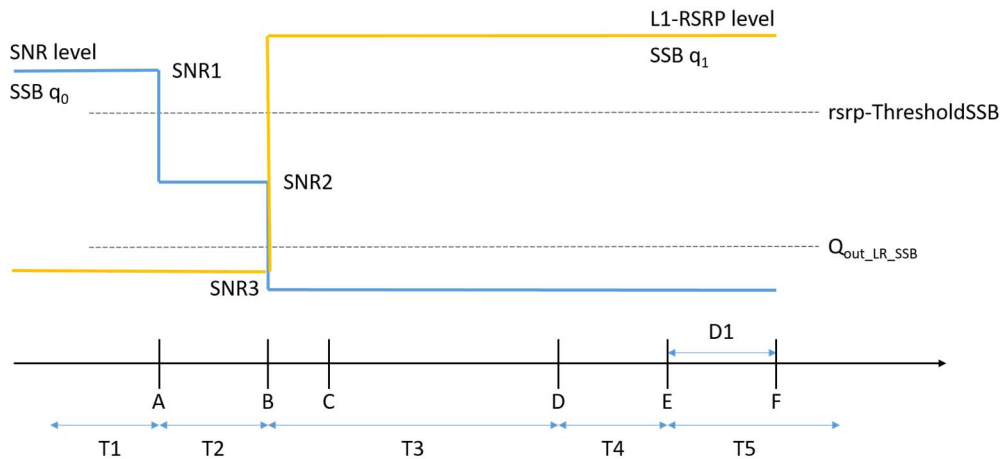
|  |  |         |                             |   |  |
|--|--|---------|-----------------------------|---|--|
| Active PCell                                   | 1-2  |         | Cell 1                      |   |  |
| RF Channel Number                              | 1-2  |         | 1                           |   |  |
| Duplex mode                                    | 1-2  |         | TDD                         |   |  |
| TDD Configuration                              | 1-2  |         | TDDConf.3.1                 |   |  |
| BW <sub>channel</sub>                          | 1-2  |         | 100: N <sub>RB,c</sub> = 66 |   |  |
| Data RBs allocated                             | 1-2  |         | 66                          |   |  |
| PDSCH/PDCCH subcarrier spacing                 | 1-2  | kHz     | 120                         |   |  |
| DL initial BWP configuration                   | 1-2  |         | DLBWP.0.1                   |   |  |
| DL dedicated BWP configuration                 | 1-2  |         | DLBWP.1.1                   |   |  |
| UL initial BWP configuration                   | 1-2  |         | ULBWP.0.1                   |   |  |
| UL dedicated BWP configuration                 | 1-2  |         | ULBWP.1.1                   |   |  |
| PDSCH Reference Channel                        | 1  |         | SR.3.2 TDD                  |   |  |
|  | 2  |         | SR.3.3 TDD                  |   |  |
| RMSI CORESET Reference Channel                 | 1  |         | CR.3.1 TDD                  |   |  |
|  | 2  |         | CR.3.2 TDD                  |   |  |
| Dedicated CORESET Reference Channel            | 1  |         | CCR.3.1 TDD                 |   |  |
|  | 2  |         | CCR.3.7 TDD                 |   |  |
| OCNG parameters                                | 1-2  |         | OP.1                        |   |  |
| CP length                                      | 1-2  |         | Normal                      |   |  |
| PDSCH/PDCCH TCI state                          | 1-2  |         | TCI.State.0                 |   |  |
| CSI-RS for tracking                            | 1-2  |         | TRS.2.1 TDD                 |   |  |
| SSB Configuration                              | 1  |         | SSB.1 FR2                   |   |  |
|  | 2  |         | SSB.2 FR2                   |   |  |
| SMTTC Configuration                            | 1-2  |         | SMTTC.3                     |   |  |
| PRACH Configuration                            | 1-2  |         | FR2 PRACH configuration 2   | A.3.8.3.2                                 |  |
| DRX configuration                              | 1-2  |         | OFF                         |   |  |
| SSB index assigned as BFD RS (q <sub>0</sub> ) | 1-2  |         | 0                           |   |  |
| SSB index assigned as CBD RS (q <sub>1</sub> ) | 1-2  |         | 1                           |   |  |
| SSB index assigned as RLM RS                   | 1-2  |         | 0,1                         |   |  |
| Beam failure detection transmission parameters | DCI format   | 1-2     | 1-0                         |   |  |
|  | Number of Control OFDM symbols                                   | 1-2     | 2                           |   |  |
|  | Aggregation level  | 1-2     | CCE                         | 8   |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-2     | dB                          | 0   |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2     | dB                          | 0   |  |
|  | DMRS precoder granularity  | 1-2     |                             | REG bundle size                           |  |
|  | REG bundle size  | 1-2     | 6                           |   |  |
| Gap pattern ID                                 | 1-2  |         | gp0                         |   |  |
| gapOffset                                      | 1-2  | ms      | 0                           |   |  |
| rimInSyncOutOfSyncThreshold                    | 1-2  |         | absent                      | Value 0 is applied. (Table 8.1.1-1).      |  |
| rsrp-ThresholdSSB                              | 1  | dBm/SCS | -95                         | Threshold used for Q <sub>in_LR_SSB</sub> |  |
|  | 2  |         | -92                         |   |  |

|   |     |      |                   |  |
|---|-----|------|-------------------|--|
| powerControlOffsetSS  | 1-2 |      | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount   | 1-2 |      | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer   | 1-2 |      | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting  | 1-2 |      | CSI-RS.3.1<br>TDD |  |
| reportConfigType  | 1-2 |      | periodic          |  |
| reportQuantity  | 1-2 |      | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity   | 1-2 | slot | 40                |  |
| CSI reporting offset  | 1-2 | slot | 4                 |  |
| T310  | 1-2 | ms   | 1000              |  |
| N310  | 1-2 |      | 2                 |  |
| T1  | 1-2 | s    | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-2 | s    | 2.61              |  |
| T3  | 1-2 | s    | 1.64              |  |
| T4  | 1-2 | s    | 0                 |  |
| T5  | 1-2 | s    | 1.01              |  |
| D1  | 1-2 | s    | 0.97              |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |     |      |                   |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |     |      |                   |  |

**Table A.7.5.5.1.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |            | Unit           | Test 1                    |                       |       |       |       |
|---|------------|----------------|---------------------------|-----------------------|-------|-------|-------|
|   |            |                | T1                        | T2                    | T3    | T4    | T5    |
| AoA setup   |            |                | Setup 1 defined in A.3.15 |                       |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>  |            |                | Rough                     |                       |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS   |            | dB             | 0                         |                       |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |            | dB             |                           |                       |       |       |       |
| EPRE ratio of PBCH DMRS to SSS  |            | dB             |                           |                       |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS   |            | dB             |                           |                       |       |       |       |
| EPRE ratio of PSS to SSS  |            | dB             |                           |                       |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS   |            | dB             |                           |                       |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS   |            | dB             |                           |                       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS  |            | dB             |                           |                       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS   |            | dB             |                           |                       |       |       |       |
| SNR_SSB of set q <sub>0</sub>   | Config 1-2 | dB             | 5 <sup>Note 11</sup>      | -3 <sup>Note 11</sup> | -12   | -12   | -12   |
| SNR_SSB of set q <sub>1</sub><br>SSB_RP of set q <sub>1</sub>   | Config 1-2 | dB             | 0.2                       | 0.2                   | 20.2  | 20.2  | 20.2  |
|   | Config 1   | dBm/           | -104.5                    | -104.5                | -84.5 | -84.5 | -84.5 |
|   | Config 2   | SCS            | -101.5                    | -101.5                | -81.5 | -81.5 | -81.5 |
| N <sub>oc</sub>   | Config 1,2 | dBm/120<br>KHz | -104.7                    |                       |       |       |       |
| Propagation condition   |            |                | TDL-A 30ns 75Hz           |                       |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |            |                |                           |                       |       |       |       |

**Table A.7.5.5.1.1-4: Void**



**Figure A.7.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.7.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 960 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.7.5.5.2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode

##### A.7.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.2.1-1, A.7.5.5.2.1-2, A.7.5.5.2.1-3, A.7.5.5.2.1-4 and A.7.5.5.2.1-5 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.2.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.7.5.5.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.7.5.5.2.1-1: Supported test configurations for FR2 PCell

| Configuration  | Description   |
|--|---|
| 1  | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2  | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 |   |

Table A.7.5.5.2.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

| Parameter                                      | Test Config.   | Unit    | Value                       | Comment                                   |  |
|--|--|---------|-----------------------------|---|--|
| <b>Test 1</b>                                  |  |         |                             |   |  |
| Active PCell                                   | 1-2  |         | Cell 1                      |   |  |
| RF Channel Number                              | 1-2  |         | 1                           |   |  |
| Duplex mode                                    | 1-2  |         | TDD                         |   |  |
| TDD Configuration                              | 1-2  |         | TDDConf.3.1                 |   |  |
| BW <sub>channel</sub>                          | 1-2  |         | 100: N <sub>RB,c</sub> = 66 |   |  |
| Data RBs allocated                             | 1-2  |         | 66                          |   |  |
| PDSCH/PDCCH subcarrier spacing                 | 1-2  | kHz     | 120                         |   |  |
| DL initial BWP configuration                   | 1-2  |         | DLBWP.0.1                   |   |  |
| DL dedicated BWP configuration                 | 1-2  |         | DLBWP.1.1                   |   |  |
| UL initial BWP configuration                   | 1-2  |         | ULBWP.0.1                   |   |  |
| UL dedicated BWP configuration                 | 1-2  |         | ULBWP.1.1                   |   |  |
| PDSCH Reference Channel                        | 1  |         | SR.3.2 TDD                  |   |  |
|  | 2  |         | SR.3.3 TDD                  |   |  |
| RMSI CORESET Reference Channel                 | 1  |         | CR.3.1 TDD                  |   |  |
|  | 2  |         | CR.3.2 TDD                  |   |  |
| Dedicated CORESET Reference Channel            | 1  |         | CCR.3.1 TDD                 |   |  |
|  | 2  |         | CCR.3.7 TDD                 |   |  |
| OCNG parameters                                | 1-2  |         | OP.1                        |   |  |
| CP length                                      | 1-2  |         | Normal                      |   |  |
| PDSCH/PDCCH TCI state                          | 1-2  |         | TCI.State.0                 |   |  |
| CSI-RS for tracking                            | 1-2  |         | TRS.2.1 TDD                 |   |  |
| SSB Configuration                              | 1  |         | SSB.1 FR2                   |   |  |
|  | 2  |         | SSB.2 FR2                   |   |  |
| SMTC Configuration                             | 1-2  |         | SMTC.3                      |   |  |
| PRACH Configuration                            | 1-2  |         | FR2 PRACH configuration 2   | A.3.8.3.2                                 |  |
| DRX configuration                              | 1-2  |         | DRX.3                       | A.3.3.3                                   |  |
| SSB index assigned as BFD RS (q <sub>0</sub> ) | 1-2  |         | 0                           |   |  |
| SSB index assigned as CBD RS (q <sub>1</sub> ) | 1-2  |         | 1                           |   |  |
| SSB index assigned as RLM RS                   | 1-2  |         | 0,1                         |   |  |
| Beam failure detection transmission parameters | DCI format   | 1-2     | 1-0                         |   |  |
|  | Number of Control OFDM symbols                                   | 1-2     | 2                           |   |  |
|  | Aggregation level  | 1-2     | CCE                         | 8   |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-2     | dB                          | 0   |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2     | dB                          | 0   |  |
|  | DMRS precoder granularity  | 1-2     |                             | REG bundle size                           |  |
|  | REG bundle size  | 1-2     | 6                           |   |  |
| Gap pattern ID                                 | 1-2  |         | N/A                         |   |  |
| rimInSyncOutOfSyncThreshold                    | 1-2  |         | absent                      | Value 0 is applied. (Table 8.1.1-1).      |  |
| rsrp-ThresholdSSB                              | 1  | dBm/SCS | -95                         | Threshold used for Q <sub>in_LR_SSB</sub> |  |
|  | 2  |         | -92                         |   |  |

|   |     |      |                   |  |
|---|-----|------|-------------------|--|
| powerControlOffsetSS  | 1-2 |      | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount   | 1-2 |      | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer   | 1-2 |      | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting  | 1-2 |      | CSI-RS.3.1<br>TDD |  |
| reportConfigType  | 1-2 |      | periodic          |  |
| reportQuantity  | 1-2 |      | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity   | 1-2 | slot | 40                |  |
| CSI reporting offset  | 1-2 | slot | 4                 |  |
| T310  | 1-2 | ms   | 1000              |  |
| N310  | 1-2 |      | 2                 |  |
| T1  | 1-2 | s    | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-2 | s    | 3.37              |  |
| T3  | 1-2 | s    | 2.8               |  |
| T4  | 1-2 | s    | 0                 |  |
| T5  | 1-2 | s    | 0.61              |  |
| D1  | 1-2 | s    | 0.57              |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |     |      |                   |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |     |      |                   |  |

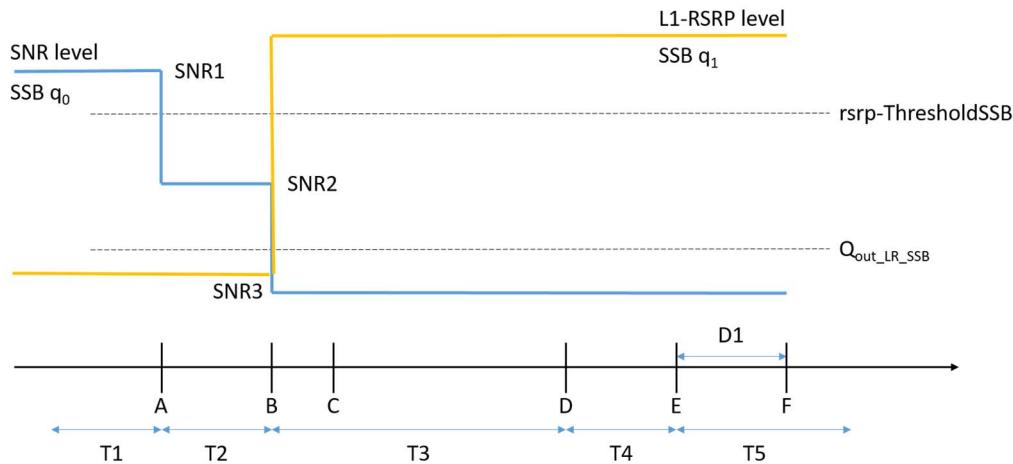


**Table A.7.5.5.2.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter   |            | Unit        | Test 1                    |                       |       |       |       |
|---|------------|-------------|---------------------------|-----------------------|-------|-------|-------|
|   |            |             | T1                        | T2                    | T3    | T4    | T5    |
| AoA setup   |            |             | Setup 1 defined in A.3.15 |                       |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>  |            |             | Rough                     |                       |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS   |            | dB          | 0                         |                       |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PBCH DMRS to SSS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PSS to SSS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS   |            | dB          |                           |                       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS  |            | dB          |                           |                       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS   |            | dB          |                           |                       |       |       |       |
| SNR_SSB of set $q_0$  | Config 1,2 | dB          | 5 <sup>Note 11</sup>      | -3 <sup>Note 11</sup> | -12   | -12   | -12   |
| SNR_SSB of set $q_1$  | Config 1-2 | dB          | 0.2                       | 0.2                   | 20.2  | 20.2  | 20.2  |
| SSB_RP of set $q_1$   | Config 1   | dBm/SCS     | -104.5                    | -104.5                | -84.5 | -84.5 | -84.5 |
|   | Config 2   |             | -101.5                    | -101.5                | -81.5 | -81.5 | -81.5 |
| $N_{oc}$  | Config 1-2 | dBm/120 KHz | -104.7                    |                       |       |       |       |
| Propagation condition   |            |             | TDL-A 30ns 75Hz           |                       |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.</p> |            |             |                           |                       |       |       |       |

Table A.7.5.5.2.1-4: Void

Table A.7.5.5.2.1-5: Void



**Figure A.7.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.7.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 560 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.7.5.5.3 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

##### A.7.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UE's active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.3.1-1, A.7.5.5.3.1-2, and A.7.5.5.3.1-3 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.3.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.7.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

Table A.7.5.5.3.1-1: Supported test configurations for FR2 PCell

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Table A.7.5.5.3.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

| Parameter   | Test Config.   | Unit | Value                       | Comment         |
|---|--|------|-----------------------------|-----------------|
|   |  |      | <b>Test 1</b>               |                 |
| Active PCell                                      | 1  |      | Cell 1                      |                 |
| RF Channel Number                                 | 1  |      | 1                           |                 |
| Duplex mode                                       | 1  |      | TDD                         |                 |
| TDD Configuration                                 | 1  |      | TDDConf.3.1                 |                 |
| BW <sub>channel</sub>                             | 1  |      | 100: N <sub>RB,c</sub> = 66 |                 |
| Data RBs allocated                                | 1  |      | 66                          |                 |
| PDSCH/PDCCH subcarrier spacing                    | 1  | kHz  | 120                         |                 |
| DL initial BWP configuration                      | 1  |      | DLBWP.0.1                   |                 |
| DL dedicated BWP configuration                    | 1  |      | DLBWP.1.1                   |                 |
| UL initial BWP configuration                      | 1  |      | ULBWP.0.1                   |                 |
| UL dedicated BWP configuration                    | 1  |      | ULBWP.1.1                   |                 |
| PDSCH Reference Channel                           | 1  |      | SR.3.2 TDD                  |                 |
| RMSI CORESET Reference Channel                    | 1  |      | CR.3.1 TDD                  |                 |
| Dedicated CORESET Reference Channel               | 1  |      | CCR.3.1 TDD                 |                 |
| OCNG parameters                                   | 1  |      | OP.1                        |                 |
| CP length   | 1  |      | Normal                      |                 |
| PDSCH/PDCCH TCI state                             | 1  |      | TCI.State.0                 |                 |
| CSI-RS for tracking                               | 1  |      | TRS.2.1 TDD                 |                 |
| SSB Configuration                                 | 1  |      | SSB.1 FR2                   |                 |
| SMTC Configuration                                | 1  |      | SMTC.3                      |                 |
| PRACH Configuration                               | 1  |      | FR2 PRACH configuration 4   | A.3.8.3.4       |
| DRX configuration                                 | 1  |      | OFF                         |                 |
| CSI-RS configuration for BFD/CBD/RLM              | 1  |      | CSI-RS.3.2 TDD              | A.3.14.2        |
| CSI-RS index assigned as BFD RS (q <sub>0</sub> ) | 1  |      | 0                           |                 |
| CSI-RS index assigned as CBD RS (q <sub>1</sub> ) | 1  |      | 1                           |                 |
| CSI-RS index assigned as RLM RS                   | 1  |      | 0,1                         |                 |
| Beam failure detection transmission parameters    | DCI format   | 1    |                             | 1-0             |
|   | Number of Control OFDM symbols                                   | 1    |                             | 2               |
|   | Aggregation level  | 1    | CCE                         | 8               |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1    | dB                          | 0               |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1    | dB                          | 0               |
|   | DMRS precoder granularity  | 1    |                             | REG bundle size |
| REG bundle size                                   | 1  |      | 6                           |                 |

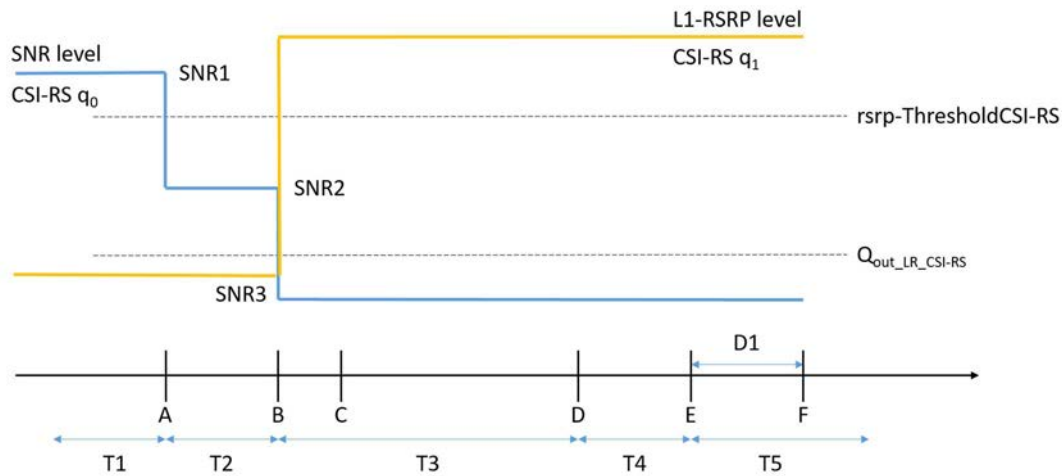
|   |   |         |                   |  |
|---|---|---------|-------------------|--|
| Gap pattern ID  | 1 |         | N/A               |  |
| rimInSyncOutOfSyncThreshold                                   | 1 |         | absent            | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1 | dBm/SCS | -95               | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1 |         | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1 |         | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1 |         | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1 |         | CSI-RS.3.1<br>TDD | A.3.14.2   |
| reportConfigType  | 1 |         | periodic          |  |
| reportQuantity  | 1 |         | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity                                     | 1 | slot    | 40                |  |
| CSI reporting offset  | 1 | slot    | 4                 |  |
| T310  | 1 | ms      | 1000              |  |
| N310  | 1 |         | 2                 |  |
| T1  | 1 | s       | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1 | s       | 1.17              |  |
| T3  | 1 | s       | 0.9               |  |
| T4  | 1 | s       | 0                 |  |
| T5  | 1 | s       | 0.31              |  |
| D1  | 1 | s       | 0.27              |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |         |                   |  |

**Table A.7.5.5.3.1-3: Cell specific test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |          | Unit            | Test 1                    |                       |       |       |       |
|--|----------|-----------------|---------------------------|-----------------------|-------|-------|-------|
|  |          |                 | T1                        | T2                    | T3    | T4    | T5    |
| AoA setup  |          |                 | Setup 1 defined in A.3.15 |                       |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |          |                 | Rough                     |                       |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB              | 0                         |                       |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB              |                           |                       |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   |          | dB              |                           |                       |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB              |                           |                       |       |       |       |
| EPRE ratio of PSS to SSS   |          | dB              |                           |                       |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB              |                           |                       |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB              |                           |                       |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |          | dB              |                           |                       |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |          | dB              |                           |                       |       |       |       |
| SNR_CSI-RS of set $q_0$  | Config 1 | dB              | 5 <sup>Note 11</sup>      | -3 <sup>Note 11</sup> | -12   | -12   | -12   |
| SNR_CSI-RS of set $q_1$  | Config 1 | dB              | 0.2                       | 0.2                   | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set $q_1$   | Config 1 | dBm/S<br>CS     | -104.5                    | -104.5                | -84.5 | -84.5 | -84.5 |
| $N_{oc}$   | Config 1 | dBm/12<br>0 KHz | -104.7                    |                       |       |       |       |
| Propagation condition  |          |                 | TDL-A 30ns 75Hz           |                       |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.3.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband</p> |          |                 |                           |                       |       |       |       |

Table A.7.5.5.3.1-4: Void

Table A.7.5.5.3.1-5: Void



**Figure A.7.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode**

### A.7.5.5.3.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.7.5.5.4 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.7.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.4.1-1, A.7.5.5.4.1-2, A.7.5.5.4.1-3, and A.7.5.5.4.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.4.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.7.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration

timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.7.5.5.4.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.5.4.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter   | Test Config.   | Unit | Value                       | Comment         |  |
|---|--|------|-----------------------------|-----------------|--|
|   |  |      | <b>Test 1</b>               |                 |  |
| Active PCell                                      | 1  |      | Cell 1                      |                 |  |
| RF Channel Number                                 | 1  |      | 1                           |                 |  |
| Duplex mode                                       | 1  |      | TDD                         |                 |  |
| TDD Configuration                                 | 1  |      | TDDConf.3.1                 |                 |  |
| BW <sub>channel</sub>                             | 1  |      | 100: N <sub>RB,c</sub> = 66 |                 |  |
| Data RBs allocated                                | 1  |      | 66                          |                 |  |
| PDSCH/PDCCH subcarrier spacing                    | 1  | kHz  | 120                         |                 |  |
| DL initial BWP configuration                      | 1  |      | DLBWP.0.1                   |                 |  |
| DL dedicated BWP configuration                    | 1  |      | DLBWP.1.1                   |                 |  |
| UL initial BWP configuration                      | 1  |      | ULBWP.0.1                   |                 |  |
| UL dedicated BWP configuration                    | 1  |      | ULBWP.1.1                   |                 |  |
| PDSCH Reference Channel                           | 1  |      | SR.3.2 TDD                  |                 |  |
| RMSI CORESET Reference Channel                    | 1  |      | CR.3.1 TDD                  |                 |  |
| Dedicated CORESET Reference Channel               | 1  |      | CCR.3.1 TDD                 |                 |  |
| OCNG parameters                                   | 1  |      | OP.1                        |                 |  |
| CP length   | 1  |      | Normal                      |                 |  |
| PDSCH/PDCCH TCI state                             | 1  |      | TCI.State.0                 |                 |  |
| CSI-RS for tracking                               | 1  |      | TRS.2.1 TDD                 |                 |  |
| SSB Configuration                                 | 1  |      | SSB.1 FR2                   |                 |  |
| SMTc Configuration                                | 1  |      | SMTc.3                      |                 |  |
| PRACH Configuration                               | 1  |      | FR2 PRACH configuration 4   | A.3.8.3.4       |  |
| DRX configuration                                 | 1  |      | DRX.3                       | A.3.3.3         |  |
| CSI-RS configuration for BFD/CBD/RLM              | 1  |      | CSI-RS.3.2 TDD              | A.3.14.2        |  |
| CSI-RS index assigned as BFD RS (q <sub>0</sub> ) | 1  |      | 0                           |                 |  |
| CSI-RS index assigned as CBD RS (q <sub>1</sub> ) | 1  |      | 1                           |                 |  |
| CSI-RS index assigned as RLM RS                   | 1  |      | 0,1                         |                 |  |
| Beam failure detection transmission parameters    | DCI format   | 1    | 1-0                         |                 |  |
|   | Number of Control OFDM symbols                                   | 1    | 2                           |                 |  |
|   | Aggregation level  | 1    | CCE                         | 8               |  |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1    | dB                          | 0               |  |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1    | dB                          | 0               |  |
|   | DMRS precoder granularity  | 1    |                             | REG bundle size |  |
| REG bundle size                                   | 1  |      | 6                           |                 |  |

|   |   |         |                   |  |
|---|---|---------|-------------------|--|
| Gap pattern ID  | 1 |         | N/A               |  |
| rimInSyncOutOfSyncThreshold                                   | 1 |         | absent            | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1 | dBm/SCS | -95               | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1 |         | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1 |         | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1 |         | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1 |         | CSI-RS.3.1<br>TDD | A.3.14.2   |
| reportConfigType  | 1 |         | periodic          |  |
| reportQuantity  | 1 |         | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity                                     | 1 | slot    | 40                |  |
| CSI reporting offset  | 1 | slot    | 4                 |  |
| T310  | 1 | ms      | 1000              |  |
| N310  | 1 |         | 2                 |  |
| T1  | 1 | s       | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1 | s       | 5.43              |  |
| T3  | 1 | s       | 5.16              |  |
| T4  | 1 | s       | 0                 |  |
| T5  | 1 | s       | 0.31              |  |
| D1  | 1 | s       | 0.27              |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |         |                   |  |



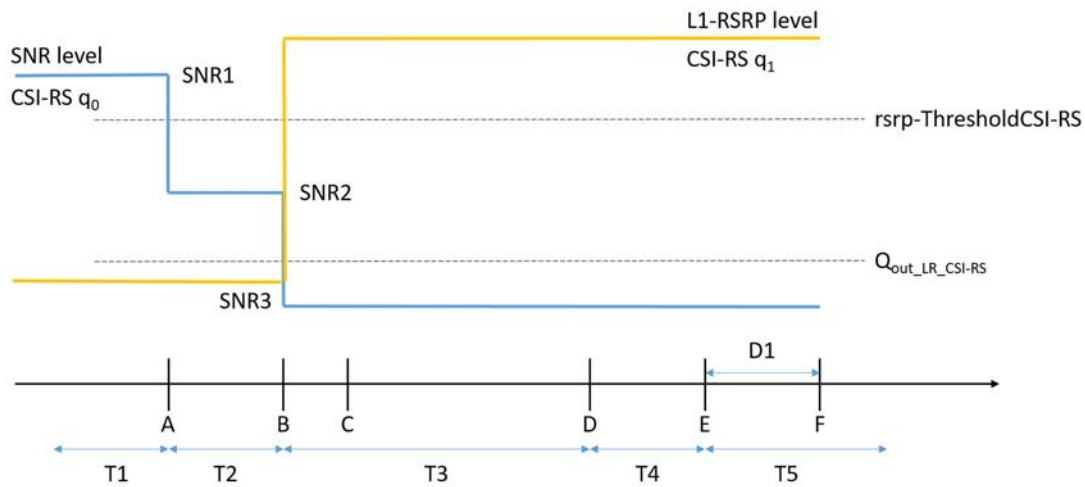
**Table A.7.5.5.4.1-3: Cell specific test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter   |          | Unit            | Test 1                    |        |       |       |       |
|---|----------|-----------------|---------------------------|--------|-------|-------|-------|
|   |          |                 | T1                        | T2     | T3    | T4    | T5    |
| AoA setup   |          |                 | Setup 1 defined in A.3.15 |        |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>  |          |                 | Rough                     |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB              | 0                         |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB              |                           |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS  |          | dB              |                           |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB              |                           |        |       |       |       |
| EPRE ratio of PSS to SSS  |          | dB              |                           |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB              |                           |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB              |                           |        |       |       |       |
| EPRE ratio of OCNG DMRS to SSS  |          | dB              |                           |        |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB              |                           |        |       |       |       |
| SNR_CSI-RS of set $q_0$   | Config 1 | dB              |                           |        |       |       |       |
| SNR_CSI-RS of set $q_1$   | Config 1 | dB              | 0.2                       | 0.2    | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set $q_1$  | Config 1 | dBm/S<br>CS     | -104.5                    | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$  | Config 1 | dBm/12<br>0 KHz | -104.7                    |        |       |       |       |
| Propagation condition   |          |                 | TDL-A 30ns 75Hz           |        |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.4.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.</p> |          |                 |                           |        |       |       |       |

Table A.7.5.5.4.1-4: Void

Table A.7.5.5.4.1-5: Void

Table A.7.5.5.4.1-6: Void



**Figure A.7.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

#### A.7.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260 + 10$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.7.5.5.5 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.7.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.7.5.5.5.1-1, A.7.5.5.5.1-2 and A.7.5.5.5.1-3 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.5.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.7.5.5.5.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In

the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

**Table A.7.5.5.1-1: Supported test configurations for FR2 PCell**

| Configuration  | Description   |
|--|---|
| 1  | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2  | NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

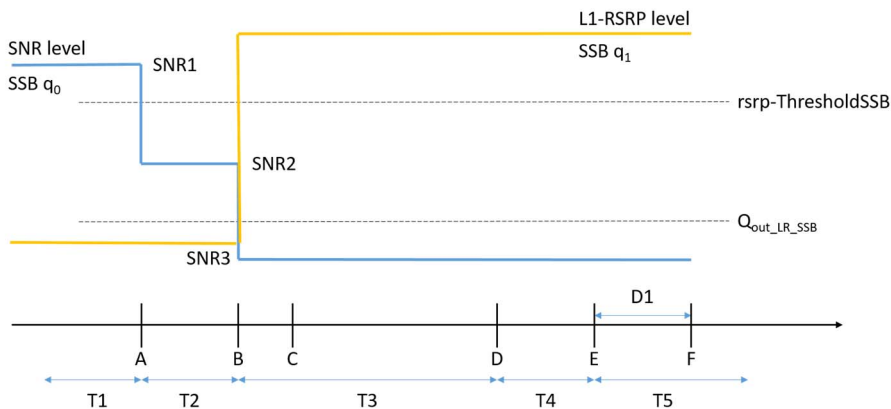
**Table A.7.5.5.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter                                      | Test Config.   | Unit | Value                       | Comment         |  |
|--|--|------|-----------------------------|-----------------|--|
| <b>Test 1</b>                                  |  |      |                             |                 |  |
| Active PCell                                   | 1-2  |      | Cell 1                      |                 |  |
| RF Channel Number                              | 1-2  |      | 1                           |                 |  |
| Duplex mode                                    | 1-2  |      | TDD                         |                 |  |
| TDD Configuration                              | 1-2  |      | TDDConf.3.1                 |                 |  |
| BW <sub>channel</sub>                          | 1-2  |      | 100: N <sub>RB,c</sub> = 66 |                 |  |
| Data RBs allocated                             | 1-2  |      | 66                          |                 |  |
| PDSCH/PDCCH subcarrier spacing                 | 1-2  | kHz  | 120                         |                 |  |
| DL initial BWP configuration                   | 1-2  |      | DLBWP.0.1                   |                 |  |
| DL dedicated BWP configuration                 | 1-2  |      | DLBWP.1.1                   |                 |  |
| UL initial BWP configuration                   | 1-2  |      | ULBWP.0.1                   |                 |  |
| UL dedicated BWP configuration                 | 1-2  |      | ULBWP.1.1                   |                 |  |
| PDSCH Reference Channel                        | 1  |      | SR.3.2 TDD                  |                 |  |
|  | 2  |      | SR.3.3 TDD                  |                 |  |
| RMSI CORESET Reference Channel                 | 1  |      | CR.3.1 TDD                  |                 |  |
|  | 2  |      | CR.3.2 TDD                  |                 |  |
| Dedicated CORESET Reference Channel            | 1  |      | CCR.3.1 TDD                 |                 |  |
|  | 2  |      | CCR.3.7 TDD                 |                 |  |
| OCNG parameters                                | 1-2  |      | OP.1                        |                 |  |
| CP length                                      | 1-2  |      | Normal                      |                 |  |
| PDSCH/PDCCH TCI state                          | 1-2  |      | TCI.State.0                 |                 |  |
| CSI-RS for tracking                            | 1-2  |      | TRS.2.1 TDD                 |                 |  |
| SSB Configuration                              | 1  |      | SSB.1 FR2                   |                 |  |
|  | 2  |      | SSB.2 FR2                   |                 |  |
| SMTTC Configuration                            | 1-2  |      | SMTTC.1                     |                 |  |
| PRACH Configuration                            | 1-2  |      | FR2 PRACH configuration 2   | A.3.8.3.2       |  |
| DRX configuration                              | 1-2  |      | OFF                         |                 |  |
| SSB index assigned as BFD RS (q <sub>0</sub> ) | 1-2  |      | 0                           |                 |  |
| SSB index assigned as CBD RS (q <sub>1</sub> ) | 1-2  |      | 1                           |                 |  |
| Beam failure detection transmission parameters | DCI format   | 1-2  | 1-0                         |                 |  |
|  | Number of Control OFDM symbols                                   | 1-2  | 2                           |                 |  |
|  | Aggregation level  | 1-2  | CCE                         | 8               |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1-2  | dB                          | 0               |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2  | dB                          | 0               |  |
|  | DMRS precoder granularity  | 1-2  |                             | REG bundle size |  |
| REG bundle size                                | 1-2  |      | 6                           |                 |  |

|   |     |         |                   |  |
|---|-----|---------|-------------------|--|
| Gap pattern ID  | 1-2 |         | N/A               |  |
| rimInSyncOutOfSyncThreshold   | 1-2 |         | absent            | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1   | dBm/SCS | -95               | Threshold used for $Q_{in\_LR\_SSB}$                   |
|   | 2   |         | -92               |  |
| powerControlOffsetSS  | 1-2 |         | db0               | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount   | 1-2 |         | n1                | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer   | 1-2 |         | pbfd4             | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting  | 1-2 |         | CSI-RS.3.1<br>TDD |  |
| reportConfigType  | 1-2 |         | periodic          |  |
| reportQuantity  | 1-2 |         | cri-RI-PMI-CQI    |  |
| CSI reporting periodicity   | 1-2 | slot    | 40                |  |
| CSI reporting offset  | 1-2 | slot    | 4                 |  |
| T310  | 1-2 | ms      | 1000              |  |
| N310  | 1-2 |         | 2                 |  |
| T1  | 1-2 | s       | 1                 | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1-2 | s       | 2.6               |  |
| T3  | 1-2 | s       | 1.64              |  |
| T4  | 1-2 | s       | 0                 |  |
| T5  | 1-2 | s       | 1.01              |  |
| D1  | 1-2 | s       | 0.97              |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |     |         |                   |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |     |         |                   |  |

**Table A.7.5.5.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |            | Unit            | Test 1                     |        |       |       |       |
|---|------------|-----------------|----------------------------|--------|-------|-------|-------|
|   |            |                 | T1                         | T2     | T3    | T4    | T5    |
| AoA Setup   |            |                 | Setup1 defined in A.3.15.1 |        |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>  |            |                 | Rough                      |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS   |            | dB              | 0                          |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |            | dB              |                            |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS  |            | dB              |                            |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS   |            | dB              |                            |        |       |       |       |
| EPRE ratio of PSS to SSS  |            | dB              |                            |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS   |            | dB              |                            |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS   |            | dB              |                            |        |       |       |       |
| EPRE ratio of OCNG DMRS to SSS  |            | dB              |                            |        |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS   |            | dB              |                            |        |       |       |       |
| SNR_SSB of set q <sub>0</sub>   | Config 1-2 | dB              |                            |        |       |       |       |
| SNR_SSB of set q <sub>1</sub>   | Config 1-2 | dB              | 0.2                        | 0.2    | 20.2  | 20.2  | 20.2  |
| SSB_RP of set q <sub>1</sub>  | Config 1   | dBm/S           | -104.5                     | -104.5 | -84.5 | -84.5 | -84.5 |
|   | Config 2   | CS              | -101.5                     | -101.5 | -81.5 | -81.5 | -81.5 |
| N <sub>oc</sub>   | Config 1-2 | dBm/12<br>0 kHz | -104.7                     |        |       |       |       |
| Propagation condition   |            |                 | TDL-A 30ns 75Hz            |        |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam given in B.2.1.3 and does not limit UE implementation or test system implementation</p> <p>Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.</p> |            |                 |                            |        |       |       |       |



**Figure A.7.5.5.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### A.7.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

### A.7.5.5.6 Beam Failure Detection and Link Recovery Test for FR2 SCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.7.5.5.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.6.1-1, A.7.5.5.6.1-2 and A.7.5.5.6.1-3. There are two cells, cell 1 is the active PCell and cell 2 is the active SCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.6.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate CSI-RS based beam failure. Figure A.7.5.5.6.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled.

**Table A.7.5.5.6.1-1: Supported test configurations for FR2 PCell and SCell**

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.5.6.1-2: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Test Config. | Unit | Value  | Comment |
|-----------|--------------|------|--------|---------|
|           |              |      | Test 1 |         |

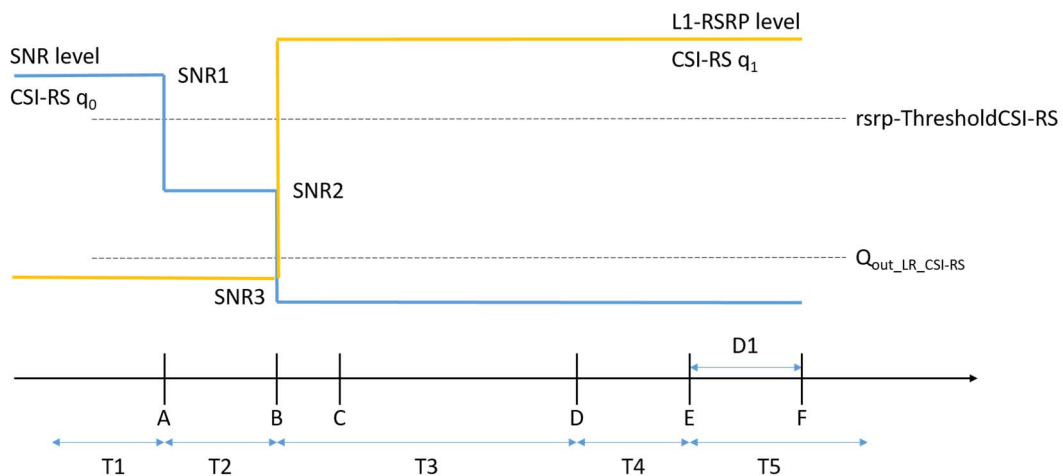
|   |  |     |                             |                   |  |
|---|--|-----|-----------------------------|-------------------|--|
| Active PCell                                      | 1  |     | Cell 1                      |                   |  |
| RF Channel Number for PCell                       | 1  |     | 1                           |                   |  |
| Active SCell                                      | 1  |     | Cell 2                      |                   |  |
| RF Channel Number for SCell                       | 1  |     | 2                           |                   |  |
| Duplex mode                                       | 1  |     | TDD                         |                   |  |
| TDD Configuration                                 | 1  |     | TDDConf.3.1                 |                   |  |
| BW <sub>channel</sub>                             | 1  | MHz | 100: N <sub>RB,c</sub> = 66 |                   |  |
| Data RBs allocated                                | 1  |     | 66                          |                   |  |
| PDSCH/PDCCH subcarrier spacing                    | 1  | kHz | 120                         |                   |  |
| DL initial BWP configuration                      | 1  |     | DLBWP.0.1                   |                   |  |
| DL dedicated BWP configuration                    | 1  |     | DLBWP.1.1                   |                   |  |
| UL initial BWP configuration                      | 1  |     | ULBWP.0.1                   |                   |  |
| UL dedicated BWP configuration                    | 1  |     | ULBWP.1.1                   |                   |  |
| PDSCH Reference Channel                           | 1  |     | SR.3.2 TDD                  |                   |  |
| RMSI CORESET Reference Channel                    | 1  |     | CR.3.1 TDD                  | A.3.1.2           |  |
| Dedicated CORESET Reference Channel               | 1  |     | CCR.3.1 TDD                 |                   |  |
| OCNG parameters                                   | 1  |     | OP.1                        | A.3.2.1           |  |
| CP length   | 1  |     | Normal                      |                   |  |
| PDSCH/PDCCH TCI state                             | 1  |     | TCI.State.0                 |                   |  |
| CSI-RS for tracking                               | 1  |     | TRS.2.1 TDD                 |                   |  |
| SSB Configuration                                 | 1  |     | SSB.3 FR2                   | A.3.10            |  |
| SMTC Configuration                                | 1  |     | SMTC.3                      | A.3.11            |  |
| PRACH Configuration                               | 1  |     | FR2 PRACH configuration 4   | Table A.3.8.3.4-1 |  |
| DRX configuration                                 | 1  |     | OFF                         |                   |  |
| CSI-RS configuration for BFD/CBD on SCell         | 1  |     | CSI-RS.3.2 TDD              | A.3.14.2          |  |
| CSI-RS index assigned as BFD RS (q <sub>0</sub> ) | 1  |     | 0                           |                   |  |
| CSI-RS index assigned as CBD RS (q <sub>1</sub> ) | 1  |     | 1                           |                   |  |
| CSI-RS configuration for RLM on PCell             | 1  |     | CSI-RS.3.2 TDD              | A.3.14.2          |  |
| Beam failure detection transmission parameters    | DCI format   | 1   | 1-0                         |                   |  |
|   | Number of Control OFDM symbols                                   | 1   | 2                           |                   |  |
|   | Aggregation level  | 1   | CCE                         | 8                 |  |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1   | dB                          | 0                 |  |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1   | dB                          | 0                 |  |
|   | DMRS precoder granularity  | 1   |                             | REG bundle size   |  |
|   | REG bundle size  | 1   | 6                           |                   |  |

|   |   |         |                           |  |
|---|---|---------|---------------------------|--|
| Gap pattern ID  | 1 |         | N/A                       |  |
| schedulingRequestID-BFR-SCell-r16                             | 1 |         | Configured                |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell    | 1 | slot    | 40                        | 5ms  |
| Offset of PUCCH for SR configuration for BFR on SCell         | 1 | slot    | 4                         |  |
| PUCCH parameters for SR configuration for BFR on SCell        | 1 |         | Table 8.3.3.1.2-1 in [13] |  |
| rlmInSyncOutOfSyncThreshold                                   | 1 |         | absent                    | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1 | dBm/SCS | -95                       | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1 |         | db0                       | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1 |         | n1                        | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1 |         | pbfd4                     | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1 |         | CSI-RS.3.1 TDD            | A.3.14.2   |
| reportConfigType  | 1 |         | periodic                  |  |
| reportQuantity  | 1 |         | cri-RI-PMI-CQI            |  |
| CSI reporting periodicity                                     | 1 | slot    | 40                        |  |
| CSI reporting offset  | 1 | slot    | 4                         |  |
| T310  | 1 | ms      | 1000                      |  |
| N310  | 1 |         | 2                         |  |
| T1  | 1 | s       | 1                         | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1 | s       | 1.17                      |  |
| T3  | 1 | s       | 0.9                       |  |
| T4  | 1 | s       | 0                         |  |
| T5  | 1 | s       | 0.31                      |  |
| D1  | 1 | s       | 0.27                      |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |         |                           |  |



**Table A.7.5.5.6.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter  | Unit                       | Cell 1<br>T1 to T5        | Cell2<br>Test 1           |        |       |       |       |
|--|----------------------------|---------------------------|---------------------------|--------|-------|-------|-------|
|  |                            |                           | T1                        | T2     | T3    | T4    | T5    |
| AoA setup  |                            | Setup 1 defined in A.3.15 | Setup 1 defined in A.3.15 |        |       |       |       |
| Assumptpion for UE beams <sup>Note 10</sup>  |                            | Rough                     | Rough                     |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  | dB                         | 0                         | 0                         |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  | dB                         |                           |                           |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   | dB                         |                           |                           |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  | dB                         |                           |                           |        |       |       |       |
| EPRE ratio of PSS to SSS   | dB                         |                           |                           |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  | dB                         |                           |                           |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  | dB                         |                           |                           |        |       |       |       |
| EPRE ratio of OCNB DMRS to SSS   | dB                         |                           |                           |        |       |       |       |
| EPRE ratio of OCNB to OCNB DMRS  | dB                         |                           |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>0</sub>   | Config 1<br>dB             |                           |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>1</sub>   | Config 1<br>dB             | 0.2                       | 0.2                       | 0.2    | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set q <sub>1</sub>  | Config 1<br>dBm/SCS<br>kHz | -104.5                    | -104.5                    | -104.5 | -84.5 | -84.5 | -84.5 |
| N <sub>oc</sub>  | Config 1<br>dBm/<br>120kHz | -104.7                    | -104.7                    |        |       |       |       |
| Propagation condition  |                            | TDL-A<br>30ns 75Hz        | TDL-A 30ns 75Hz           |        |       |       |       |
| <p>Note 1: OCNB shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNB.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.6.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |                            |                           |                           |        |       |       |       |



**Figure A.7.5.5.6.1-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in non-DRX mode**

### A.7.5.5.6.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.7.5.5.6.1 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260+10$  ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit PUCCH with an LRR with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.7.5.5.7 Beam Failure Detection and Link Recovery Test for FR2 SCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.7.5.5.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.7.1-1, A.7.5.5.7.1-2 and A.7.5.5.7.1-3. There are two cell, cell 1 is the active PCell and cell 2 is the active SCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.7.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate CSI-RS based beam failure. Figure A.7.5.5.7.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.7.5.5.7.1-1: Supported test configurations for FR2 PCell and SCell**

| Configuration | Description   |
|---------------|---|
| 1             | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.7.5.5.7.1-2: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | Test Config. | Unit | Value  | Comment |
|-----------|--------------|------|--------|---------|
|           |              |      | Test 1 |         |

|  |  |     |                           |                   |  |
|--|--|-----|---------------------------|-------------------|--|
| Active PCell                                   | 1  |     | Cell 1                    |                   |  |
| RF Channel Number for PCell                    | 1  |     | 1                         |                   |  |
| Active SCell                                   | 1  |     | Cell 2                    |                   |  |
| RF Channel Number for SCell                    | 1  |     | 2                         |                   |  |
| Duplex mode                                    | 1  |     | TDD                       |                   |  |
| TDD Configuration                              | 1  |     | TDDConf.3.1               |                   |  |
| $BW_{channel}$                                 | 1  | MHz | 100: $N_{RB,c} = 66$      |                   |  |
| Data RBs allocated                             | 1  |     | 66                        |                   |  |
| PDSCH/PDCCH subcarrier spacing                 | 1  | kHz | 120                       |                   |  |
| DL initial BWP configuration                   | 1  |     | DLBWP.0.1                 |                   |  |
| DL dedicated BWP configuration                 | 1  |     | DLBWP.1.1                 |                   |  |
| UL initial BWP configuration                   | 1  |     | ULBWP.0.1                 |                   |  |
| UL dedicated BWP configuration                 | 1  |     | ULBWP.1.1                 |                   |  |
| PDSCH Reference Channel                        | 1  |     | SR.3.2 TDD                |                   |  |
| RMSI CORESET Reference Channel                 | 1  |     | CR.3.1 TDD                | A.3.1.2           |  |
| Dedicated CORESET Reference Channel            | 1  |     | CCR.3.1 TDD               |                   |  |
| OCNG parameters                                | 1  |     | OP.1                      | A.3.2.1           |  |
| CP length                                      | 1  |     | Normal                    |                   |  |
| PDSCH/PDCCH TCI state                          | 1  |     | TCI.State.0               |                   |  |
| CSI-RS for tracking                            | 1  |     | TRS.2.1 TDD               |                   |  |
| SSB Configuration                              | 1  |     | SSB.3 FR2                 | A.3.10            |  |
| SMTTC Configuration                            | 1  |     | SMTTC.3                   | A.3.11            |  |
| PRACH Configuration                            | 1  |     | FR2 PRACH configuration 4 | Table A.3.8.3.4-1 |  |
| DRX configuration                              | 1  |     | DRX.3                     | A.3.3.3           |  |
| CSI-RS configuration for BFD/CBD on SCell      | 1  |     | CSI-RS.3.2 TDD            | A.3.14.2          |  |
| CSI-RS index assigned as BFD RS ( $q_0$ )      | 1  |     | 0                         |                   |  |
| CSI-RS index assigned as CBD RS ( $q_1$ )      | 1  |     | 1                         |                   |  |
| CSI-RS configuration for RLM on PCell          | 1  |     | CSI-RS.3.2 TDD            | A.3.14.2          |  |
| Beam failure detection transmission parameters | DCI format   | 1   | 1-0                       |                   |  |
|  | Number of Control OFDM symbols                                   | 1   | 2                         |                   |  |
|  | Aggregation level  | 1   | CCE                       | 8                 |  |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | 1   | dB                        | 0                 |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1   | dB                        | 0                 |  |
|  | DMRS precoder granularity  | 1   |                           | REG bundle size   |  |
|  | REG bundle size  | 1   |                           | 6                 |  |

|   |   |         |                           |  |
|---|---|---------|---------------------------|--|
| Gap pattern ID  | 1 |         | N/A                       |  |
| schedulingRequestID-BFR-SCell-r16                             | 1 |         | Configured                |  |
| Periodicity of PUCCH for SR configuration for BFR on SCell    | 1 | slot    | 40                        | 5ms  |
| Offset of PUCCH for SR configuration for BFR on SCell         | 1 | slot    | 4                         |  |
| PUCCH parameters for SR configuration for BFR on SCell        | 1 |         | Table 8.3.3.1.2-1 in [13] |  |
| rlmInSyncOutOfSyncThreshold                                   | 1 |         | absent                    | Value 0 is applied. (Table 8.1.1-1).                   |
| rsrp-ThresholdSSB   | 1 | dBm/SCS | -95                       | Threshold used for $Q_{in\_LR\_SSB}$                   |
| powerControlOffsetSS  | 1 |         | db0                       | Used for deriving rsrp-ThresholdCSI-RS                 |
| beamFailureInstanceMaxCount                                   | 1 |         | n1                        | see TS 38.321 [7], clause 5.17                         |
| beamFailureDetectionTimer                                     | 1 |         | pbfd4                     | see TS 38.321 [7], clause 5.17                         |
| CSI-RS configuration for CSI reporting                        | 1 |         | CSI-RS.3.1 TDD            | A.3.14.2   |
| reportConfigType  | 1 |         | periodic                  |  |
| reportQuantity  | 1 |         | cri-RI-PMI-CQI            |  |
| CSI reporting periodicity                                     | 1 | slot    | 40                        |  |
| CSI reporting offset  | 1 | slot    | 4                         |  |
| T310  | 1 | ms      | 1000                      |  |
| N310  | 1 |         | 2                         |  |
| T1  | 1 | s       | 1                         | The UE shall be fully synchronized to cell 1 during T1 |
| T2  | 1 | s       | 5.43                      |  |
| T3  | 1 | s       | 5.16                      |  |
| T4  | 1 | s       | 0                         |  |
| T5  | 1 | s       | 0.31                      |  |
| D1  | 1 | s       | 0.27                      |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. |   |         |                           |  |

**Table A.7.5.5.7.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | Unit | Cell1<br>T1 to T5 | Cell2<br>Test 1 |    |    |    |    |
|-----------|------|-------------------|-----------------|----|----|----|----|
|           |      |                   | T1              | T2 | T3 | T4 | T5 |
|           |      |                   |                 |    |    |    |    |

|  |          |             |                           |                           |        |       |       |       |
|--|----------|-------------|---------------------------|---------------------------|--------|-------|-------|-------|
| AoA setup  |          |             | Setup 1 defined in A.3.15 | Setup 1 defined in A.3.15 |        |       |       |       |
| Assumption for UE beams <sup>Note 10</sup>   |          |             | Rough                     | Rough                     |        |       |       |       |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB          | 0                         | 0                         |        |       |       |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB          |                           |                           |        |       |       |       |
| EPRE ratio of PBCH DMRS to SSS   |          | dB          |                           |                           |        |       |       |       |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB          |                           |                           |        |       |       |       |
| EPRE ratio of PSS to SSS   |          | dB          |                           |                           |        |       |       |       |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB          |                           |                           |        |       |       |       |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB          |                           |                           |        |       |       |       |
| EPRE ratio of OCNG DMRS to SSS   |          | dB          |                           |                           |        |       |       |       |
| EPRE ratio of OCNG to OCNG DMRS  |          | dB          |                           |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>0</sub>   | Config 1 | dB          |                           |                           |        |       |       |       |
| SNR_CSI-RS of set q <sub>1</sub>   | Config 1 | dB          | 0.2                       | 0.2                       | 0.2    | 20.2  | 20.2  | 20.2  |
| CSI-RS_RP of set q <sub>1</sub>  | Config 1 | dBm/SCS kHz | -104.5                    | -104.5                    | -104.5 | -84.5 | -84.5 | -84.5 |
| N <sub>oc</sub>  | Config 1 | dBm/120 kHz | -104.7                    | -104.7                    |        |       |       |       |
| Propagation condition  |          |             | TDL-A<br>30ns<br>75Hz     | TDL-A 30ns 75Hz           |        |       |       |       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Void</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.7.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |          |             |                           |                           |        |       |       |       |

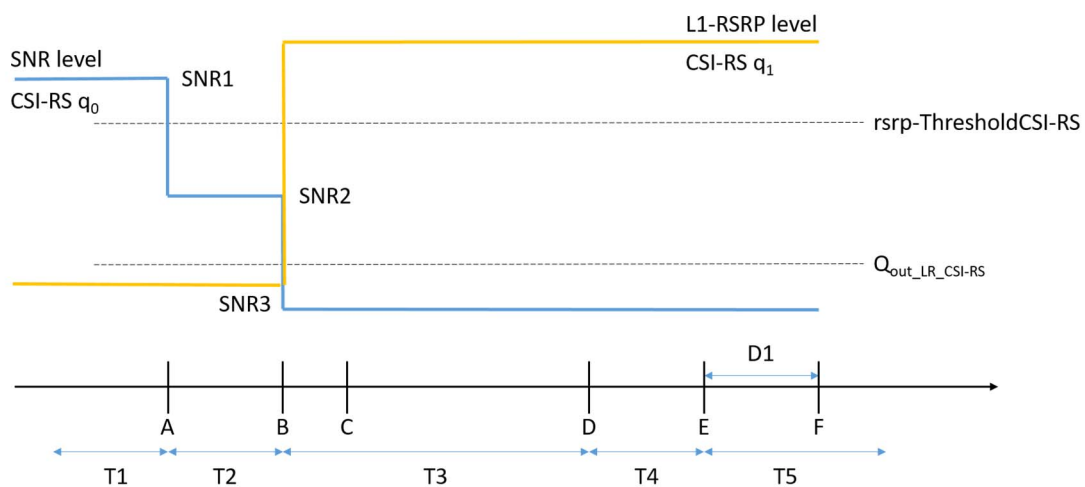


Figure A.7.5.5.7.1-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in DRX mode

### A.7.5.5.7.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 in A.7.5.5.7.1 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 260 + 10$  ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit PUCCH with an LRR with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.7.5.6 Active BWP switch

### A.7.5.6.1 DCI-based and Timer-based Active BWP Switch

#### A.7.5.6.1.1 NR FR2- NR FR2 DL active BWP switch of SCell with non-DRX in SA

##### A.7.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.1.1-1 below. The test scenario comprises of one PCell (Cell 1) and one SCell (Cell 2) as given in Table A.7.5.6.1.1.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.1.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.1.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PCell.

UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell's DL slot ( $i+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell no later than the first UL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-2 no later than the first DL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on SCell (Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the half subframe immediately after *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell's DL slot ( $j+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-1 no later than the first DL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

**Table A.7.5.6.1.1.1-1: DL BWP switch supported test configurations**

| Config  | Description   |
|---------|---|
| 1       | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD -TDD duplex mode |
| Note 1: | Void  |

**Table A.7.5.6.1.1.1-2: General test parameters for DL BWP switch in SA**

| Parameter   | Unit | Value  | Comment   |
|---|------|--------|---|
| NR RF Channel Number                                    |      | 1, 2   | Two NR radio channels are used for this test                        |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                                       |
| Active SCell  |      | Cell 2 | SCell on RF channel number 2.                                       |
| CP length   |      | Normal |   |
| DRX   |      | OFF    | For both PCell and SCell  |
| <i>bwp-InactivityTimer</i>                              | ms   | 200    |   |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.                                 |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on PSCC.                                |
| Cell2 timing offset to cell1                            | μs   | 3      | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1  | s    | 0.2    |   |
| T2  | s    | 0.2    |   |
| T3  | s    | 0.2    |   |

Table A.7.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

| Parameter   | Unit | Cell 1                   | Cell2     |
|---|------|--------------------------|-----------|
| Frequency Range   |      | FR2                      | FR2       |
| Duplex mode   |      | TDD                      |           |
| TDD configuration   |      | TDDConf.3.1              |           |
| $BW_{channel}$  |      | 100 MHz: $N_{RB,c} = 66$ |           |
| Active BWP ID   |      | 0                        | 1, 2      |
| Downlink initial BWP Configuration  |      | DLBWP.0.2                |           |
| Uplink initial BWP Configuration  |      | ULBWP.0.2                | N.A.      |
| Downlink active BWP-0 Configuration   |      | DLBWP.0.2                | N.A.      |
| Downlink active BWP-1 Configuration   |      | N.A.                     | DLBWP.1.1 |
| Downlink active BWP-2 Configuration   |      | N.A.                     | DLBWP.1.3 |
| Uplink active BWP-0 Configuration   |      | ULBWP.0.2                | N.A.      |
| Uplink active BWP-1 Configuration   |      | N.A.                     | N.A.      |
| Uplink active BWP-2 Configuration   |      | N.A.                     | N.A.      |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD               |           |
| TRS configuration   |      | TRS.2.1 TDD              |           |
| TCI state   |      | TCI.State.0              |           |
| RMSI CORESET parameters   |      | CR.3.1 TDD               |           |
| Dedicated CORESET parameters  |      | CCR.3.1 TDD              |           |
| OCNG Patterns   |      | OP.1                     |           |
| SSB Configuration   |      | SSB.1 FR2                |           |
| SMTC Configuration  |      | SMTC.1                   |           |
| Correlation Matrix and Antenna Configuration  |      | 1x2 Low                  |           |
| EPRE ratio of PSS to SSS  | dB   | 0                        | 0         |
| EPRE ratio of PBCH DMRS to SSS  |      |                          |           |
| EPRE ratio of PBCH to PBCH DMRS   |      |                          |           |
| EPRE ratio of PDCCH DMRS to SSS   |      |                          |           |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                          |           |
| EPRE ratio of PDSCH DMRS to SSS   |      |                          |           |
| EPRE ratio of PDSCH to PDSCH  |      |                          |           |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |      |                          |           |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                          |           |
| Propagation Condition   |      | AWGN                     | AWGN      |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                          |           |



Table A.7.5.6.1.1.1-4: OTA related test parameters for BWP switching test case

| Parameter  | Unit                              | Cell 1                             | Cell 2                             |
|--|-----------------------------------|------------------------------------|------------------------------------|
| Angle of arrival configuration   |                                   | Setup 1 defined in clause A.3.15.1 | Setup 1 defined in clause A.3.15.1 |
| Assumption for UE beams <sup>Note 6</sup>  |                                   | Fine                               | Fine                               |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz                         | -112                               | -112                               |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS                           | -103                               | -103                               |
| SS-RSRP <sup>Note2</sup>   | dBm/SCS<br><sup>Note3</sup>       | -85                                | -85                                |
| $\hat{E}_s/I_{ot}$   | dB                                | 18                                 | 18                                 |
| $I_o$ <sup>Note4</sup>   | dBm/95.04<br>MHz <sup>Note4</sup> | -56                                | -56                                |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |                                   |                                    |                                    |

#### A.7.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ( $i + T_{BWPswitchDelay} + k_1$ ).

During T3, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ( $j + T_{BWPswitchDelay} + k_1$ ).

Where,  $k_1$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of PCell interruption during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the first UL slot that occurs after the beginning of DL slot ( $i + T_{BWPswitchDelay} + k_1$ ), ( $j + T_{BWPswitchDelay} + k_1$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

### A.7.5.6.1.2 NR FR1- NR FR2 DL active BWP switch of SCell with non-DRX in SA

#### A.7.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.2.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). The general parameters are given in Table A.7.5.6.1.2.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.2.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.2.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.

UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in SCell.

UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in PCell.

UE is configured with a bwp-InactivityTimer timer value for SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell's DL slot ( $i+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell no later than the first UL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-2 no later than the first DL slot that occurs after the beginning of slot ( $i+T_{\text{BWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to BWP switch on SCell shall occur within the BWP switch delay if the UE doesn't support per-FR gap, otherwise no interruption due to BWP switch on PCell is allowed.

During T2, the test equipment won't transmit DCI format for PDSCH reception on SCell (Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the half subframe immediately after *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of SCell's DL slot ( $j+T_{\text{BWPswitchDelay}}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PCell at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}+k_1$ ). The UE shall be continuously scheduled on SCell's BWP-1 no later than the first DL slot that occurs after the beginning of slot ( $j+T_{\text{BWPswitchDelay}}$ ).

The starting time of PCell (Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay if the UE doesn't support per-FR gap, otherwise no interruption due to BWP switch on PCell is allowed.

The test equipment verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

**Table A.7.5.6.1.2.1-1: DL BWP switch supported test configurations**

| Config   | Description  |
|--|--|
| 1  | PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3  | PCell: NR 30 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.7.5.6.1.2.1-2: General test parameters for DL BWP switch in SA**

| Parameter   | Unit | Value  | Comment   |
|---|------|--------|---|
| NR RF Channel Number                                    |      | 2      | Two NR radio channel is used for this test                          |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.                                       |
| Active SCell  |      | Cell 2 | SCell on RF channel number 2.                                       |
| CP length   |      | Normal |   |
| DRX   |      | OFF    | For both PCell and SCell  |
| <i>bwp-InactivityTimer</i>                              | ms   | 200    |   |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.                                 |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0      | Individual offset for cells on SCC.                                 |
| Cell2 timing offset to cell1                            | μs   | 3      | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1  | s    | 0.2    |   |
| T2  | s    | 0.2    |   |
| T3  | s    | 0.2    |   |

**Table A.7.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter   |              | Unit | Cell 1                             | Cell2                           |
|---|--------------|------|------------------------------------|---------------------------------|
| Frequency Range   |              |      | FR1                                | FR2                             |
| Duplex mode   | Config 1     |      | FDD                                | TDD                             |
|   | Config 2,3   |      | TDD                                |                                 |
| TDD configuration   | Config 1     |      | Not Applicable                     | TDDConf.3.1                     |
|   | Config 2     |      | TDDConf.1.1                        |                                 |
|   | Config 3     |      | TDDConf.2.1                        |                                 |
| BW <sub>channel</sub>   | Config 1,2   | MHz  | 10 MHz: N <sub>RB,c</sub> = 52     | 100 MHz: N <sub>RB,c</sub> = 66 |
|   | Config 3     |      | 40 MHz: N <sub>RB,c</sub> = 106    |                                 |
| Active BWP ID   |              |      | 0                                  | 1, 2                            |
| Downlink initial BWP Configuration  |              |      | DLBWP.0.2                          |                                 |
| Uplink initial BWP Configuration  |              |      | ULBWP.0.2                          | N.A.                            |
| Downlink active BWP-0 Configuration   |              |      | DLBWP.0.2                          | N.A.                            |
| Downlink active BWP-1 Configuration   |              |      | N.A.                               | DLBWP.1.1                       |
| Downlink active BWP-2 Configuration   |              |      | N.A.                               | DLBWP.1.3                       |
| Uplink active BWP-0 Configuration   |              |      | ULBWP.0.2                          | N.A.                            |
| Uplink active BWP-1 Configuration   |              |      | N.A.                               | N.A.                            |
| Uplink active BWP-2 Configuration   |              |      | N.A.                               | N.A.                            |
| PDSCH Reference measurement channel   | Config 1     |      | SR.1.1 FDD                         | SR.3.1 TDD                      |
|   | Config 2     |      | SR.1.1 TDD                         |                                 |
|   | Config 3     |      | SR.2.1 TDD                         |                                 |
| RMSI CORESET parameters   | Config 1     |      | CR.1.1 FDD                         | CR.3.1 TDD                      |
|   | Config 2     |      | CR.1.1 TDD                         |                                 |
|   | Config 3     |      | CR.2.1 TDD                         |                                 |
| Dedicated CORESET parameters  | Config 1     |      | CCR.1.1 FDD                        | CCR.3.1 TDD                     |
|   | Config 2     |      | CCR.1.1 TDD                        |                                 |
|   | Config 3     |      | CCR.2.1 TDD                        |                                 |
| OCNG Patterns   |              |      | OP.1                               |                                 |
| SSB Configuration   | Config 1,2   |      | SSB.1 FR1                          | SSB.1 FR2                       |
|   | Config 3     |      | SSB.2 FR1                          |                                 |
| TRS configuration   | Config 1,2,3 |      | -                                  | TRS.2.1 TDD                     |
| TCI state   | Config 1,2,3 |      | TCI.State.0                        | TCI.State.0                     |
| SMTC Configuration  |              |      | SMTC.1                             |                                 |
| Correlation Matrix and Antenna Configuration  |              |      | NA<br>Link only, see clause A.3.7A | 1x2 Low                         |
| EPRE ratio of PSS to SSS  |              | dB   | 0                                  | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |              |      |                                    |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |              |      |                                    |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |              |      |                                    |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |      |                                    |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |              |      |                                    |                                 |
| EPRE ratio of PDSCH to PDSCH  |              |      |                                    |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |              |      |                                    |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |      |                                    |                                 |
| Propagation Condition   |              |      | NA<br>Link only, see clause A.3.7A | AWGN                            |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |      |                                    |                                 |

Table A.7.5.6.1.2.1-4: OTA related test parameters for BWP switching test case

| Parameter  | Unit                              | Cell 1                                 | Cell 2                                |
|--|-----------------------------------|--|---------------------------------------|
| Angle of arrival configuration   |                                   | -NA<br>Link only, see clause<br>A.3.7A | Setup 1 defined in<br>clause A.3.15.1 |
| Assumption for UE beams <sup>Note 6</sup>  |                                   |  | Fine                                  |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz                         |  | -112                                  |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS                           |  | -103                                  |
| SS-RSRP <sup>Note2</sup>   | dBm/SCS<br><sup>Note3</sup>       |  | -85                                   |
| $\hat{E}_s/I_{ot}$   | dB                                |  | 18                                    |
| $I_o$ <sup>Note4</sup>   | dBm/95.04<br>MHz <sup>Note4</sup> |  | -56                                   |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |                                   |  |                                       |

#### A.7.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+kI$ ).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ( $j+T_{BWPswitchDelay}+kI$ ).

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

If the UE doesn't support per-FR gap,

- During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.
- The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

Otherwise no interruption due to BWP switch on SCell is allowed.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+kI$ ), ( $j+T_{BWPswitchDelay}+kI$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### A.7.5.6.1.3 NR FR2 DL active BWP switch with non-DRX in SA

#### A.7.5.6.1.3.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.7.5.6.1.3.1-1.

The test scenario comprises of one cell (Cell 1) as given in Table A.7.5.6.1.3.1-2. Cell-specific parameters of NR PCell is specified in Table A.7.5.6.1.3.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.6.1.3.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell 1's slot # denoted  $i$ . The UE should switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell 1's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 no later than the first UL slot that occurs after the beginning of slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on Cell 1's BWP-2 starting from the first DL slot that occurs after the beginning of slot ( $i+T_{BWPswitchDelay}$ ).

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell 1.

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the half subframe immediately after *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell 1's DL slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on Cell 1's BWP-1 starting from the first DL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}$ ).

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

**Table A.7.5.6.1.3.1-1: DL BWP switch supported test configurations**

| Config  | Description   |
|---------|---|
| 1       | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  |
| Note 1: | Void.   |
| Note 2: | A UE which fulfils the requirements in test case A.7.5.6.1.1 or A.7.5.6.1.2 can skip the test cases in A.7.5.6.1.3. |

**Table A.7.5.6.1.3.1-2: General test parameters for DL BWP switch in SA**

| Parameter                  | Unit | Value  | Comment                                    |
|----------------------------|------|--------|--|
| NR RF Channel Number       |      | 1      | One NR radio channel is used for this test |
| Active Cell                |      | Cell 1 | Cell on RF channel number 1.               |
| CP length                  |      | Normal |  |
| DRX                        |      | OFF    | For both PCell and PSCell                  |
| <i>bwp-InactivityTimer</i> | ms   | [200]  |  |
| T1                         | s    | [0.2]  |  |
| T2                         | s    | [0.2]  |  |
| T3                         | s    | [0.2]  |  |

**Table A.7.5.6.1.3.1-3: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter  | Unit | Cell 1                      |
|--|------|-----------------------------|
| Frequency Range  |      | FR2                         |
| Duplex mode  |      | TDD                         |
| TDD configuration  |      | TDDConf.3.1                 |
| $BW_{channel}$   |      | 100 MHz: $N_{RB,c} = 66$    |
| Active BWP ID  |      | 1, 2                        |
| Initial DL BWP Configuration   |      | DLBWP.0.2 <sup>Note 2</sup> |
| Active DL BWP-1 Configuration  |      | DLBWP.1.1 <sup>Note 2</sup> |
| Active DL BWP-2 Configuration  |      | DLBWP.1.3 <sup>Note 2</sup> |
| Initial UL BWP Configuration   |      | ULBWP.0.2 <sup>Note 2</sup> |
| Active UL BWP-1 Configuration  |      | ULBWP.1.1 <sup>Note 2</sup> |
| Active UL BWP-2 Configuration  |      | ULBWP.1.3 <sup>Note 2</sup> |
| PDSCH Reference measurement channel  |      | SR.3.1 TDD                  |
| RMSI CORESET parameters  |      | CR.3.1 TDD                  |
| Dedicated CORESET parameters   |      | CCR.3.1 TDD                 |
| OCNG Patterns  |      | OP.1                        |
| SSB Configuration  |      | SSB.1 FR2                   |
| SMTC Configuration   |      | SMTC.1                      |
| TCI State  |      | TCI.State.0                 |
| TRS Configuration  |      | TRS.2.1 TDD                 |
| Correlation Matrix and Antenna Configuration   |      | 1x2 Low                     |
| EPRE ratio of PSS to SSS   | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |      |                             |
| EPRE ratio of PDSCH to PDSCH   |      |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |      |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |      |                             |
| Propagation Condition  |      | AWGN                        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |      |                             |

**Table A.7.5.6.1.3.1-4: OTA related test parameters for DL BWP switch in SA**

| Parameter  | Unit                            | Cell 2                             |
|--|---------------------------------|------------------------------------|
| Angle of arrival configuration   |                                 | Setup 1 defined in clause A.3.15.1 |
| Assumption for UE beams <sup>Note 6</sup>  |                                 | Fine                               |
| $N_{oc}$ <sup>Note 1</sup>   | dBm/15 kHz                      | -112                               |
| $N_{oc}$ <sup>Note 1</sup>   | dBm/SCS                         | -103                               |
| SS-RSRP <sup>Note 2</sup>  | dBm/120 kHz <sup>Note 3</sup>   | -85                                |
| $\bar{E}_s/I_{ot}$   | dB                              | 18                                 |
| $\bar{E}_s/N_{oc}$ <sup>Note 5</sup>   | dB                              | 18                                 |
| $I_o$ <sup>Note 2</sup>  | dBm/95.04 MHz <sup>Note 4</sup> | -56                                |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |                                 |                                    |

#### A.7.5.6.1.3.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### A.7.5.6.2 RRC-based Active BWP Switch

#### A.7.5.6.2.1 NR FR2 DL active BWP switch of PCell with non-DRX in SA

##### A.7.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.7.5.6.2.1.1-1.

The test scenario comprises of one PCell (Cell 1) as given in Table A.7.5.6.2.1.1-2. Cell-specific parameters of PCell are specified in Table A.7.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.



Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to completely receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$  as defined in clause 8.6.3 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length} + k1$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ .

$T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.7.5.6.2.1.1-1: DL BWP switch supported test configurations**

| Config   | Description  |
|--|--|
| 1  | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.7.5.6.2.1.1-2: General test parameters for DL BWP switch in SA**

| Parameter   | Unit | Value  | Comment                                    |
|---|------|--------|--|
| NR RF Channel Number                                    |      | 1      | One NR radio channel is used for this test |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.              |
| CP length   |      | Normal |  |
| DRX   |      | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.        |
| T1  | s    | [0.2]  |  |

**Table A.7.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter   |                               | Unit | Cell 1                          |
|---|-------------------------------|------|---------------------------------|
| Frequency Range   |                               |      | FR2                             |
| Duplex mode   |                               |      | TDD                             |
| TDD configuration   |                               |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |                               |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Active BWP ID   |                               |      | 1                               |
| Initial Condition   | Active DL BWP-1 Configuration |      | DLBWP.0.2                       |
|   | Active UL BWP-1 Configuration |      | ULBWP.1.3                       |
| Final Condition   | Active DL BWP-1 Configuration |      | DLBWP.1.1                       |
|   | Active UL BWP-1 Configuration |      | ULBWP.1.1                       |
|   |                               |      |                                 |
|   |                               |      |                                 |
|   |                               |      |                                 |
| PDSCH Reference measurement channel   |                               |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |                               |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |                               |      | CCR.3.1 TDD                     |
| OCNG Patterns   |                               |      | OP.1                            |
| SSB Configuration   |                               |      | SSB.1 FR2                       |
| SMTc Configuration  |                               |      | SMTc.1                          |
| TCI State   |                               |      | TCI.State.0                     |
| TRS Configuration   |                               |      | TRS.2.1 TDD                     |
| Antenna Configuration   |                               |      | 1x2                             |
| Propagation Condition   |                               |      | AWGN                            |
| EPRE ratio of PSS to SSS  |                               | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |                               |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |                               |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |                               |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |                               |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                               |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                               |      |                                 |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                               |      |                                 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                               |      |                                 |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |      |                                 |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].           |                               |      |                                 |

**Table A.7.5.6.2.1.1-4: OTA related test parameters for BWP switching test case**

| Parameter                                 |              | Unit      | Cell 2                            |
|---|--------------|-----------|-----------------------------------|
| Angle of arrival configuration            |              |           | Setup 1 according to table A.3.15 |
| Assumption for UE beams <sup>Note 5</sup> |              |           | Fine                              |
| N <sub>oc</sub> <sup>Note1</sup>          | NR_TDD_FR2_A | dBm/15kHz | -112                              |
|   | NR_TDD_FR2_B |           |                                   |
|   | NR_TDD_FR2_F |           |                                   |
|   | NR_TDD_FR2_G |           |                                   |

|  |              |                                   |      |
|--|--------------|-----------------------------------|------|
|  | NR_TDD_FR2_T |                                   |      |
|  | NR_TDD_FR2_Y |                                   |      |
| $N_{oc}$ <sup>Note1</sup>  | NR_TDD_FR2_A | dBm/SCS                           | -103 |
|  | NR_TDD_FR2_B |                                   |      |
|  | NR_TDD_FR2_F |                                   |      |
|  | NR_TDD_FR2_G |                                   |      |
|  | NR_TDD_FR2_T |                                   |      |
|  | NR_TDD_FR2_Y |                                   |      |
| SS-RSRP <sup>Note2</sup>   | NR_TDD_FR2_A | dBm/SCS<br><sup>Note3</sup>       | -85  |
|  | NR_TDD_FR2_B |                                   |      |
|  | NR_TDD_FR2_F |                                   |      |
|  | NR_TDD_FR2_G |                                   |      |
|  | NR_TDD_FR2_T |                                   |      |
|  | NR_TDD_FR2_Y |                                   |      |
| $\hat{E}_s/I_{ot}$   |              | dB                                | 18   |
| $I_o$ <sup>Note2</sup>   | NR_TDD_FR2_A | dBm/95.04<br>MHz <sup>Note4</sup> | -56  |
|  | NR_TDD_FR2_B |                                   |      |
|  | NR_TDD_FR2_F |                                   |      |
|  | NR_TDD_FR2_G |                                   |      |
|  | NR_TDD_FR2_T |                                   |      |
|  | NR_TDD_FR2_Y |                                   |      |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |              |                                   |      |

A.7.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs after the beginning of slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$  and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length} + k1$ .

Where,  $k1$  is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

A.7.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

A.7.5.6.3.1 Active BWP switch on multiple SCells with non-DRX in SA

A.7.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify fulfillment of DL BWP switch delay requirement defined in clauses 8.6.2A.1 and 8.6.2B.1, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.3.1.1-1 below. The test scenario comprises one PCell (Cell 1) and two SCells (Cell 2 and Cell 3) as given in Table A.7.5.6.3.1.1-2. NR cell-specific parameters are provided in Table A.7.5.6.3.1.1-3, and OTA related test parameters in Table A.7.5.6.3.1.1-4 below.

The test consists of three consecutive time periods with durations T1, T2 and T3, respectively.

PDCCHs indicating new transmissions shall be transmitted in PCell, SCell1 and SCell2 throughout time periods T1 and T3 to ensure that UE sends ACK/NACKs for PDSCH reception in PCell, SCell1 and SCell2. During T2, there shall be scheduling on PDSCH in PCell only.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (SCell1) on radio channel 2 (SCC1), and Cell 3 (SCell2) on radio channel 3 (SCC2).

UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for Cell 1 (PCell). BWP-0 includes the bandwidth of the initial DL BWP and SSB.

UE is configured with two different UE-specific downlink bandwidth parts, BWP-1 and BWP-2, for Cell 2 (SCell1). BWP-1 and BWP-2 include the bandwidth of the initial DL BWP and SSB.

UE is configured with two different UE-specific downlink bandwidth parts, BWP-3 and BWP-4, for Cell 3 (SCell2). BWP-3 and BWP-4 include the bandwidth of the initial DL BWP and SSB.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PCell.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell1.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-3 in SCell2.

UE is configured with a *bwp-InactivityTimer* timer value for SCell1 and SCell2, respectively.

All cells have constant signal levels throughout the test.

Time period T1 starts when the UE simultaneously receives DCI format 1\_1 commands for DL BWP switch in SCell1 and SCell2, respectively, in a slot # denoted  $m$ . The UE shall switch its SCell1 bandwidth part from BWP-1 to BWP-2, and its SCell2 bandwidth part from BWP-3 to BWP-4. The UE shall be able to receive PDSCH in SCell1 and SCell2 starting from the first DL slot that occurs after slot  $(m + T_{MultipleBWPswitchDelay})$  as defined in clause 8.6.2A.1, and to transmit ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after  $(m + T_{BWPswitchDelay} + kI)$  where  $kI$  is specified in [7]. The UE shall be continuously scheduled in SCell1 BWP-2 and SCell2 BWP-4 no later than in the first DL slot that occurs after slot  $(m + T_{MultipleBWPswitchDelay})$ . The starting time of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall occur within the BWP switching delay. The length of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall fulfill requirements in clause 8.2.2.2.5.

Time period T2 starts when the test equipment ceases to schedule the UE on PDSCH in SCell1 and SCell2, thereby causing the *bwp-InactivityTimer* timers for SCell1 and SCell2 to be running until expiry.

Time period T3 starts at the beginning of the first DL half-subframe immediately after the earliest of the *bwp-InactivityTimer* timers expires, in a slot # denoted  $n$ . The UE shall switch its SCell1 bandwidth part from BWP-2 to BWP-1, and its SCell2 bandwidth part from BWP-4 to BWP-3. The UE shall be able to receive PDSCH in SCell1 and SCell2 starting from the first DL slot that occurs after slot  $(n + T_{MultipleBWPswitchDelay})$  as defined in clause 8.6.2B.1, and to transmit ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after slot  $(n + T_{MultipleBWPswitchDelay} + kI)$ . The UE shall be continuously scheduled in SCell1 BWP-1 and SCell2 BWP-3 no later than in the first DL slot that occurs after slot  $(n + T_{MultipleBWPswitchDelay})$ . The starting time of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall occur within the BWP switching delay. The length of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall fulfill requirements in clause 8.2.2.2.5.

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch commands are received or *bwp-InactivityTimer* timers expire until ACK/NACKs are sent in SCell1 and SCell2, respectively.

The test equipment verifies that potential interruptions of PCell due to DL BWP switching on SCell1 and SCell2 are carried out within the correct time span, and are within the correct length, by monitoring ACK/NACKs sent in PCell for PCell.

**Table A.7.5.6.3.1.1-1: DL BWP switch supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD -TDD duplex mode |

**Table A.7.5.6.3.1.1-2: General test parameters for DL BWP switch in SA**

| Parameter                     | Unit | Value   | Comment  |
|-------------------------------|------|---------|--|
| NR RF Channel Number          |      | 1, 2, 3 | Three NR radio channels are used for this test   |
| Active PCell                  |      | Cell 1  | PCell on RF channel number 1.  |
| Active SCell1                 |      | Cell 2  | SCell1 on RF channel number 2.   |
| Active SCell2                 |      | Cell 3  | SCell2 on RF channel number 3.   |
| CP length                     |      | Normal  |  |
| DRX                           |      | OFF     |  |
| <i>sCellDeactivationTimer</i> | ms   | ---     | Same value applies for SCell1 and SCell2. The value infinity is applied.               |
| <i>bwp-InactivityTimer</i>    | ms   | 200     | Same value applies for SCell1 and SCell2.  |
| Cell2 timing offset to Cell1  | μs   | 0       | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.                    |
| Cell3 timing offset to Cell1  | μs   | 0       |  |
| T1                            | s    | 0.2     | During T1, DCI-based simultaneous BWP switching of SCell1 and SCell2 is carried out.   |
| T2                            | s    | 0.2     | During T2 <i>bwp-InactivityTimer</i> timers shall run to expiry.                       |
| T3                            | s    | 0.2     | During T3, timer-based simultaneous BWP switching of SCell1 and SCell2 is carried out. |

Table A.7.5.6.3.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

| Parameter  | Unit | Cell 1               | Cell 2    | Cell 3    |
|--|------|----------------------|-----------|-----------|
| Frequency Range  |      | FR2                  |           |           |
| NR RF channel  |      | 1                    | 2         | 3         |
| Duplex mode  |      | TDD                  |           |           |
| TDD configuration  |      | TDDConf.3.1          |           |           |
| $BW_{channel}$   | MHz  | 100: $N_{RB,c} = 66$ |           |           |
| Active Downlink BWP ID   |      | 0                    | 1, 2      | 3, 4      |
| Downlink initial BWP Configuration   |      | DLBWP.0.2            | DLBWP.0.2 | DLBWP.0.2 |
| Uplink initial BWP Configuration   |      | ULBWP.0.2            | ULBWP.0.2 | ULBWP.0.2 |
| Downlink active BWP-0 Configuration  |      | DLBWP.1.1            | ---       | ---       |
| Downlink active BWP-1 Configuration  |      | ---                  | DLBWP.1.1 | ---       |
| Downlink active BWP-2 Configuration  |      | ---                  | DLBWP.1.3 | ---       |
| Downlink active BWP-3 Configuration  |      | ---                  | ---       | DLBWP.1.1 |
| Downlink active BWP-4 Configuration  |      | ---                  | ---       | DLBWP.1.3 |
| Uplink active BWP-0 Configuration  |      | ULBWP.1.1            | ULBWP.1.1 | ULBWP.1.1 |
| PDSCH Reference measurement channel  |      | SR.3.1 TDD           |           |           |
| TRS configuration  |      | TRS.2.1 TDD          |           |           |
| TCI state  |      | TCI.State.0          |           |           |
| RMSI CORESET parameters  |      | CR.3.1 TDD           |           |           |
| Dedicated CORESET parameters   |      | CCR.3.1 TDD          |           |           |
| OCNG Patterns  |      | OP.1                 |           |           |
| SSB Configuration  |      | SSB.3 FR2            |           |           |
| SMTTC Configuration  |      | SMTTC.1              |           |           |
| EPRE ratio of PSS to SSS   | dB   | 0                    | 0         | 0         |
| EPRE ratio of PBCH DMRS to SSS   |      |                      |           |           |
| EPRE ratio of PBCH to PBCH DMRS  |      |                      |           |           |
| EPRE ratio of PDCCH DMRS to SSS  |      |                      |           |           |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |                      |           |           |
| EPRE ratio of PDSCH DMRS to SSS  |      |                      |           |           |
| EPRE ratio of PDSCH to PDSCH   |      |                      |           |           |
| EPRE ratio of OCNG DMRS to SSS <small>Note1</small>  |      |                      |           |           |
| EPRE ratio of OCNG to OCNG DMRS <small>Note1</small>   |      |                      |           |           |
| Propagation Condition  |      | AWGN                 | AWGN      | AWGN      |
| Correlation Matrix and Antenna Configuration   |      | 1x2 Low              | 1x2 Low   | 1x2 Low   |
| Note 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                      |           |           |

Table A.7.5.6.3.1.1-4: OTA related test parameters for BWP switching test case

| Parameter                                | Unit   | Cell 1                             | Cell 2   | Cell 3   |
|--|--|------------------------------------|----------|----------|
| Angle of arrival configuration           |  | Setup 1 defined in clause A.3.15.1 |          |          |
| Assumption for UE beams <sup>Note4</sup> |  | Fine                               | Fine     | Fine     |
| $N_{oc}$ <sup>Note1</sup>                | dBm/15kHz  | [-111.7]                           | [-111.7] | [-111.7] |
| $N_{oc}$ <sup>Note1</sup>                | dBm/SCS  | [-102.7]                           | [-102.7] | [-102.7] |
| $\hat{E}_s/N_{oc}$                       | dB   | [7]                                | [7]      | [7]      |
| SSB-RP <sup>Note2</sup>                  | dBm/SCS  | [-95.7]                            | [-95.7]  | [-95.7]  |
| $\hat{E}_s/I_{ot}$                       | dB   | [7]                                | [7]      | [7]      |
| $I_o$ <sup>Note3</sup>                   | dBm/95.04 MHz  | [-65.9]                            | [-65.9]  | [-65.9]  |
| Note 1:                                  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                    |          |          |
| Note 2:                                  | SSB-RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                                    |          |          |
| Note 3:                                  | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                    |          |          |
| Note 4:                                  | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |                                    |          |          |

#### A.7.5.6.3.1.2 Test Requirements

During T1, the UE shall start to send ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after the beginning of DL slot ( $m+T_{MultipleBWPswitchDelay}+kI$ ).

During T3, the UE shall start to send ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after the beginning of DL slot ( $n+T_{MultipleBWPswitchDelay}+kI$ ).

During T1 and T3, the start of any interruption on PCell due to active BWP switching on SCell1 and SCell2 shall not happen outside the BWP switching delay  $T_{MultipleBWPswitchDelays}$ , and the length of any interruption shall not exceed the length specified in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed active BWP switch delays in SCell1 and SCell2 to be considered correct.

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

#### A.7.5.6.4 SCell dormancy switch

##### A.7.5.6.4.1 NR FR2 PCell SCell dormancy switch of single FR2 SCell inside active time

###### A.7.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the Dormant SCell BWP switch delay requirements are within the requirements stated in section 8.6 for UE configured with a single downlink SCell, when the dormancy indication is received in any of the first 3 OFDM symbols or is received after the first 3 OFDM symbols.

The Supported test configurations are given in Table A.7.5.6.4.1.1-1. The test parameters are given in Tables A.7.5.6.4.1.1-2 and cell-specific parameters in A.7.5.6.4.1.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A6 is used. The test consists of four successive time periods, with duration of T1, T2, T3 and T4, respectively. There are two carriers both in FR2, with one cell on the PCC and 2 cells on SCC. Cell 1, Cell 2 and Cell 3 operate in either FDD or TDD duplex mode according to test configuration. All cells have constant signal levels

throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) with configured and activated SCell (SCell1) on radio channel 2 (SCC1). The UE is not aware of Cell 3 on radio channel 2 (SCC1). The UE is reporting CSI and shall not report CQI index 0 (out-of-range) in the available uplink resources to report CQI for the SCell. The UE shall be continuously scheduled in the PCell throughout the whole test.

The UE receives a DCI-based BWP switch command by which the SCell1 (Cell 2) is requested to switch the active BWP to the dormant BWP.

The point in time at which the DCI message is received at the UE antenna connector, in a subframe # denoted  $n$ , defines the start of time period T1. The UE shall accomplish the BWP switch to the dormant BWP latest in subframe  $(n + T_{\text{BWPswitchDelay}} + X)$ . The UE shall continue to report valid CQI if the UE has available uplink resources to report CQI for the dormant SCell. The UE shall continue to report L1-RSRP if the UE has available uplink resources to report L1-RSRP for the Dormant SCell. Any PCell interruption due to BWP switch on the SCell shall occur in the subframes  $n$  to  $(n + T_{\text{BWPswitchDelay}} + X)$ .

Time T2 start at  $T1 + (T_{\text{BWPswitchDelay}} + X)$ . During T2 the UE shall continue to measure and report CQI and L1-RSRP in the available uplink resources to report CQI and L1-RSRP for the SCell.

Time T3 starts at  $T2 + 500\text{ms}$ . During T3 the UE shall continue to measure and report CQI and L1-RSRP in the available uplink resources to report CQI and L1-RSRP for the SCell.

Starting at  $T4 = T3 + 500\text{ms}$ , Cell 3 becomes detectable. During T3 the UE shall continue to measure and report CQI and L1-RSRP in the available uplink resources to report CQI and L1-RSRP for the SCell. The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than 1000 ms from the beginning of time period T4. The UE is not required to read the neighbour cell SSB index in this test.

At time T5 starting at  $T4 + 1500\text{ms}$  a DCI-based BWP switch command by which the SCell1 (Cell 2) is requested to switch the active BWP to the non-dormant BWP.

The point in time at which the DCI message is received at the UE antenna connector, in a subframe # denoted  $n$ , defines the start of time period T6. The UE shall accomplish the BWP switch to the non-dormant BWP latest in subframe  $(n + T_{\text{BWPswitchDelay}} + X)$ . The UE shall continue to report valid CQI if the UE has available uplink resources to report CQI for the non-dormant SCell. The UE shall continue to report L1-RSRP if the UE has available uplink resources to report L1-RSRP for the non-dormant SCell. Any PCell interruption due to BWP switch on the SCell shall occur in the subframes  $n$  to  $(n + T_{\text{BWPswitchDelay}} + X)$ .

During T2, T3 and T4 the total rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements and RRM measurements, clause 8.2.2.2.12.3, on dormant SCells, shall not exceed [0.5]%.

During T2, T3 and T4 the total rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from L1-RSRP measurements and RRM measurements, clause 8.2.2.2.12.x, on dormant SCells, shall not exceed [0.5]%.

During T2, T3 and T4 the total rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from RRM measurements and RRM measurements, clause 8.2.2.2.12.3, on dormant SCells, shall not exceed [0.5]%.

During T1, T2, T3, T4, T5 and T6, the UE shall be continuously scheduled in the SCell1.

**Table A.7.5.6.4.1.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |



**Table A.7.5.6.4.1.1-2: General test parameters for dormancy SCell in NR SA with PCell and SCell in FR2**

| Parameter  | Unit | Test configuration | Value          |        |        |        | Comment   |
|--|------|--------------------|----------------|--------|--------|--------|---|
|  |      |                    | Test 1         | Test 2 | Test 3 | Test 4 |   |
| PCell  |      | 1                  | Cell 1         |        |        |        |   |
| SCell  |      | 1                  | Cell 2         |        |        |        |   |
| Neighbour cell   |      | 1                  | Cell 3         |        |        |        | Cell to be identified.  |
| RF Channel Number  |      | 1                  | 1              |        |        |        | cell 1  |
| RF Channel Number  |      | 1                  | 2              |        |        |        | Cell 2 and Cell 3   |
| Measurement gap type   |      | 1                  |                |        |        |        | No measurement gaps configured  |
| SSB configuration  |      | 1                  | SSB.1 FR2      |        |        |        | for all cells   |
| SMTC configuration   |      | 1                  | SMTC.1         |        |        |        | all cells   |
| CSI-RS parameters  |      | 1                  | CSI-RS.3.2 FDD |        |        |        |   |
| CSI reporting periodicity, Non-dormant BWP                                 | ms   |                    | 2              |        |        |        |   |
| CSI reporting periodicity, Dormant BWP                                     | ms   |                    | 40             |        |        |        |   |
| Timing offset between the cells  | ms   |                    | 0              |        |        |        |   |
| Triggering DCI format  |      |                    | 1_1            | 0_1    | 1_1    | 0_1    | Triggering DCI format   |
| OFDM symbol range in slot for transmission of DCI with dormancy indication |      |                    | 0 – 2          |        | 3 – 11 |        | Test1 and Test3 are based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 and Test4 are based on that the triggering DCI is received after the first three OFDM symbols of a slot |
| A3-Offset  | dB   | 1                  | -4.5           |        |        |        |   |
| CP length  |      | 1                  | Normal         |        |        |        |   |
| Hysteresis   | dB   | 1                  | 0              |        |        |        |   |
| Time To Trigger  | s    | 1                  | 0              |        |        |        |   |
| Filter coefficient   |      | 1                  | 0              |        |        |        | L3 filtering is not used  |
| DRX  |      | 1                  | OFF            |        |        |        |   |
| T1   | s    | 1                  | 5              |        |        |        |   |
| T2   | s    | 1                  | 5              |        |        |        |   |

**Table A.7.5.6.4.1.1-3: NR Cell specific test parameters for dormancy SCell in NR SA with PCell and SCell in FR2**

| Parameter   | Unit       | Test configuration | Cell 1, Cell 2 |            | Cell 3      |       |
|---|------------|--------------------|----------------|------------|-------------|-------|
|   |            |                    | T1             | T2         | T1          | T2    |
| TDD configuration                                 |            | 1                  | TDDConf.3.1    |            | TDDConf.3.1 |       |
| PDSCH RMC configuration                           |            | 1                  | SR.3.1 TDD     |            | SR.3.1 TDD  |       |
| RMSI CORESET RMC configuration                    |            | 1                  | CR.3.1 TDD     |            | CR.3.1 TDD  |       |
| Dedicated CORESET RMC configuration, Test 1,2     |            | 1                  | CCR.3.1 TDD    |            | CCR.3.1 TDD |       |
| Dedicated CORESET RMC configuration, Test 3,4     |            |                    | CCR.3.2 TDD    |            | CCR.3.1 TDD |       |
| OCNG Patterns                                     |            | 1                  | OP.1           |            | OP.1        |       |
| TRS configuration                                 |            | 1                  | TRS.2.1 TDD    |            | N/A         |       |
| Downlink initial BWP configuration                |            | 1                  | DLBWP.0.1      |            | N/A         |       |
| Uplink initial BWP configuration                  |            | 1                  | ULBW P.0.1     | N/A        | N/A         |       |
| Downlink active non-dormant BWP configuration     |            | 1                  | N/A            | DLBW P.1.2 | N/A         |       |
| Downlink active dormant BWP configuration         |            | 1                  | DLBWP.1.2      |            | N/A         |       |
| Active UL BWP configuration                       |            | 1                  | ULBW P.1.1     | N/A        | N/A         |       |
| RLM-RS  |            | 1                  | CSI-RS         |            | N/A         |       |
| EPRE ratio of PSS to SSS                          | dB         |                    | 0              |            |             |       |
| EPRE ratio of PBCH DMRS to SSS                    |            |                    |                |            |             |       |
| EPRE ratio of PBCH to PBCH DMRS                   |            |                    |                |            |             |       |
| EPRE ratio of PDCCH DMRS to SSS                   |            |                    |                |            |             |       |
| EPRE ratio of PDCCH to PDCCH DMRS                 |            |                    |                |            |             |       |
| EPRE ratio of PDSCH DMRS to SSS                   |            |                    |                |            |             |       |
| EPRE ratio of PDSCH to PDSCH                      |            |                    |                |            |             |       |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 4</sup>  |            |                    |                |            |             |       |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 4</sup> |            |                    |                |            |             |       |
| $N_{oc}$ <sup>Note 2</sup>                        | dBm/SCS    | 1                  | -98            |            |             |       |
| $N_{oc}$ <sup>Note 2</sup>                        | dBm/15 kHz | 1                  | -98            |            |             |       |
| $\hat{E}_s/I_{ot}$                                | dB         | 1                  | 4              | -1.46      | -Infinity   | -1.46 |
| $\hat{E}_s/N_{oc}$                                | dB         | 1                  | 4              | 4          | -Infinity   | 4     |

|                           |  |   |        |        |           |        |
|---------------------------|--|---|--------|--------|-----------|--------|
| SS-RSRP <sup>Note 3</sup> | dBm/SCS kHz  | 1 | -94    | -94    | -Infinity | -94    |
| Io                        | dBm/9.36 MHz   | 1 | -64.60 | -62.25 | -64.60    | -62.25 |
| Propagation Condition     |  | 1 | AWGN   |        |           |        |
| Note 1:                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |   |        |        |           |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |        |        |           |        |
| Note 3:                   | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |        |        |           |        |
| Note 4:                   | OCNG shall be used such that the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols  |   |        |        |           |        |

#### A.7.5.6.4.1.2 Test Requirements

During T1 the UE shall switch to the dormant BWP.

During T2, T3, T4 and T5 the UE shall not send ACK/NACK for the PDSCH data scheduled on the SCell.

During T2, T3, T4 and T5 the UE shall continue to send CSI reports for SCell1 with non-zero CQI index.

During T2, T3, T4 and T5 the UE shall continue to send L1-RSRP reports for SCell.

During T4 the UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than 1000 ms from the beginning of time period T4.

During T2, T3, T4 and T5, the missing ACK/NACK sent in PCell shall be less than 1.5% of the total number of the expected ACK/NACK.

During T6, the UE shall send ACK/NACK for the PDSCH data scheduled after subframe  $(n + T_{BWPswitchDelay} + X)$  for the SCell1.

All of the above test requirements shall be fulfilled in order for the observed SCell1 BWP switch delays, Pcell interruption rate, correct CSI and L1-RSRP reporting and event triggered reporting. The rate of correct observed SCell1 hibernation delay, activation delay and SCell1 deactivation delay during repeated tests shall be at least 90%.

#### A.7.5.6.4.2 NR FR1 PCell SCell dormancy switch of two FR2 SCells outside active time

##### A.7.5.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify fulfillment of SCell dormancy switching delay requirements in clause 8.6.2A when the UE is triggered to switch between non-dormancy and dormancy outside DRX active time. In the tested scenario, the UE is connected to PCell in FR1 and two SCCells in FR2, and the SCCells are switched from non-dormancy to dormancy, and vice versa, at a point in time before start of *onDuration*. The UE is configured to monitor PDCCH for DCI format 2\_6 at *ps-Offset* before the start of *onDuration*. Two tests are specified, where a UE that only supports triggering within the first three OFDM symbols of a slot shall undergo Test1 only, and a UE that supports triggering also in remaining OFDM symbols of a slot shall undergo both Test1 and Test2. In the tested scenario, *ps-Offset* is selected to correspond to the dormancy switching time specified in clause 8.6.2A.

The supported test configurations are provided in Table A.7.5.6.4.2.1-1 below. General test parameters are provided in Table A.7.5.6.4.2.1-2, and cell-specific parameters are provided in Table A.7.5.6.4.2.1-3 below. OTA-related test parameters are provided in Table A.7.5.6.4.2.1-4.

The tests consist of four consecutive time periods, T1, T2, T3 and T4, respectively.

Three carriers are used in the test. Cell 1 (PCell) is on RF channel 1 (PCC) in FR1, and Cell 2 (SCCell1) and Cell 3 (SCCell2) are on RF channels 2 (SCC1) and 3 (SCC2) in FR2, respectively. All three cells have constant signal levels throughout the test.

Before the test starts,

UE is connected to Cell 1 (PCell), Cell 2 (SCCell1) and Cell 3 (SCCell2).

UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for Cell 1. BWP-0 includes the bandwidth of the initial DL BWP and SSB.

UE is configured with one non-dormant and one dormant UE-specific downlink bandwidth part, BWP-0 and BWP-1, respectively, for Cell 2 and Cell 3. BWP-0 includes the bandwidth of the initial DL BWP and SSB.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 1 is BWP-0.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 2 is BWP-0.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 3 is BWP-0.

UE is configured with DRX.

UE is configured to monitor DCI format 2\_6, and to be active during *onDuration* even when no DCI format 2\_6 is detected (*ps-WakeUp*).

Time period T1 starts when the UE at *ps-Offset* before *onDuration* detects a DCI format 2\_6 carrying dormancy indication that indicates that SCell1 and SCell2 are to be switched from non-dormancy to dormancy. The UE shall switch active bandwidth parts for SCell1 and SCell2, respectively, from non-dormant BWP-0 to dormant BWP-1. The UE shall complete the switching before the start of *onDuration*. The test equipment schedules the UE continuously with new data indications in PCell starting from beginning of *onDuration*. The test equipment verifies that the UE is transmitting HARQ feedback for PCell from the beginning of *onDuration* and thus verifies that the UE has completed interruptions due to dormancy switching before the start of *onDuration*.

Time period T2 starts when T1 is completed. The test equipment continues to schedule the UE continuously in PCell. The UE shall carry out CSI and RRM measurements on the dormant SCells. The UE shall report ACK/NACK in PCell in response to scheduled PDSCH, with the maximum loss of transmitted ACK/NACKs fulfilling the requirement in clause 8.2.2.2.12. The test equipment verifies that the loss of ACK/NACKs is no larger than 1.5%.

Time period T3 starts when T2 is completed. During T3, the test equipment does not schedule the UE, by which the inactivity timer expires and the UE stops monitoring PDCCH except for signalling using DCI format 2\_6 at wake-up signalling occasions.

Time period T4 starts when the UE at *ps-Offset* before *onDuration* detects a DCI format 2\_6 carrying dormancy indication that indicates that SCell1 and SCell2 are to be switched from dormancy to non-dormancy. The UE shall switch active bandwidth parts for SCell1 and SCell2, respectively, from dormant BWP-1 to non-dormant BWP-0. The UE shall complete the switching before the start of *onDuration*. The test equipment schedules the UE with new data indication in PCell, SCell1 and SCell2 during *onDuration*. The UE shall receive in PCell, SCell1 and SCell2 and send HARQ feedback for PCell, SCell1 and SCell2 via PCell. The test equipment verifies that the UE is transmitting HARQ feedback for PCell, SCell1 and SCell2 from the beginning of *onDuration*, and thus verifies that the UE has completed interruptions due to dormancy switching before the start of *onDuration*.

**Table A.7.5.6.4.2.1-1: Supported test configurations**

| Config  | Description  |
|---|--|
| 1   | PCell: 15kHz SSB SCS, 10MHz bandwidth, FDD duplex mode<br>SCells: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | PCell: 15kHz SSB SCS, 10MHz bandwidth, TDD duplex mode<br>SCells: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3   | PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode<br>SCells: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to undergo test for one of the supported test configurations. |  |

Table A.7.5.6.4.2.1-2: General test parameters

| Parameter  | Unit | Value                      |        | Comment   |
|--|------|----------------------------|--------|---|
|  |      | Test1                      | Test2  |   |
| NR RF Channel Number   |      | 1, 2, 3                    |        | Three NR radio channels are used for this test  |
| Active PCell   |      | Cell 1                     |        | PCell on RF channel number 1 in FR1   |
| Active SCell1  |      | Cell 2                     |        | SCell1 on RF channel number 2 in FR2  |
| Active SCell2  |      | Cell 3                     |        | SCell2 on RF channel number 3 in FR2  |
| CSI reporting periodicity, Non-dormant BWP                                 | ms   | 2                          |        | CSI reporting periodicity for periodic reporting of CQI for PCell and non-dormant SCells  |
| CSI reporting periodicity, Dormant BWP                                     | ms   | 40                         |        | CSI reporting periodicity for periodic reporting of CQI for dormant SCells  |
| CP length  |      | Normal                     |        |   |
| DRX  |      | DRX.8                      |        | For both PCell and SCells. See clause A.3.3.8.  |
| ps-Offset  |      | Depending on UE capability |        | Monitoring of DCI 2_6 ahead of start of drx-onDurationTimer. Value of ps-Offset shall correspond to SCell dormancy switching time for switching of two SCells, as specified in clause 8.6.2A. Actual value depends on reported UE capabilities. |
| ps-WakeUp  |      | true                       |        | Wake up for onDuration in case DCI format 2_6 is not detected.  |
| Cell 2 timing offset to Cell 1   | μs   | <24                        |        | Timing offset shall be less than MRTD for FR1-FR2 CA, and leave margin for timing difference between Cell2 and Cell3.   |
| Cell 3 timing offset to Cell 2   | ns   | <260                       |        | Timing offset shall be less than MRTD for FR2 intra-band non-contiguous CA.   |
| OFDM symbol range in slot for transmission of DCI with dormancy indication |      | 0 – 2                      | 3 – 11 | Test1 is based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 is based on that the triggering DCI is received later than within the first three OFDM symbols of a slot.                                |
| T1   | s    | 0.2                        |        | During this time the SCells are switched from non-dormancy to dormancy.   |
| T2   | s    | 10                         |        | During this time the SCells are dormant.  |
| T3   | s    | 0.2                        |        | During this time the UE is not scheduled in PCell.  |
| T4   | s    | 0.2                        |        | During this time the SCells are switched from dormancy to non-dormancy.   |

Table A.7.5.6.4.2.1-3: Cell specific test parameters

| Parameter  |            | Unit | Cell 1                              | Cell2                       | Cell 3                      |
|--|------------|------|-------------------------------------|-----------------------------|-----------------------------|
| Frequency Range  |            |      | FR1                                 | FR2                         | FR2                         |
| NR RF channel  |            |      | 1                                   | 2                           | 3                           |
| Duplex mode  | Config 1   |      | FDD                                 | TDD                         | TDD                         |
|  | Config 2,3 |      | TDD                                 |                             |                             |
| TDD configuration  | Config 1   |      | ---                                 | TDDConf.3.1                 | TDDConf.3.1                 |
|  | Config 2   |      | TDDConf.1.1                         |                             |                             |
|  | Config 3   |      | TDDConf.2.1                         |                             |                             |
| BW <sub>channel</sub>  | Config 1,2 | MHz  | 10: N <sub>RB,c</sub> = 52          | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
|  | Config 3   |      | 40: N <sub>RB,c</sub> = 106         |                             |                             |
| Downlink initial BWP Configuration   |            |      | DLBWP.0.2                           | DLBWP.0.2                   | DLBWP.0.2                   |
| Uplink initial BWP Configuration   |            |      | ULBWP.0.2                           | ---                         | ---                         |
| Downlink active non-dormant BWP-0 Configuration  |            |      | DLBWP.1.1                           | DLBWP.1.1                   | DLBWP.1.1                   |
| Downlink active dormant BWP-1 Configuration  |            |      | ---                                 | DLBWP.1.1                   | DLBWP.1.1                   |
| Uplink active BWP-0 Configuration  |            |      | ULBWP.0.2                           | ---                         | ---                         |
| PDSCH Reference measurement channel  | Config 1   |      | SR.1.1 FDD                          | SR.3.1 TDD                  | SR.3.1 TDD                  |
|  | Config 2   |      | SR.1.1 TDD                          |                             |                             |
|  | Config 3   |      | SR.2.1 TDD                          |                             |                             |
| CSI-RS configuration for CSI reporting, Non-dormant BWP  | Config 1   |      | CSI-RS.1.1 FDD                      | CSI-RS.3.1 TDD              | CSI-RS.3.1 TDD              |
|  | Config 2   |      | CSI-RS.1.1 TDD                      |                             |                             |
|  | Config 3   |      | CSI-RS.2.1 TDD                      |                             |                             |
| CSI-RS configuration for CSI reporting, Dormant BWP  |            |      | ---                                 | CSI-RS.3.5 TDD              | CSI-RS.3.5 TDD              |
| TRS configuration  | Config 1   |      | TRS.1.1 FDD                         | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
|  | Config 2   |      | TRS.1.1 TDD                         |                             |                             |
|  | Config 3   |      | TRS.1.2 TDD                         |                             |                             |
| TCI state  |            |      | TCI.State.0                         | TCI.State.0                 | TCI.State.0                 |
| RMSI CORESET parameters  | Config 1   |      | CR.1.1 FDD                          | ---                         | ---                         |
|  | Config 2   |      | CR.1.1 TDD                          |                             |                             |
|  | Config 3   |      | CR.2.1 TDD                          |                             |                             |
| Dedicated CORESET parameters, Test 1,2   | Config 1   |      | CCR.1.1 FDD                         | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|  | Config 2   |      | CCR.1.1 TDD                         |                             |                             |
|  | Config 3   |      | CCR.2.1 TDD                         |                             |                             |
| Dedicated CORESET parameters, Test 3,4   | Config 1   |      | CCR.1.5 FDD                         | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|  | Config 2   |      | CCR.1.5 TDD                         |                             |                             |
|  | Config 3   |      | CCR.2.3 TDD                         |                             |                             |
| OCNG Patterns  |            |      | OP.1                                | OP.1                        | OP.1                        |
| SSB Configuration  | Config 1,2 |      | SSB.1 FR1                           | SSB.1 FR2                   | SSB.1 FR2                   |
|  | Config 3   |      | SSB.2 FR1                           |                             |                             |
| SMTc Configuration   |            |      | SMTc.1                              | SMTc.1                      | SMTc.1                      |
| Correlation Matrix and Antenna Configuration   |            |      | 1x2 Low                             |                             |                             |
| EPRE ratio of PSS to SSS   |            | dB   | 0                                   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |            |      |                                     |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS  |            |      |                                     |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS  |            |      |                                     |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |            |      |                                     |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS  |            |      |                                     |                             |                             |
| EPRE ratio of PDSCH to PDSCH   |            |      |                                     |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>  |            |      |                                     |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>   |            |      |                                     |                             |                             |
| Propagation Condition  |            |      | N/A<br>Link only, see clause A.3.7A | AWGN                        | AWGN                        |
| Note 1: OCNG shall be used such that the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |            |      |                                     |                             |                             |

Table A.7.5.6.4.2.1: OTA related test parameters

| Parameter                        | Unit   | Cell 1                                 | Cell 2                             | Cell 3 |
|----------------------------------|--|--|------------------------------------|--------|
| Angle of arrival configuration   |  | N/A<br>Link only, see<br>clause A.3.7A | Setup 1 defined in clause A.3.15.1 |        |
| Assumption for UE beams<br>Note6 |  |  | Fine                               | Fine   |
| $N_{oc}$ Note1                   | dBm/15kHz  |  | -112                               | -112   |
| $N_{oc}$ Note1                   | dBm/SCS  |  | -103                               | -103   |
| SS-RSRP <sup>Note2</sup>         | dBm/SCS <sup>Note3</sup>   |  | -85                                | -85    |
| $\hat{E}_s/I_{ot}$               | dB   |  | 18                                 | 18     |
| $I_o$ <sup>Note4</sup>           | dBm/95.04 MHz <sup>Note4</sup>   |  | -56                                | -56    |
| Note 1:                          | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |  |                                    |        |
| Note 2:                          | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |  |                                    |        |
| Note 3:                          | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |  |                                    |        |
| Note 4:                          | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |  |                                    |        |
| Note 6:                          | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |  |                                    |        |

#### A.7.5.6.4.2.2 Test Requirements

Starting from *onDuration* in time period T1, the UE shall transmit ACK/NACK in response to scheduling in PCell. There shall be no loss of ACK/NACK.

During time period T2, the UE shall transmit ACK/NACKs in response to scheduling in PCell and the rate of missed ACK/NACKs shall be no more than 1.5%.

Starting from *onDuration* in time period T4, the UE shall transmit ACK/NACK in response to scheduling in PCell, SCell1 and SCell2. There shall be no loss of ACK/NACK.

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

### A.7.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

#### A.7.5.6.5.1 Active BWP switch on multiple SCells with non-DRX in SA

##### A.7.5.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for simultaneous RRC-based BWP switch on multiple CCs defined in clause 8.6.3A.

The supported test configurations are shown in Table A.7.5.6.5.1.1-1. The test scenario comprises one PCell (Cell 1) and one SCell (Cell 2) as given in Table A.7.5.6.5.1.1-2. NR cell-specific parameters are provided in Table A.7.5.6.5.1.1-3, and OTA related test parameters in Table A.7.5.6.5.1.1-4.

PDCCHs indicating new transmissions shall be transmitted in PCell and SCell throughout to ensure that UE sends ACK/NACKs for PDSCH reception in PCell, SCell.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), to Cell 2 (SCell) on radio channel 2 (SCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell1 (PCell), Cell 2 (SCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition on Cell1 (PCell), Cell 2 (SCell).

All cells have constant signal levels throughout the test.



The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration in Cell1 and Cell2, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition in Cell1 and Cell2.

The UE shall be able to receive PDSCH on Cell 1 and Cell 2 at the beginning of the DL slot right after PCell's DL slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ) as defined in clause 8.6.3A and be ready for the reception of uplink grant for the PCell no later than at the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ). The UE shall be continuously scheduled on Cell 1's BWP-1 and Cell 2's BWP-1 starting from the beginning of the DL slot right after slot ( $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{NR\ slot\ length}$ ).

$T_{RRCprocessingDelay}$ ,  $T_{BWPswitchDelayRRC}$  and  $D_{RRC}$  are defined in clause 8.6.3A.

The test equipment verifies the DL BWP switch time in Cell 1 and Cell 2 by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.7.5.6.5.1.1-1: DL BWP switch supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD -TDD duplex mode |

**Table A.7.5.6.5.1.1-2: General test parameters for DL BWP switch in SA**

| Parameter                    | Unit | Value   | Comment  |
|------------------------------|------|---------|--|
| NR RF Channel Number         |      | 1, 2, 3 | Three NR radio channels are used for this test                                     |
| Active PCell                 |      | Cell 1  | PCell on RF channel number 1.  |
| Active SCell                 |      | Cell 2  | SCell on RF channel number 2.  |
| CP length                    |      | Normal  |  |
| DRX                          |      | OFF     |  |
| Cell2 timing offset to Cell1 | μs   | 0       | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.                |
| T1                           | s    | [0.2]   | During T1, RRC-based simultaneous BWP switching of PCell and SCell is carried out. |

**Table A.7.5.6.5.1.1-3: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter   | Unit                          | Cell 1                        | Cell 2    |           |           |
|---|-------------------------------|-------------------------------|-----------|-----------|-----------|
| Frequency Range   |                               | FR2                           |           |           |           |
| NR RF channel   |                               | 1                             | 2         |           |           |
| Duplex mode   |                               | TDD                           |           |           |           |
| TDD configuration   |                               | TDDConf.3.1                   |           |           |           |
| BW <sub>channel</sub>   | MHz                           | 100: N <sub>RB,c</sub> = 66   |           |           |           |
| Active Downlink BWP ID  |                               | 0                             | 1         |           |           |
| Downlink initial BWP Configuration  |                               | DLBWP.0.2                     | DLBWP.0.2 |           |           |
| Uplink initial BWP Configuration  |                               | ULBWP.0.2                     | ULBWP.0.2 |           |           |
| Initial Condition   | Active DL BWP-1 Configuration |                               | DLBWP.1.3 | DLBWP.1.3 |           |
|   | Active UL BWP-1 Configuration |                               | ULBWP.1.3 | ULBWP.1.3 |           |
|   | Final Condition               | Active DL BWP-1 Configuration |           | DLBWP.1.1 | DLBWP.1.1 |
|   |                               | Active UL BWP-1 Configuration |           | ULBWP.1.1 | ULBWP.1.1 |
| PDSCH Reference measurement channel   |                               | SR.3.1 TDD                    |           |           |           |
| TRS configuration   |                               | TRS.2.1 TDD                   |           |           |           |
| TCI state   |                               | TCI.State.0                   |           |           |           |
| RMSI CORESET parameters   |                               | CR.3.1 TDD                    |           |           |           |
| Dedicated CORESET parameters  |                               | CCR.3.1 TDD                   |           |           |           |
| OCNG Patterns   |                               | OP.1                          |           |           |           |
| SSB Configuration   |                               | SSB.3 FR2                     |           |           |           |
| SMTTC Configuration   |                               | SMTTC.1                       |           |           |           |
| EPRE ratio of PSS to SSS  | dB                            | 0                             | 0         |           |           |
| EPRE ratio of PBCH DMRS to SSS  |                               |                               |           |           |           |
| EPRE ratio of PBCH to PBCH DMRS   |                               |                               |           |           |           |
| EPRE ratio of PDCCH DMRS to SSS   |                               |                               |           |           |           |
| EPRE ratio of PDCCH to PDCCH DMRS   |                               |                               |           |           |           |
| EPRE ratio of PDSCH DMRS to SSS   |                               |                               |           |           |           |
| EPRE ratio of PDSCH to PDSCH  |                               |                               |           |           |           |
| EPRE ratio of OCNG DMRS to SSS <small>Note1</small>   |                               |                               |           |           |           |
| EPRE ratio of OCNG to OCNG DMRS <small>Note1</small>  |                               |                               |           |           |           |
| Propagation Condition   |                               |                               |           | AWGN      | AWGN      |
| Correlation Matrix and Antenna Configuration  |                               | 1x2 Low                       | 1x2 Low   |           |           |
| <p>Note 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |                               |                               |           |           |           |

**Table A.7.5.6.3.1.1-4: OTA related test parameters for BWP switching test case**

| Parameter                                | Unit   | Cell 1                             | Cell 2   |
|--|--|------------------------------------|----------|
| Angle of arrival configuration           |  | Setup 1 defined in clause A.3.15.1 |          |
| Assumption for UE beams <sup>Note4</sup> |  | Fine                               | Fine     |
| $N_{oc}$ <sup>Note1</sup>                | dBm/15kHz  | [-111.7]                           | [-111.7] |
| $N_{oc}$ <sup>Note1</sup>                | dBm/SCS  | [-102.7]                           | [-102.7] |
| $\hat{E}_s/N_{oc}$                       | dB   | [7]                                | [7]      |
| SSB-RP <sup>Note2</sup>                  | dBm/SCS  | [-85]                              | [-85]    |
| $\hat{E}_s/I_{ot}$                       | dB   | [18]                               | [18]     |
| $I_o$ <sup>Note3</sup>                   | dBm/95.04 MHz  | [-56]                              | [-56]    |
| Note 1:                                  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                    |          |
| Note 2:                                  | SSB-RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                                    |          |
| Note 3:                                  | Equivalent power received by an antenna with 0 dBi gain at the center of the quiet zone  |                                    |          |
| Note 4:                                  | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |                                    |          |

#### A.7.5.6.5.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell and SCell in the beginning of the DL slot right after slot ( $i + \frac{T_{RRC\ processing\ Delay} + T_{BWP\ switch\ Delay\ RRC} + D_{RRC}}{NR\ slot\ length}$ ).

All of the above test requirements shall be fulfilled in order for the observed PCell and SCell active BWP switch delay to be counted as correct.

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

### A.7.5.7 PSCell addition and release delay

#### A.7.5.7.1 Addition and Release Delay of known NR PSCell

##### A.7.5.7.1.1 Test Purpose and Environment

The purpose of this test is to verify the PSCell addition and release delay requirements defined in clauses 8.9.2 and 8.9.3, respectively, for the case where the PSCell is known to the UE at the time of addition.

The supported test configurations are given in Table A.7.5.7.1.1-1. The test scenario comprises two NR cells, Cell 1 and Cell 2, on radio channel 1 in FR1 and radio channel 2 in FR2, respectively. Test parameters are given in Tables A.7.5.7.1.1-2, A.7.5.7.1.1-3 and A.7.5.7.1.1-4 below. The test consists of five time periods with durations T1, T2, T3, T4 and T5, respectively.

At the start of T1, the UE shall be connected to Cell 1 (PCell) on radio channel 1 (PCC) and shall only monitor PCC and hence be unaware of Cell 2 (PSCell-to-be) on radio channel 2. Before the start of T2, the test system shall send measurement control information including measurement gap configuration and event-triggered reporting configuration for measurements on radio channel 2.

During T2, the UE shall identify Cell 2 and send an event-triggered report. When the test system receives the report, it shall send updated measurement control information where the measurement gap pattern is released. Before the start of T3, the test system shall send a RRC message instructing the UE to add PSCell (Cell 2), and further instructing the UE

to report CSI periodically in the PSCell once it has been added. Reception by the UE of this RRC message defines the start of T3.

During T3, the UE shall carry out random access towards the PSCell. Reception by the test system of the PRACH preamble defines the start of T4.

During T4, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send a RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines the start of T5.

During T5, the UE shall release the PSCell.

**Table A.7.5.7.1.1-1: Supported test configurations for FR2 PSCell**

| Config | Description   |
|--------|---|
| 1      | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2      | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3      | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.7.5.7.1.1-2: General test parameters for PSCell addition and release delay**

| Parameter   | Unit            | Value                     | Comment  |                              |
|---|-----------------|---------------------------|--|------------------------------|
| RF Channel Number   |                 | 1, 2                      | Two radio channels are used for this test                                    |                              |
| Active PCell  |                 | Cell 1                    | PCell on RF channel number 1 in FR1  |                              |
| Neighbour cell  |                 | Cell 2                    | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2                  |                              |
| A4  | Hysteresis      | dB                        | 0  | Hysteresis for event A4      |
|   | Threshold RSRP  | dBm                       | -118   | Threshold for event A4       |
|   | Time to Trigger | S                         | 0  | Time to trigger for event A4 |
| DRX   |                 | OFF                       | For both PCell and PSCell once activated                                     |                              |
| Measurement gap pattern ID                                    |                 | 0                         | Gaps are configured before T2 and released before T3.                        |                              |
| PRACH configuration in Cell 2                                 |                 | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2.                        |                              |
| CSI reporting periodicity and offset configuration for Cell 2 | ms              | 2                         |  |                              |
| T1  | s               | 5                         | During this time the PCell is known and Cell 2 is unknown.                   |                              |
| T2  | s               | 1                         | During this time the UE shall identify neighbour cell 2 and report event B1. |                              |
| T3  | s               | 1                         | During this time the UE adds the PSCell.                                     |                              |
| T4  | s               | 1                         | During this time the UE sends CSI reports for PSCell.                        |                              |
| T5  | s               | 1                         | During this time the UE releases the PSCell.                                 |                              |

**Table A.7.5.7.1.1-3: NR Cell specific test parameters for PSCell addition and release delay**

| Parameter  | Unit | Config | Cell 1                      | Cell2                       |    |    |    |    |
|--|------|--------|-----------------------------|-----------------------------|----|----|----|----|
|  |      |        |                             | T1                          | T2 | T3 | T4 | T5 |
| Frequency Range  |      | 1,2,3  | FR1                         | FR2                         |    |    |    |    |
| Duplex mode  |      | 1      | FDD                         | TDD                         |    |    |    |    |
|  |      | 2,3    | TDD                         |                             |    |    |    |    |
| TDD configuration  |      | 1      | –                           | TDDConf.3.1                 |    |    |    |    |
|  |      | 2      | TDDConf.1.1                 |                             |    |    |    |    |
|  |      | 3      | TDDConf.2.1                 |                             |    |    |    |    |
| BW <sub>channel</sub>  | MHz  | 1,2    | 10: N <sub>RB,c</sub> = 52  | 100: N <sub>RB,c</sub> = 66 |    |    |    |    |
|  |      | 3      | 40: N <sub>RB,c</sub> = 106 |                             |    |    |    |    |
| Data RBs allocated   |      | 1,2    | 52                          | 48                          |    |    |    |    |
|  |      | 3      | 106                         |                             |    |    |    |    |
| Initial Downlink BWP configuration   |      | 1,2,3  | DLBWP.0.1                   | DLBWP.0.1                   |    |    |    |    |
| Initial Uplink BWP configuration   |      | 1,2,3  | ULBWP.0.1                   | ULBWP.0.1                   |    |    |    |    |
| Dedicated Downlink BWP configuration   |      | 1,2,3  | DLBWP.1.1                   | DLBWP.1.1                   |    |    |    |    |
| Dedicated Uplink BWP configuration   |      | 1,2,3  | ULBWP.1.1                   | ULBWP.1.1                   |    |    |    |    |
| PDSCH Reference Measurement Channel  |      | 1      | SR.1.1 FDD                  | SR.3.3 TDD                  |    |    |    |    |
|  |      | 2      | SR.1.1 TDD                  |                             |    |    |    |    |
|  |      | 3      | SR.2.1 TDD                  |                             |    |    |    |    |
| TRS configuration  |      | 1,2,3  | –                           | TRS.2.1 TDD                 |    |    |    |    |
| TCI state  |      | 1,2,3  | –                           | TCI.State.0                 |    |    |    |    |
| RMSI CORESET parameters  |      | 1      | CR.1.1 FDD                  | CR.3.2 TDD                  |    |    |    |    |
|  |      | 2      | CR.1.1 TDD                  |                             |    |    |    |    |
|  |      | 3      | CR.2.1 TDD                  |                             |    |    |    |    |
| Dedicated CORESET parameters   |      | 1      | CCR.1.1 FDD                 | CCR.3.7 TDD                 |    |    |    |    |
|  |      | 2      | CCR.1.1 TDD                 |                             |    |    |    |    |
|  |      | 3      | CCR.2.1 TDD                 |                             |    |    |    |    |
| OCNG Patterns <sup>Note1</sup>   |      | 1,2,3  | OP.1                        | OP.3                        |    |    |    |    |
| SSB configuration  |      | 1,2    | SSB.1 FR1                   | SSB.2 FR2                   |    |    |    |    |
|  |      | 3      | SSB.2 FR1                   |                             |    |    |    |    |
| SMTC configuration   |      | 1,2,3  | SMTC.2                      | SMTC.1                      |    |    |    |    |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 1,2    | 15                          | 120                         |    |    |    |    |
|  |      | 3      | 30                          |                             |    |    |    |    |
| EPRE ratio of PSS to SSS   | dB   | 1,2,3  | 0                           | 0                           |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS   |      |        |                             |                             |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS  |      |        |                             |                             |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS  |      |        |                             |                             |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |        |                             |                             |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS  |      |        |                             |                             |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH   |      |        |                             |                             |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS   |      |        |                             |                             |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS  |      |        |                             |                             |    |    |    |    |
| Propagation Condition  |      | 1,2,3  | N/A                         | AWGN                        |    |    |    |    |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: Void |      |        |                             |                             |    |    |    |    |

**Table A.7.5.7.1.1-4: OTA related test parameters for PSCell addition and release delay**

| Parameter | Unit | Config | Cell 1 | Cell 2 |    |    |    |    |
|-----------|------|--------|--------|--------|----|----|----|----|
|           |      |        |        | T1     | T2 | T3 | T4 | T5 |

|   |                  |       |                                    |  |      |
|---|------------------|-------|------------------------------------|--|------|
| Angle of arrival configuration  |                  | 1,2,3 | Link only,<br>see clause<br>A.3.7A | Setup 2a according to clause<br>A.3.15.2.1 |      |
| Assumption for UE beams <sup>Note 3</sup>   |                  |       |                                    | Rough                                      |      |
| $\hat{E}_s$   | dBm/SCS          | 1,2,3 |                                    | $-\infty$                                  | -81  |
| SSB_RP <sup>Note1, Note2</sup>  | dBm/SCS          | 1,2,3 |                                    | $-\infty$                                  | -81  |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note1, Note 4</sup>   | dB               | 1,2,3 |                                    | $-\infty$                                  | 4.88 |
| $I_o$ <sup>Note 1, Note2</sup>  | dBm/95.04<br>MHz | 1,2,3 | N/A                                | -56.41                                     |      |
| <p>Note 1: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 4: Calculation of <math>E_s/I_{ot\_BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_S</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                  |       |                                    |  |      |

### A.7.5.7.1.2 Test Requirements

The UE shall transmit the PRACH preamble to PSCell at latest 112 ms into T3.

The UE shall transmit at least one periodic CSI report for PSCell during T4.

The UE shall stop transmitting CSI reports for PSCell at latest 20 ms into T5.

All of the above test requirements shall be fulfilled in order for the observed PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

## A.7.5.7.2 Addition and Release Delay of unknown NR PSCell

### A.7.5.7.2.1 Test Purpose and Environment

The purpose of this test is to verify the PSCell addition and release delay requirements defined in clauses 8.9.2 and 8.9.3, respectively, for the case where the PSCell is unknown to the UE at the time of addition.

The supported test configurations are given in Table A.7.5.7.2.1-1. The test scenario comprises two NR cells, Cell 1 and Cell 2, on radio channel 1 in FR1 and radio channel 2 in FR2, respectively. Test parameters are given in Tables A.7.5.7.2.1-2, A.7.5.7.2.1-3 and A.7.5.7.2.1-4 below. The test consists of four time periods with durations T1, T2, T3 and T4, respectively.

At the start of T1, the UE shall be connected to Cell 1 (PCell) on radio channel 1 (PCC) and shall only monitor PCC and hence be unaware of Cell 2 (PSCell-to-be) on radio channel 2. At the end of T1, the test system shall send a RRC message instructing the UE to add PSCell (Cell 2), and further instructing the UE to report CSI periodically in the PSCell once it has been added. Reception by the UE of this RRC message defines the start of T2.

During T2, the UE shall identify PSCell and carry out random access towards the PSCell. Reception by the test system of the PRACH preamble defines the start of T3.

During T3, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send a RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines the start of T4.

During T4, the UE shall release the PSCell.

**Table A.7.5.7.2.1-1: Supported test configurations for FR2 PSCell**

| Config   | Description   |
|--|---|
| 1  | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2  | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3  | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.7.5.7.2.1-2: General test parameters for PSCell addition and release delay**

| Parameter   | Unit | Value                     | Comment   |
|---|------|---------------------------|---|
| RF Channel Number   |      | 1, 2                      | Two radio channels are used for this test                   |
| Active PCell  |      | Cell 1                    | PCell on RF channel number 1 in FR1                         |
| Neighbour cell  |      | Cell 2                    | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| DRX   |      | OFF                       | For both PCell and PSCell once activated                    |
| PRACH configuration in Cell 2                                 |      | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2.       |
| CSI reporting periodicity and offset configuration for Cell 2 | ms   | [2]                       |   |
| T1  | s    | 5                         | During this time the PCell is known and Cell 2 is unknown.  |
| T2  | s    | 1                         | During this time the UE adds the PSCell.                    |
| T3  | s    | 1                         | During this time the UE sends CSI reports for PSCell.       |
| T4  | s    | 1                         | During this time the UE releases the PSCell.                |



Table A.7.5.7.2.1-3: NR Cell specific test parameters for PSCell addition and release delay

| Parameter  | Unit | Config | Cell 1                      | Cell2                       |    |    |    |
|--|------|--------|-----------------------------|-----------------------------|----|----|----|
|  |      |        |                             | T1                          | T2 | T3 | T4 |
| Frequency Range  |      | 1,2,3  | FR1                         | FR2                         |    |    |    |
| Duplex mode  |      | 1      | FDD                         | TDD                         |    |    |    |
|  |      | 2,3    | TDD                         |                             |    |    |    |
| TDD configuration  |      | 1      | –                           | TDDConf.3.1                 |    |    |    |
|  |      | 2      | TDDConf.1.1                 |                             |    |    |    |
|  |      | 3      | TDDConf.2.1                 |                             |    |    |    |
| BW <sub>channel</sub>  | MHz  | 1,2    | 10: N <sub>RB,c</sub> = 52  | 100: N <sub>RB,c</sub> = 66 |    |    |    |
|  |      | 3      | 40: N <sub>RB,c</sub> = 106 |                             |    |    |    |
| Data RBs allocated   |      | 1,2    | 52                          | 48                          |    |    |    |
|  |      | 3      | 106                         |                             |    |    |    |
| Initial Downlink BWP configuration   |      | 1,2,3  | DLBWP.0.1                   | DLBWP.0.1                   |    |    |    |
| Initial Uplink BWP configuration   |      | 1,2,3  | ULBWP.0.1                   | ULBWP.0.1                   |    |    |    |
| Dedicated Downlink BWP configuration   |      | 1,2,3  | DLBWP.1.1                   | DLBWP.1.1                   |    |    |    |
| Dedicated Uplink BWP configuration   |      | 1,2,3  | ULBWP.1.1                   | ULBWP.1.1                   |    |    |    |
| PDSCH Reference Measurement Channel  |      | 1      | SR.1.1 FDD                  | SR.3.3 TDD                  |    |    |    |
|  |      | 2      | SR.1.1 TDD                  |                             |    |    |    |
|  |      | 3      | SR.2.1 TDD                  |                             |    |    |    |
| TRS configuration  |      | 1,2,3  | –                           | TRS.2.1 TDD                 |    |    |    |
| TCI state  |      | 1,2,3  | –                           | TCI.State.0                 |    |    |    |
| RMSI CORESET parameters  |      | 1      | CR.1.1 FDD                  | CR.3.2 TDD                  |    |    |    |
|  |      | 2      | CR.1.1 TDD                  |                             |    |    |    |
|  |      | 3      | CR.2.1 TDD                  |                             |    |    |    |
| Dedicated CORESET parameters   |      | 1      | CCR.1.1 FDD                 | CCR.3.7 TDD                 |    |    |    |
|  |      | 2      | CCR.1.1 TDD                 |                             |    |    |    |
|  |      | 3      | CCR.2.1 TDD                 |                             |    |    |    |
| OCNG Patterns <sup>Note1</sup>   |      | 1,2,3  | OP.1                        | OP.3                        |    |    |    |
| SSB configuration  |      | 1,2    | SSB.1 FR1                   | SSB.2 FR2                   |    |    |    |
|  |      | 3      | SSB.2 FR1                   |                             |    |    |    |
| SMTC configuration   |      | 1,2,3  | SMTC.2                      | SMTC.1                      |    |    |    |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 1,2    | 15                          | 120                         |    |    |    |
|  |      | 3      | 30                          |                             |    |    |    |
| EPRE ratio of PSS to SSS   | dB   | 1,2,3  | 0                           | 0                           |    |    |    |
| EPRE ratio of PBCH DMRS to SSS   |      |        |                             |                             |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS  |      |        |                             |                             |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS  |      |        |                             |                             |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |        |                             |                             |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS  |      |        |                             |                             |    |    |    |
| EPRE ratio of PDSCH to PDSCH   |      |        |                             |                             |    |    |    |
| EPRE ratio of OCNG DMRS to SSS   |      |        |                             |                             |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS  |      |        |                             |                             |    |    |    |
| Propagation Condition  |      | 1,2,3  | AWGN                        | AWGN                        |    |    |    |
| Note 1: OCNG shall be used such that and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |        |                             |                             |    |    |    |
| Note 2: Void   |      |        |                             |                             |    |    |    |
| Note 3: Void   |      |        |                             |                             |    |    |    |
| Note 4: Void   |      |        |                             |                             |    |    |    |
| Note 5: Void   |      |        |                             |                             |    |    |    |

Table A.7.5.7.2.1-4: OTA related test parameters for PSCell addition and release delay

| Parameter | Unit | Config | Cell 1 | Cell 2 |    |    |    |
|-----------|------|--------|--------|--------|----|----|----|
|           |      |        |        | T1     | T2 | T3 | T4 |

|   |                  |       |                                    |  |      |
|---|------------------|-------|------------------------------------|--|------|
| Angle of arrival configuration  |                  | 1,2,3 | Link only,<br>see clause<br>A.3.7A | Setup 2a according to clause<br>A.3.15.2.1 |      |
| Assumption for UE beams <sup>Note 3</sup>   |                  |       |                                    | Rough                                      |      |
| $\hat{E}_s$   | dBm/SCS          | 1,2,3 |                                    | $-\infty$                                  | -81  |
| SSB_RP <sup>Note1, Note 2</sup>   | dBm/SCS          | 1,2,3 |                                    | $-\infty$                                  | -81  |
| $\hat{E}_s / I_{ot\ BB}$ <sup>Note1, Note 4</sup>   | dB               | 1,2,3 |                                    | $-\infty$                                  | 4.88 |
| $I_o$ <sup>Note 1, Note 2</sup>   | dBm/95.04<br>MHz | 1,2,3 | N/A                                | -56.41                                     |      |
| <p>Note 1: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 4: Calculation of <math>E_s/I_{ot\ BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_S</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                  |       |                                    |  |      |

### A.7.5.7.2.2 Test Requirements

The UE shall transmit the PRACH preamble to PSCell at latest 572 ms into T2.

The UE shall transmit at least one periodic CSI report for PSCell during T3.

The UE shall stop transmitting CSI reports for PSCell at latest 20 ms into T4.

All of the above test requirements shall be fulfilled in order for the observed PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

## A.7.5.8 Active TCI state switch delay

### A.7.5.8.1 MAC-CE based active TCI state switch

#### A.7.5.8.1.1 NR PCell FR2 active TCI state switch for a known TCI state

##### A.7.5.8.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3. Supported test configuration is shown in Table A.7.5.8.1.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.7.5.8.1.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.7.5.8.1.1.1-3 below. The OTA related test parameters for FR2 are shown in Table A.7.5.8.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL'd to SSB0) and TCIstate 1 (QCL'd to SSB1), in Cell 1 before starting the test.
- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. Figure A.7.5.8.1.1.1-1 and Figure A.7.5.8.1.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a

switch to TCI state 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PCell on TCI state 0 till  $n + T_{\text{HARQ}} + 3$  ms. The test equipment also verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after  $n + T_{\text{HARQ}} + 3$  ms + ( $T_{\text{first-SSB}} + T_{\text{SSB-proc}}$ ).

**Table A.7.5.8.1.1-1: Supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.5.8.1.1-2: General test parameters for TCI state switch**

| Parameter            | Unit | Value  | Comment                                    |
|----------------------|------|--------|--|
| NR RF Channel Number |      | 1      | One NR radio channel is used for this test |
| Active PCell         |      | Cell 1 | PCell on RF channel number 1.              |
| CP length            |      | Normal |  |
| DRX                  |      | OFF    |  |
| T1                   | s    | 0.2    |  |
| T2                   | s    | 0.2    |  |

**Table A.7.5.8.1.1-3: NR Cell specific test parameters for TCI state switch**

| Parameter  | Unit | Cell 1                          |
|--|------|---------------------------------|
| Frequency Range  |      | FR2                             |
| Duplex mode  |      | TDD                             |
| TDD configuration  |      | TDDConf.3.1                     |
| $BW_{\text{channel}}$  |      | 100 MHz: $N_{\text{RB,c}} = 66$ |
| Data RBs allocated   |      | 66                              |
| Initial DL BWP Configuration   |      | DLBWP.0.2                       |
| Dedicated DL BWP Configuration   |      | DLBWP.1.1                       |
| Initial UL BWP Configuration   |      | ULBWP.0.2                       |
| Dedicated UL BWP Configuration   |      | ULBWP.1.1                       |
| PDSCH Reference measurement channel  |      | SR.3.2 TDD                      |
| RMSI CORESET parameters  |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters   |      | CCR.3.1 TDD                     |
| OCNG Patterns  |      | OP.5                            |
| SSB Configuration  |      | SSB.1 FR2                       |
| SMTC Configuration   |      | SMTC.1                          |
| TCI State 0  |      | TCI.State.0                     |
| TCI State 1  |      | TCI.State.1                     |
| TRS Configuration  |      | TRS.2.1 TDD                     |
| Correlation Matrix and Antenna Configuration   |      | 1x2 Low                         |
| EPRE ratio of PSS to SSS   | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS   |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS  |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS  |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS  |      |                                 |
| EPRE ratio of PDSCH to PDSCH   |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |      |                                 |
| Propagation Condition  |      | AWGN                            |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                 |

Table A.7.5.8.1.1-4: OTA related test parameters for TCI state switch

| Parameter   | Unit                            | Cell 1                               |       |           |       |
|---|---------------------------------|--------------------------------------|-------|-----------|-------|
|   |                                 | SSB0                                 |       | SSB1      |       |
|   |                                 | T1                                   | T2    | T1        | T2    |
| Angle of arrival configuration  |                                 | Setup 3 according to clause A.3.15.3 |       |           |       |
| Assumption for UE beams <sup>Note 6</sup>   |                                 | Rough                                |       |           |       |
| $\hat{E}_s$   | dBm/SCS                         | -80.6                                | -80.6 | -Infinity | -80.6 |
| SSB_RP <sup>Note 2</sup>  | dBm/ SCS                        | -80.6                                | -80.6 | -Infinity | -80.6 |
| $\hat{E}_v/I_{ot, BB}$ <sup>Note 7</sup>  | dB                              | 8.3                                  | 8.3   | -Infinity | 8.3   |
| $I_o$ <sup>Note 2</sup>   | dBm/95.04 MHz <sup>Note 4</sup> | -56.0                                | -56.0 | -Infinity | -56.0 |
| <p>Note 1: Void</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 7: Calculation of <math>E_s/I_{ot, BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                                 |                                      |       |           |       |

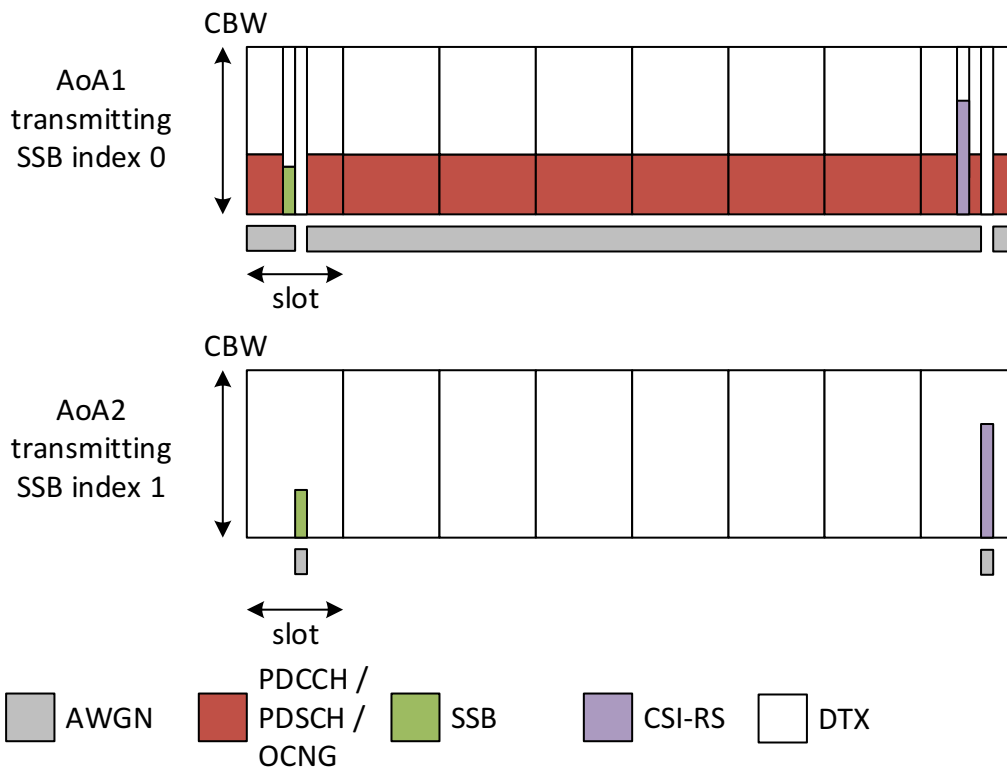
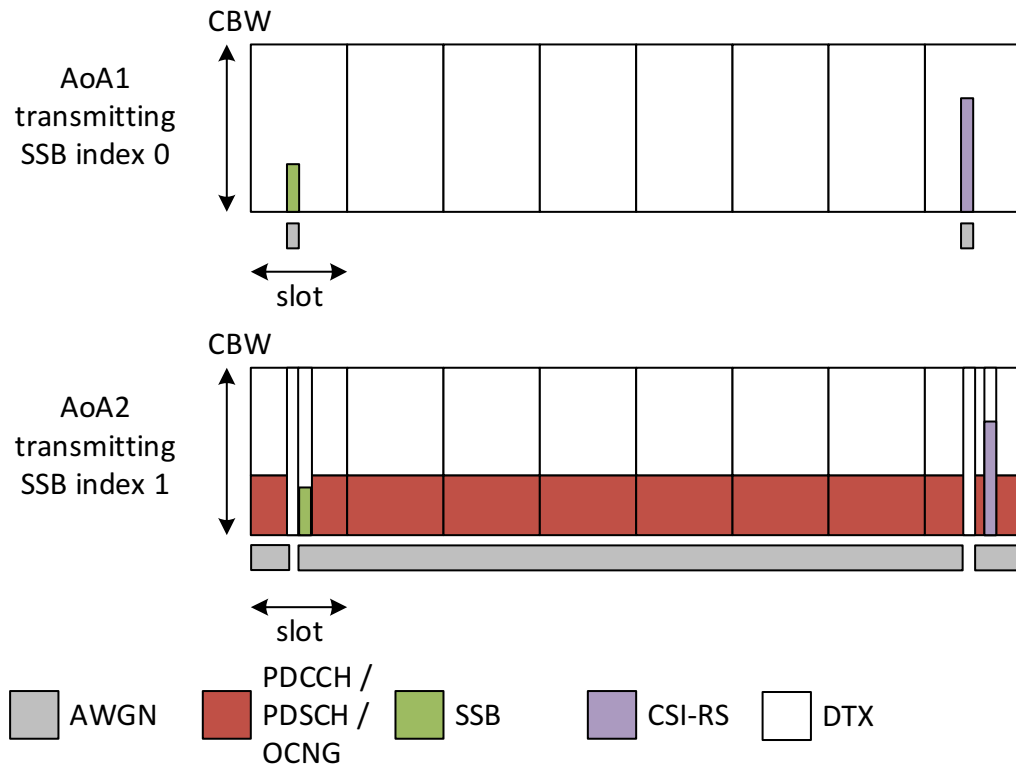


Figure A.7.5.8.1.1-1: Time multiplexed downlink transmissions during T1



**Figure A.7.5.8.1.1-2: Time multiplexed downlink transmissions during T2**

**A.7.5.8.1.1.2 Test Requirements**

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till  $n + T_{HARQ} + 3 \text{ ms}$
- be able to start receiving on TCI state 1 after  $n + T_{HARQ} + 5 \text{ ms} + T_{\text{first-SSB}}$

**A.7.5.8.2 RRC based active TCI state switch**

**A.7.5.8.2.1 NR PCell FR2 active TCI state switch for a known TCI state**

**A.7.5.8.2.1.1 Test Purpose and Environment**

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3. Supported test configuration is shown in Table A.7.5.8.2.1.1-1.

The test scenario comprises of one NR PCell as given in Table A.7.5.8.2.1.1-2. Cell-specific parameters of NR PCell is specified in Table A.7.5.8.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.8.2.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 1 TCI state for PCell, PDCCH-TCI-state0 (QCL'd to SSB0)
- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. Figure A.7.5.8.2.1.1-1 and Figure A.7.5.8.2.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI-state1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after  $n + T_{\text{RRC\_processing}} + T_{\text{first-SSB}} + 2\text{ms}$ .

**Table A.7.5.8.2.1.1-1: Supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.5.8.2.1.1-2: General test parameters for TCI state switch**

| Parameter            | Unit | Value  | Comment                                    |
|----------------------|------|--------|--|
| NR RF Channel Number |      | 1      | One NR radio channel is used for this test |
| Active PCell         |      | Cell 1 | PCell on RF channel number 1.              |
| CP length            |      | Normal |  |
| DRX                  |      | OFF    |  |
| T1                   | s    | 0.2    |  |
| T2                   | s    | 2      |  |

**Table A.7.5.8.2.1.1-3: NR Cell specific test parameters for TCI state switch**

| Parameter  | Unit | Cell 1                          |
|--|------|---------------------------------|
| Frequency Range  |      | FR2                             |
| Duplex mode  |      | TDD                             |
| TDD configuration  |      | TDDConf.3.1                     |
| BW <sub>channel</sub>  |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   |      | 66                              |
| Initial DL BWP Configuration   |      | DLBWP.0.2                       |
| Dedicated DL BWP Configuration   |      | DLBWP.1.1                       |
| Initial UL BWP Configuration   |      | ULBWP.0.2                       |
| Dedicated UL BWP Configuration   |      | ULBWP.1.1                       |
| PDSCH Reference measurement channel  |      | SR.3.2 TDD                      |
| RMSI CORESET parameters  |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters   |      | CCR.3.1 TDD                     |
| OCNG Patterns  |      | OP.5                            |
| SSB Configuration  |      | SSB.1 FR2                       |
| SMTc Configuration   |      | SMTc.1                          |
| TCI State 0  |      | TCI.State.0                     |
| TCI State 1  |      | TCI.State.1                     |
| reportConfigType   |      | ssb-Index-RSRP                  |
| reportConfigType   |      | periodic                        |
| Number of reported RS  |      | 2                               |
| L1-RSRP reporting period   | slot | 640                             |
| timeRestrictionForChannelMeasurements  |      | configured                      |
| TRS Configuration  |      | TRS.2.1 TDD                     |
| Correlation Matrix and Antenna Configuration   |      | 1x2 Low                         |
| EPRE ratio of PSS to SSS   | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS   |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS  |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS  |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS  |      |                                 |
| EPRE ratio of PDSCH to PDSCH   |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |      |                                 |
| Propagation Condition  |      | AWGN                            |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                 |

Table A.7.5.8.2.1.1-4: OTA related test parameters for TCI state switch

| Parameter   | Unit                            | Cell 1                               |       |           |       |
|---|---------------------------------|--------------------------------------|-------|-----------|-------|
|   |                                 | SSB0                                 |       | SSB1      |       |
|   |                                 | T1                                   | T2    | T1        | T2    |
| Angle of arrival configuration  |                                 | Setup 3 according to clause A.3.15.3 |       |           |       |
| Assumption for UE beams <sup>Note 6</sup>   |                                 | Rough                                |       |           |       |
| $\hat{E}_s$   | dBm/SCS                         | -80.6                                | -80.6 | -Infinity | -80.6 |
| SSB_RP <sup>Note 2</sup>  | dBm/ SCS                        | -80.6                                | -80.6 | -Infinity | -80.6 |
| $\hat{E}_s/I_{ot, BB}$ <sup>Note 7</sup>  | dB                              | 8.3                                  | 8.3   | -Infinity | 8.3   |
| $I_o$ <sup>Note 2</sup>   | dBm/95.04 MHz <sup>Note 4</sup> | -56.0                                | -56.0 | -Infinity | -56.0 |
| <p>Note 1: Void</p> <p>Note 2: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> <p>Note 7: Calculation of <math>E_s/I_{ot, BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                                 |                                      |       |           |       |

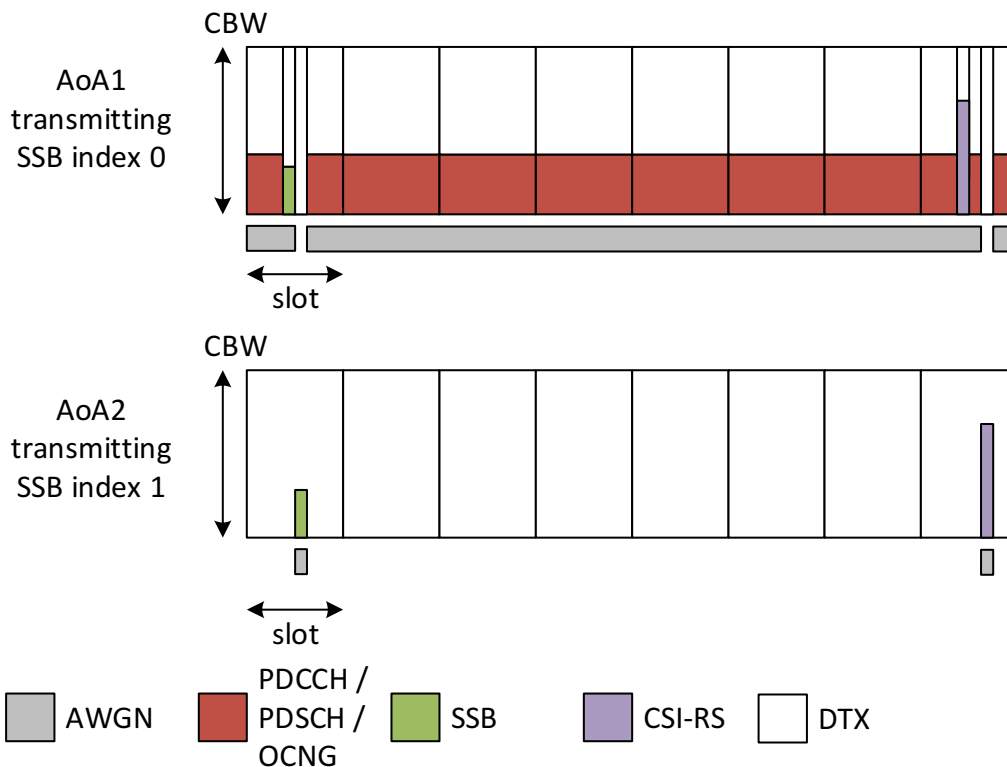
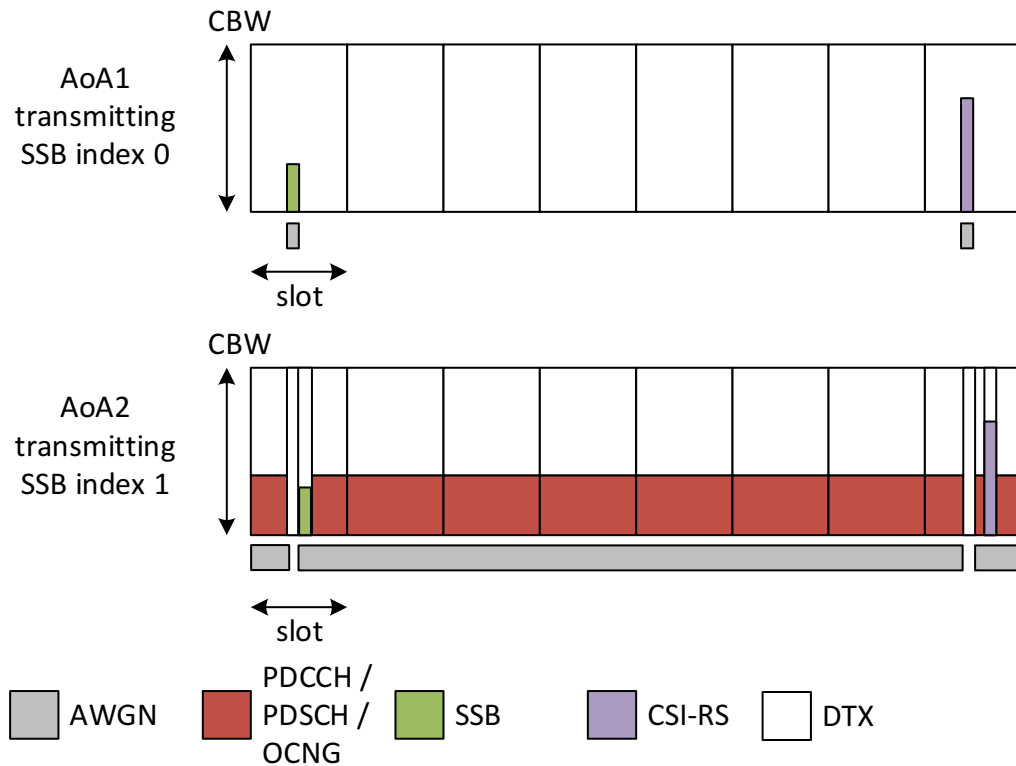


Figure A.7.5.8.2.1.1-1: Time multiplexed downlink transmissions during T1





**Figure A.7.5.8.2.1.1-2: Time multiplexed downlink transmissions during T2**

**A.7.5.8.2.1.2 Test Requirements**

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot  $n$ , UE shall be able to start receiving on TCI state 1 after  $n + T_{RRC\_processing} + T_{first-SSB} + 2ms$ .

**A.7.5.9 Uplink spatial relation switch delay**

**A.7.5.9.1 MAC-CE based Spatial Relation switch**

**A.7.5.9.1.1 NR PCell FR2 spatial relation associated with known DL-RS**

**A.7.5.9.1.1.1 Test Purpose and Environment**

The purpose of this test is to verify fulfillment of the uplink spatial relation switch delay requirement defined in clause 8.12.3 by a UE capable of beam correspondence without the need for UL beam sweeping. The supported test configurations are shown in Table A.7.5.9.1.1.1-1.

The test scenario comprises one PCell (Cell 1) as outlined in Table A.7.5.9.1.1.1-2. Cell-specific parameters are provided in Table A.7.5.9.1.1.1-3. OTA-related test parameters are provided in Table A.7.5.9.1.1.1-4.

Throughout the test, PDCCH indicating new transmissions shall be sent continuously on PCell to ensure that the UE will send ACK/NACKs on PUCCH.

Before the test starts,

UE is connected to Cell 1 on radio channel 1.

UE is configured with a single TCI state, TCI State-0, which is QCLed with SSB0.

UE is configured with two spatial relation information configurations Spatial Relation Info-0 and Spatial Relation Info-1 for PUCCH, each associated with SSB0 and SSB1, respectively.

UE is indicated via MAC-CE activation of *PUCCH-SpatialRelationInfoId* corresponding to Spatial Relation Info-0

UE is configured with a CSI measurement configuration indicating L1-RSRP measurements on SSB0 and SSB1 with periodic reporting. The L1-RSRP measurement period is influenced by the following: the higher layer parameter *timeRestrictionForChannelMeasurement* is configured, measured SSBs are fully overlapping with SMTC window, and there are no conflicts with measurement gaps.

The test consists of two time periods, T1 and T2. During T1 only the SSB associated with PDCCH TCI state-0 and PUCCH Spatial Relation Info-0 is transmitted. At the beginning of T2, transmission of the SSB associated with PUCCH Spatial Relation Info-1 starts. The UE conducts periodic L1-RSRP measurements and *SSB-Index-RSRP* reporting for SSB0 and SSB1. In slot  $n$ , which is within 1280ms after UE receiving both SSB0 and SSB1, and after reporting valid results for both the SSB0 and the SSB1, the UE receives a MAC-CE indicating a switch of spatial relation to PUCCH Spatial Relation Info 1

The test equipment verifies that the UE transmits according to PUCCH Spatial Relation Info 0 up until slot  $n + T_{\text{HARQ}}/\text{NR slot length} + 3N_{\text{slot}}^{\text{subframe},\mu}$ , and according to PUCCH Spatial Relation Info 1 from slot  $n + T_{\text{HARQ}}/\text{NR slot length} + 3N_{\text{slot}}^{\text{subframe},\mu} + 1$  and onwards.

**Table A.7.5.9.1.1-1: Supported test configurations**

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.5.9.1.1-2: General test parameters**

| Parameter                | Unit | Value      | Comment   |
|--------------------------|------|------------|---|
| NR RF Channel Number     |      | 1          | One NR radio channel is used for this test          |
| Active PCell             |      | Cell 1     | PCell on RF channel number 1.                       |
| CP length                |      | Normal     |   |
| DRX                      |      | OFF        |   |
| L1-RSRP reporting period | slot | 160        | Periodic L1-RSRP reporting configured               |
| L1-RSRP measured RS      |      | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1.              |
| Number of reported RS    |      | 2          | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1                       | s    | [0.2]      |   |
| T2                       | s    | [2]        |   |

Table A.7.5.9.1.1.1-3: NR Cell specific test parameters

| Parameter  | Unit | Cell 1                   |
|--|------|--------------------------|
| Frequency Range  |      | FR2                      |
| Duplex mode  |      | TDD                      |
| TDD configuration  |      | TDDConf.3.1              |
| $BW_{\text{channel}}$  |      | 100 MHz: $N_{RB,c} = 66$ |
| Initial DL BWP Configuration   |      | DLBWP.0.2                |
| Dedicated DL BWP Configuration   |      | DLBWP.1.1                |
| Initial UL BWP Configuration   |      | ULBWP.0.2                |
| Dedicated UL BWP Configuration   |      | ULBWP.1.1                |
| PDSCH Reference measurement channel  |      | SR.3.1 TDD               |
| RMSI CORESET parameters  |      | CR.3.1 TDD               |
| Dedicated CORESET parameters   |      | CCR.3.1 TDD              |
| OCNG Patterns  |      | OP.1                     |
| SSB Configuration  |      | SSB.1 FR2                |
| SMTC Configuration   |      | SMTC.1                   |
| TCI State-0 Configuration  |      | TCI.State.0              |
| reportConfigType   |      | ssb-Index-RSRP           |
| reportConfigType   |      | periodic                 |
| timeRestrictionForChannelMeasurements  |      | configured               |
| TRS Configuration  |      | TRS.2.1 TDD              |
| Spatial Relation Info-0 Configuration  |      | PUCCH.SRI.0              |
| Spatial Relation Info-1 Configuration  |      | PUCCH.SRI.1              |
| Correlation Matrix and Antenna Configuration   |      | 1x2 Low                  |
| EPRE ratio of PSS to SSS   | dB   | 0                        |
| EPRE ratio of PBCH DMRS to SSS   |      |                          |
| EPRE ratio of PBCH to PBCH DMRS  |      |                          |
| EPRE ratio of PDCCH DMRS to SSS  |      |                          |
| EPRE ratio of PDCCH to PDCCH DMRS  |      |                          |
| EPRE ratio of PDSCH DMRS to SSS  |      |                          |
| EPRE ratio of PDSCH to PDSCH   |      |                          |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |      |                          |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |      |                          |
| Propagation Condition  |      | AWGN                     |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                          |

Table A.7.5.9.1.1.1-4: OTA related test parameters

| Parameter                                 | Unit   | Cell 1                               |    |           |       |
|---|--|--------------------------------------|----|-----------|-------|
|   |  | SSB0                                 |    | SSB1      |       |
|   |  | T1                                   | T2 | T1        | T2    |
| Angle of arrival configuration            |  | Setup 3 according to clause A.3.15.3 |    |           |       |
|   |  | AoA1                                 |    | AoA2      |       |
| Assumption for UE beams <sup>Note 6</sup> |  | Rough                                |    |           |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/15 kHz   | -92.1                                |    |           |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/SCS  | -83.1                                |    |           |       |
| $\bar{E}_s/N_{oc}$                        | dB   | 1                                    |    | -infinity | 1     |
| SS-RSRP <sup>Note 2</sup>                 | dBm/120 kHz <sup>Note 3</sup>  | -82.1                                |    | -infinity | -82.1 |
| $I_o$ <sup>Note 2</sup>                   | dBm/95.04 MHz <sup>Note 4</sup>  | -50.6                                |    | -54.1     | -50.6 |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                      |    |           |       |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |    |           |       |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                      |    |           |       |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                      |    |           |       |
| Note 5:                                   | As observed with 0dBi gain antenna at the center of the quiet zone.  |                                      |    |           |       |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.   |                                      |    |           |       |

#### A.7.5.9.1.1.2 Test Requirements

During T2, the UE shall send L1-RSRP report with results for SSB0 and SSB1.

After receiving MAC-CE command in slot  $n$ , the UE shall:

Continue transmitting using PUCCH spatial relation associated with SSB0 up to and including slot  $n + T_{HARQ}/NR$  slot length +  $3N_{slot}^{subframe,\mu}$

Start transmitting using PUCCH spatial relation associated with SSB1 from slot  $n + T_{HARQ}/NR$  slot length +  $3N_{slot}^{subframe,\mu} + 1$  and onwards.

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

#### A.7.5.9.2 RRC based spatial relation switch

##### A.7.5.9.2.1 NR PCell FR2 spatial relation switch associated with a known DL-RS

###### A.7.5.9.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the RRC based spatial relation switch delay requirement defined in clause 8.12.5 by a UE capable of beam correspondence without the need for UL beam sweeping. In the test the higher layer parameter *timeRestrictionForChannelMeasurements* is configured. Supported test configuration is shown in Table A.7.5.9.2.1.1-1.

The test scenario comprises of one PCell (Cell 1) as given in Table A.7.5.9.2.1.1-2. Cell-specific parameters of PCell is specified in Table A.7.5.9.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.9.2.1.1-4.

Periodic SRS is transmitted on PCell (Cell 1), and the SRS configuration is SRSCConf.1 given in Table A.5.4.1.1.1-3.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 1 SRS-SpatialRelation0 associated with SSB0.
- UE is indicated SRS-SpatialRelation0 as the active SRS spatial relation.

The test consists of two time periods, T1 and T2. During T1 only SSB0 to which SRS-SpatialRelation0 associated is transmitted. UE shall transmit periodic SRS with SRS-SpatialRelation0 on the UL of the PCell.

T2 start when the tester initiates transmission of SSB1 corresponding to SRS-SpatialRelation1. The UE is configured to transmit periodic L1-RSRP reports.

In slot n, which is within [1280]ms of UE providing the L1-RSRP report with results for both SSB0 and SSB1, the UE receives an RRC command indicating a switch to transmit periodic SRS with target SRS-SpatialRelation1. The UE shall be able to transmit periodic SRS with target spatial relation (SRS-SpatialRelation1) on PCell in slot  $n + T_{\text{RRC\_processing}}/\text{NR slot length} + 1$ .

**Table A.7.5.9.2.1.1-1: Supported test configurations**

| Config | Description   |
|--------|---|
| 1      | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.5.9.2.1.1-2: General test parameters for spatial relation switch associated with a known DL-RS**

| Parameter   | Unit | Value      | Comment  |
|---|------|------------|--|
| NR RF Channel Number                                    |      | 1          | One NR radio channel is used for this test   |
| Active PCell  |      | Cell 1     | PCell on RF channel number 1.  |
| CP length   |      | Normal     |  |
| DRX   |      | OFF        |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0          | Individual offset for cells on PCC.  |
| timeRestrictionForChannel Measurements                  |      | configured | Time domain measurement restriction for the channel (signal) measurements (see TS 38.214 [19], clause 5.2.1.1) |
| T1  | s    | 0.5        |  |
| T2  | s    | 1.5        |  |

**Table A.7.5.9.2.1.1-3: NR Cell specific test parameters for spatial relation switch associated with a known DL-RS**

| Parameter   | Unit | Cell 1                          |
|---|------|---------------------------------|
| Frequency Range   |      | FR2                             |
| Duplex mode   |      | TDD                             |
| TDD configuration   |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Initial DL BWP Configuration  |      | DLBWP.0.2                       |
| Dedicated DL BWP Configuration  |      | DLBWP.1.1                       |
| Initial UL BWP Configuration  |      | ULBWP.0.2                       |
| Dedicated UL BWP Configuration  |      | ULBWP.1.1                       |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |      | CCR.3.1 TDD                     |
| OCNG Patterns   |      | OP.1                            |
| SSB Configuration   |      | SSB.1 FR2                       |
| SMTC Configuration  |      | SMTC.1                          |
| SRS-SpatialRelation0  |      | SRS.SRI0                        |
| SRS-SpatialRelation1  |      | SRS.SRI1                        |
| reportConfigType  |      | ssb-Index-RSRP                  |
| reportConfigType  |      | periodic                        |
| Number of reported RS   |      | 2                               |
| L1-RSRP reporting period  | slot | 160                             |
| TRS Configuration   |      | TRS.2.1 TDD                     |
| Correlation Matrix and Antenna Configuration  |      | 1x2 Low                         |
| EPRE ratio of PSS to SSS  | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |      |                                 |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |      |                                 |
| Propagation Condition   |      |                                 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                 |

**Table A.7.5.9.2.1.1-4: OTA related test parameters for spatial relation switch associated with a known DL-RS**

| Parameter                                 | Unit   | Cell 1                               |       |           |       |
|---|--|--------------------------------------|-------|-----------|-------|
|   |  | SSB0                                 |       | SSB1      |       |
|   |  | T1                                   | T2    | T1        | T2    |
| Angle of arrival configuration            |  | Setup 3 according to clause A.3.15.3 |       |           |       |
|   |  | AoA1                                 |       | AoA2      |       |
| Assumption for UE beams <sup>Note 6</sup> |  | Rough                                |       | Rough     |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/15 kHz   | -92.1                                |       |           |       |
| $N_{oc}$ <sup>Note 1</sup>                | dBm/SCS  | -83.1                                |       |           |       |
| $\bar{E}_s/N_{oc}$                        | dB   | 1                                    | 1     | -Infinity | 1     |
| SS-RSRP <sup>Note 2</sup>                 | dBm/120 kHz <sup>Note 3</sup>  | -82.1                                | -82.1 | -Infinity | -82.1 |
| $I_o$ <sup>Note 2, Note 6</sup>           | dBm/95.04 MHz <sup>Note 4</sup>  | -50.6                                | -50.6 | -54.1     | -50.6 |
| Note 1:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                                      |       |           |       |
| Note 2:                                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |       |           |       |
| Note 3:                                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                                      |       |           |       |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                      |       |           |       |
| Note 5:                                   | As observed with 0dBi gain antenna at the center of the quiet zone.  |                                      |       |           |       |
| Note 6:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                      |       |           |       |

#### A.7.5.9.2.1.2 Test Requirements

During T1 UE shall send L1-RSRP report with SSB0 to which SRS-SpatialRelation0 is associated. During T2, UE shall send L1-RSRP report with SSB1 to which SRS-SpatialRelation1 is associated.

After receiving RRC command in slot  $n$ , UE shall be able to transmit target periodic SRS with SRS-SpatialRelation1 on the PCell in the slot  $n + T_{RRC\_processing}/NR\ slot\ length + 1$ .

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

#### A.7.5.10 UE specific CBW change

##### A.7.5.10.1 NR FR2 UE specific CBW change of PCell with non-DRX in SA

###### A.7.5.10.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13. Supported test configurations are shown in Table A.7.5.10.1.1-1.

The test scenario comprises of one PCell (Cell 1) as given in Table A.7.5.10.1.1-2. Cell-specific parameters of PCell are specified in Table A.7.5.10.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK transmission.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 of initial condition in PCell.
- UE has been configured with UE-specific CBW (CBW-1)
- UE is indicated in SCS-SpecificCarrier [2] that the UE-specific CBW is CBW-1 as the initial condition in Cell 1 (PCell).

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated CBW configuration, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. The UE shall reconfigure its CBW with the updated CBW of final condition.

The UE shall be able to completely receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$  as defined in clause 8.13.2 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1$ . The UE shall be continuously scheduled on PCell's new CBW starting from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ .

$T_{RRCprocessingDelay}$  and  $T_{CBWchangeDelayRRC}$  are defined in clause 8.13.

The test equipment verifies the UE specific CBW switch time in PCell by counting the time from the time when the RRC Reconfiguration message including updated CBW configurations sent till the time when RRC Reconfiguration Complete message is received.

**Table A.7.5.10.1.1-1: UE specific CBW change supported test configurations**

| Config   | Description  |
|--|--|
| 1  | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.7.5.10.1.1-2: General test parameters for UE specific CBW change in NR SA**

| Parameter   | Unit | Value  | Comment                                    |
|---|------|--------|--|
| NR RF Channel Number                                    |      | 1      | One NR radio channel is used for this test |
| Active PCell  |      | Cell 1 | PCell on RF channel number 1.              |
| CP length   |      | Normal |  |
| DRX   |      | OFF    |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0      | Individual offset for cells on PCC.        |
| T1  | s    | [0.2]  |  |



Table A.7.5.10.1.1-3: NR Cell specific test parameters for UE specific CBW change in NR SA

| Parameter   |                               | Unit | Cell 1                          |
|---|-------------------------------|------|---------------------------------|
| Frequency Range   |                               |      | FR2                             |
| Duplex mode   |                               |      | TDD                             |
| TDD configuration   |                               |      | TDDConf.3.1                     |
| BW <sub>channel</sub>   |                               |      | 100 MHz: N <sub>RB,c</sub> = 66 |
| Active DL BWP ID  |                               |      | 1                               |
| Initial DL BWP Configuration (BWP-1)  |                               |      | DLBWP.0.2                       |
| Initial UL BWP Configuration  |                               |      | ULBWP.0.2                       |
| Initial Condition   | Active DL CBW-1 Configuration |      | DLCBW.1.1                       |
|   | Active UL CBW-1 Configuration |      | ULCBW.1.1                       |
| Final Condition   | Active DL CBW-1 Configuration |      | DLCBW.1.2                       |
|   | Active UL CBW-1 Configuration |      | ULCBW.1.2                       |
| 'PDSCH Reference measurement channel  |                               |      | SR.3.1 TDD                      |
| RMSI CORESET parameters   |                               |      | CR.3.1 TDD                      |
| Dedicated CORESET parameters  |                               |      | CCR.3.1 TDD                     |
| OCNG Patterns   |                               |      | OP.1                            |
| SSB Configuration   |                               |      | SSB.1 FR2                       |
| SMTc Configuration  |                               |      | SMTc.1                          |
| TCI State   |                               |      | TCI.State.0                     |
| TRS Configuration   |                               |      | TRS.2.1 TDD                     |
| Antenna Configuration   |                               |      | 1x2                             |
| Propagation Condition   |                               |      | AWGN                            |
| EPRE ratio of PSS to SSS  |                               | dB   | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |                               |      |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |                               |      |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |                               |      |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |                               |      |                                 |
| EPRE ratio of PDSCH to PDSCH  |                               |      |                                 |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                               |      |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                               |      |                                 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                               |      |                                 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                               |      |                                 |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |      |                                 |

**Table A.7.5.10.1.1-4: OTA related test parameters for UE specific CBW change test case**

| Parameter  |              | Unit                           | Cell 2                            |
|--|--------------|--------------------------------|-----------------------------------|
| Angle of arrival configuration   |              |                                | Setup 1 according to table A.3.15 |
| Assumption for UE beams <sup>Note 5</sup>  |              |                                | Fine                              |
| $N_{oc}$ <sup>Note1</sup>  | NR_TDD_FR2_A | dBm/15kHz                      | -112                              |
|  | NR_TDD_FR2_B |                                |                                   |
|  | NR_TDD_FR2_F |                                |                                   |
|  | NR_TDD_FR2_G |                                |                                   |
|  | NR_TDD_FR2_T |                                |                                   |
|  | NR_TDD_FR2_Y |                                |                                   |
| $N_{oc}$ <sup>Note1</sup>  | NR_TDD_FR2_A | dBm/SCS                        | -103                              |
|  | NR_TDD_FR2_B |                                |                                   |
|  | NR_TDD_FR2_F |                                |                                   |
|  | NR_TDD_FR2_G |                                |                                   |
|  | NR_TDD_FR2_T |                                |                                   |
|  | NR_TDD_FR2_Y |                                |                                   |
| SS-RSRP <sup>Note2</sup>   | NR_TDD_FR2_A | dBm/SCS <sup>Note3</sup>       | -85                               |
|  | NR_TDD_FR2_B |                                |                                   |
|  | NR_TDD_FR2_F |                                |                                   |
|  | NR_TDD_FR2_G |                                |                                   |
|  | NR_TDD_FR2_T |                                |                                   |
|  | NR_TDD_FR2_Y |                                |                                   |
| $\hat{E}_s/I_{ot}$   |              | dB                             | 18                                |
| $I_o$ <sup>Note2</sup>   | NR_TDD_FR2_A | dBm/95.04 MHz <sup>Note4</sup> | -56                               |
|  | NR_TDD_FR2_B |                                |                                   |
|  | NR_TDD_FR2_F |                                |                                   |
|  | NR_TDD_FR2_G |                                |                                   |
|  | NR_TDD_FR2_T |                                |                                   |
|  | NR_TDD_FR2_Y |                                |                                   |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.</p> |              |                                |                                   |

**A.7.5.10.1.2 Test Requirements**

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs after the beginning of slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$  and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + kI$ .

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed PCell UE specific CBW change delay to be counted as correct.

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

## A.7.6 Measurement procedure

### A.7.6.1 Intra-frequency Measurements

#### A.7.6.1.1 SA event triggered reporting test without gap under non-DRX

##### A.7.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.1.1-1.

**Table A.7.6.1.1.1-1: supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| 2             | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                               |
| Note:         | The UE is only required to be tested in one of the supported test configurations. |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.1.1-2, A.7.6.1.1.1-3 and A.7.6.1.1.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

**Table A.7.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter                             | Unit | Config | Value                | Comment   |
|---------------------------------------|------|--------|----------------------|---|
| Active cell                           |      | 1, 2   | PCell (Cell 1)       |   |
| Neighbour cell                        |      | 1, 2   | Cell 2               | Cell to be identified.                              |
| RF Channel Number                     |      | 1, 2   | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration                    |      | 1, 2   | SMTC.1               |   |
| A3-Offset                             | dB   | 1, 2   | -11                  |   |
| CP length                             |      | 1, 2   | Normal               |   |
| Hysteresis                            | dB   | 1, 2   | 0                    |   |
| Time To Trigger                       | s    | 1, 2   | 0                    |   |
| Filter coefficient                    |      | 1, 2   | 0                    | L3 filtering is not used                            |
| DRX                                   |      | 1, 2   | OFF                  |   |
| Time offset between Cell 1 and Cell 2 |      | 1, 2   | 3 $\mu$ s            | Synchronous cells                                   |
| T1                                    | s    | 1, 2   | 5                    |   |
| T2                                    | s    | 1, 2   | 5                    |   |

**Table A.7.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter                           | Unit | Config | Cell 1                      |           | Cell 2                      |           |
|-------------------------------------|------|--------|-----------------------------|-----------|-----------------------------|-----------|
|                                     |      |        | T1                          | T2        | T1                          | T2        |
| TDD configuration                   |      | 1, 2   | TDDConf.3.1                 |           | TDDConf.3.1                 |           |
| BW <sub>channel</sub>               | MHz  | 1, 2   | 100: N <sub>RB,c</sub> = 66 |           | 100: N <sub>RB,c</sub> = 66 |           |
| Data RBs allocated                  |      | 1      | 24                          |           | 24                          |           |
|                                     |      | 2      | 48                          |           | 48                          |           |
| Initial BWP configuration           |      | 1, 2   | DLBWP.0.1                   | ULBWP.0.1 | DLBWP.0.1                   | ULBWP.0.1 |
| Active DL BWP configuration         |      | 1, 2   | DLBWP.1.1                   |           | DLBWP.1.1                   |           |
| Active UL BWP configuration         |      | 1, 2   | ULBWP.1.1                   |           | ULBWP.1.1                   |           |
| RLM-RS                              |      | 1, 2   | SSB                         |           | SSB                         |           |
| PDSCH RMC configuration             |      | 1      | SR.3.2 TDD                  |           | N/A                         |           |
|                                     |      | 2      | SR.3.3 TDD                  |           | N/A                         |           |
| RMSI CORESET RMC configuration      |      | 1      | CR.3.1 TDD                  |           | N/A                         |           |
|                                     |      | 2      | CR.3.2 TDD                  |           | N/A                         |           |
| Dedicated CORESET RMC configuration |      | 1      | CCR.3.1 TDD                 |           | N/A                         |           |
|                                     |      | 2      | CCR.3.7 TDD                 |           | N/A                         |           |
| TRS configuration                   |      | 1, 2   | TRS.2.1 TDD                 |           | N/A                         |           |
| PDSCH/PDCCH TCI states              |      | 1, 2   | TCI.State.2                 |           | N/A                         |           |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1, 2   | 120                         |           | 120                         |           |
| OCNG Patterns                       |      | 1, 2   | OP.5                        |           | N/A                         |           |
| cellIndividualOffset                | dB   | 1~2    | N/A                         |           | 16                          |           |
| SSB                                 |      | 1      | SSB.3 FR2                   |           | SSB.7 FR2                   |           |
|                                     |      | 2      | SSB.4 FR2                   |           | SSB.8 FR2                   |           |
| Propagation Condition               |      | 1, 2   | AWGN                        |           | AWGN                        |           |

**Table A.7.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter                                  | Unit    | Config | Cell 1                      |       | Cell 2    |       |
|--|---------|--------|-----------------------------|-------|-----------|-------|
|  |         |        | T1                          | T2    | T1        | T2    |
| AoA setup                                  |         | 1, 2   | Setup 3 defined in A.3.15.3 |       |           |       |
|  |         |        | AoA1                        |       | AoA2      |       |
| Beam assumption <sup>Note 4</sup>          |         | 1, 2   | Rough                       |       | Rough     |       |
| E <sub>s</sub>                             | dBm/SCS | 1      | -89                         | -89   | -Infinity | -89   |
|  |         | 2      | -86                         | -86   | -Infinity | -86   |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note 5</sup> | dB      | 1, 2   | -0.12                       | -0.12 | -Infinity | -0.12 |
| SSB_RP                                     | dBm/SCS | 1      | -89                         | -89   | -Infinity | -89   |
|  |         | 2      | -86                         | -86   | -Infinity | -86   |

|   |   |      |                                 |        |           |        |
|---|---|------|---------------------------------|--------|-----------|--------|
| $I_o$   | dBm/95.04MHz  | 1    | -64.41                          | -64.41 | -Infinity | -64.41 |
|   |   | 2    | -61.41                          | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA |   | 1, 2 | Defined in Figure A.7.6.1.1.1-1 |        |           |        |
| Note 1:   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |      |                                 |        |           |        |
| Note 2:   | Void  |      |                                 |        |           |        |
| Note 3:   | Es/lot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |                                 |        |           |        |
| Note 4:   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |      |                                 |        |           |        |
| Note 5:   | Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |      |                                 |        |           |        |

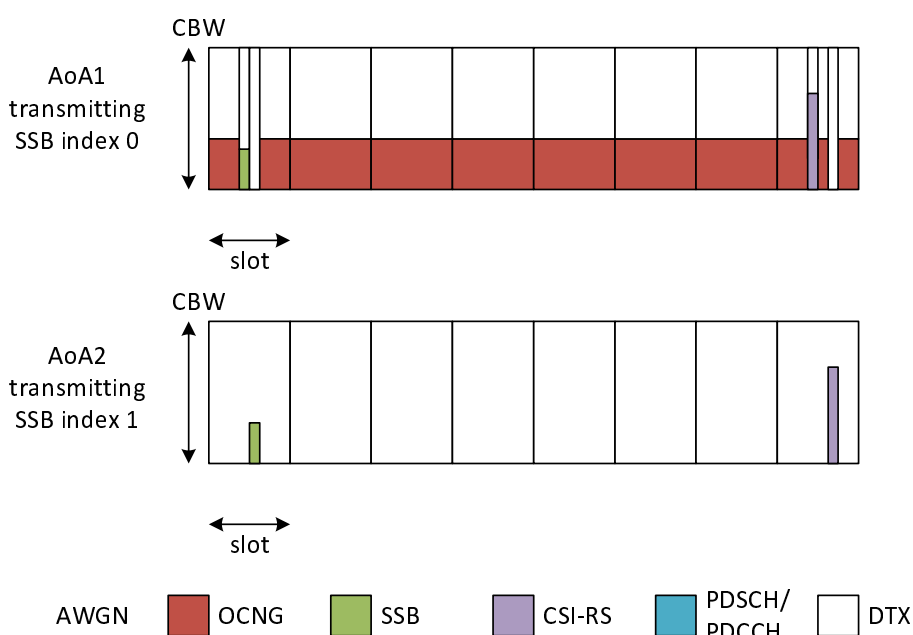


Figure A.7.6.1.1.1-1: Time multiplexed downlink transmissions (Config 1 example)

A.7.6.1.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{PDCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.1.2 SA event triggered reporting test without gap under DRX

### A.7.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.2.1-1.

**Table A.7.6.1.2.1-1: supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.2.1-2 ~ 6.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                             | Unit | Config | Value                |        | Comment   |
|---------------------------------------|------|--------|----------------------|--------|---|
|                                       |      |        | Test 1               | Test 2 |   |
| Active cell                           |      | 1, 2   | PCell (Cell 1)       |        |   |
| Neighbour cell                        |      | 1, 2   | Cell 2               |        | Cell to be identified.                                    |
| RF Channel Number                     |      | 1, 2   | 1: Cell 1 and Cell 2 |        | One TDD carrier frequency is used for the NR cells.       |
| SMTTC configuration                   |      | 1, 2   | SMTTC.1              |        |   |
| A3-Offset                             | dB   | 1, 2   | -6                   |        |   |
| CP length                             |      | 1, 2   | Normal               |        |   |
| Hysteresis                            | dB   | 1, 2   | 0                    |        |   |
| Time To Trigger                       | s    | 1, 2   | 0                    |        |   |
| Filter coefficient                    |      | 1, 2   | 0                    |        | L3 filtering is not used                                  |
| DRX                                   |      | 1, 2   | DRX.1                | DRX.7  | DRX related parameters are defined in Table A.7.6.1.2.1-5 |
| Time offset between Cell 1 and Cell 2 |      | 1, 2   | 3 $\mu$ s            |        | Synchronous cells   |
| T1                                    | s    | 1, 2   | 5                    |        |   |
| T2                                    | s    | 1, 2   | 10                   | 52     |   |

**Table A.7.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                           | Unit | Config | Cell 1                 |    | Cell 2                 |    |
|-------------------------------------|------|--------|------------------------|----|------------------------|----|
|                                     |      |        | T1                     | T2 | T1                     | T2 |
| TDD configuration                   |      | 1, 2   | TDDConf.3.1            |    | TDDConf.3.1            |    |
| $BW_{\text{channel}}$               | MHz  | 1, 2   | 100: $N_{RB,c} = 66$   |    | 100: $N_{RB,c} = 66$   |    |
| Data RBs allocated                  |      | 1, 2   | 66                     |    | 66                     |    |
| Initial BWP configuration           |      | 1, 2   | DLBWP.0.1<br>ULBWP.0.1 |    | DLBWP.0.1<br>ULBWP.0.1 |    |
| Active DL BWP configuration         |      | 1, 2   | DLBWP.1.1              |    | DLBWP.1.1              |    |
| Active UL BWP configuration         |      | 1, 2   | ULBWP.1.1              |    | ULBWP.1.1              |    |
| RLM-RS                              |      | 1, 2   | SSB                    |    | SSB                    |    |
| PDSCH RMC configuration             |      | 1      | SR.3.2 TDD             |    | N/A                    |    |
|                                     |      | 2      | SR.3.3 TDD             |    |                        |    |
| RMSI CORESET RMC configuration      |      | 1      | CR.3.1 TDD             |    | N/A                    |    |
|                                     |      | 2      | CR.3.2 TDD             |    | N/A                    |    |
| Dedicated CORESET RMC configuration |      | 1      | CCR.3.1 TDD            |    | N/A                    |    |
|                                     |      | 2      | CCR.3.7 TDD            |    | N/A                    |    |
| TRS configuration                   |      | 1, 2   | TRS.2.1 TDD            |    | N/A                    |    |
| PDSCH/PDCCH TCI states              |      | 1, 2   | TCI.State.2            |    | N/A                    |    |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1, 2   | 120                    |    | 120                    |    |
| OCNG Patterns                       |      | 1, 2   | OP.1                   |    | OP.1                   |    |
| SSB                                 |      | 1      | SSB.3 FR2              |    | SSB.3 FR2              |    |
|                                     |      | 2      | SSB.4 FR2              |    | SSB.4 FR2              |    |
| Propagation Condition               |      | 1, 2   | AWGN                   |    | AWGN                   |    |

**Table A.7.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                               | Unit  | Config | Cell 1                      |        | Cell 2             |       |
|---|---|--------|-----------------------------|--------|--------------------|-------|
|   |   |        | T1                          | T2     | T1                 | T2    |
| AoA setup                               |   | 1, 2   | Setup 1 defined in A.3.15.1 |        |                    |       |
| Beam assumption <sup>Note 4</sup>       |   | 1,2    | Rough                       |        | Rough              |       |
| $\hat{E}_s/I_{ot}$ <sup>BB Note 5</sup> | dB  | 1, 2   | 3.77                        | -1.52  | -Infinity          | -1.52 |
| $N_{oc}$ <sup>Note 2</sup>              | dBm/15 KHz  | 1, 2   | -98                         |        |                    |       |
| $N_{oc}$ <sup>Note 2</sup>              | dBm/SCS   | 1      | -89                         |        |                    |       |
|   |   | 2      | -86                         |        |                    |       |
| SSB_RP                                  | dBm/SCS   | 1      | -85                         | -85    | -Infinity          | -85   |
|   |   | 2      | -82                         | -82    | -Infinity          | -82   |
| $\hat{E}_s/N_{oc}$                      | dB  | 1, 2   | 4                           | 4      | -Infinity          | 4     |
| $I_o$                                   | dBm/95.04MHz  | 1, 2   | -54.53                      | -52.18 | See Cell 1 columns |       |
| Note 1:                                 | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |        |                             |        |                    |       |
| Note 2:                                 | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |        |                             |        |                    |       |
| Note 3:                                 | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |        |                             |        |                    |       |
| Note 4:                                 | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.   |        |                             |        |                    |       |
| Note 5:                                 | Calculation of Es/Iot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |        |                             |        |                    |       |

**Table A.7.6.1.2.1-5: Void****Table A.7.6.1.2.1-6: Void**

### A.7.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.



### A.7.6.1.3 SA event triggered reporting test with per-UE gaps under non-DRX

#### A.7.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.3.1-1.

**Table A.7.6.1.3.1-1: supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.3.1-2 ~ 4 below.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

**Table A.7.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX**

| Parameter                              | Unit | Config | Value                | Comment   |
|--|------|--------|----------------------|---|
| Active cell                            |      | 1, 2   | PCell (Cell 1)       |   |
| Neighbour cell                         |      | 1, 2   | Cell 2               | Cell to be identified.                              |
| RF Channel Number                      |      | 1, 2   | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Gap type                               |      | 1, 2   | Per-UE gaps          |   |
| Measurement gap repetition periodicity | ms   | 1, 2   | 40                   |   |
| Measurement gap length                 | ms   | 1, 2   | 6                    |   |
| Measurement gap offset                 | ms   | 1, 2   | 39                   |   |
| SMTC configuration                     |      | 1, 2   | SMTC.1               |   |
| CSI-RS parameters                      |      | 1, 2   | CSI-RS.3.2 TDD       |   |
| A3-Offset                              | dB   | 1, 2   | -11                  |   |
| CP length                              |      | 1, 2   | Normal               |   |
| Hysteresis                             | dB   | 1, 2   | 0                    |   |
| Time To Trigger                        | s    | 1, 2   | 0                    |   |
| Filter coefficient                     |      | 1, 2   | 0                    | L3 filtering is not used                            |
| DRX                                    |      | 1, 2   | OFF                  |   |
| Time offset between Cell 1 and Cell 2  |      | 1, 2   | 3 $\mu$ s            | Synchronous cells                                   |
| T1                                     | s    | 1, 2   | 5                    |   |
| T2                                     | s    | 1, 2   | 5                    |   |

**Table A.7.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX**

| Parameter                           | Unit | Config | Cell 1                      |    | Cell 2                      |    |
|-------------------------------------|------|--------|-----------------------------|----|-----------------------------|----|
|                                     |      |        | T1                          | T2 | T1                          | T2 |
| TDD configuration                   |      | 1, 2   | TDDConf.3.1                 |    | TDDConf.3.1                 |    |
| BW <sub>channel</sub>               | MHz  | 1, 2   | 100: N <sub>RB,c</sub> = 66 |    | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                  |      | 1      | 24                          |    | 24                          |    |
|                                     |      | 2      | 48                          |    | 48                          |    |
| Initial BWP configuration           |      | 1, 2   | DLBWP.0.1<br>ULBWP.0.1      |    | DLBWP.0.1<br>ULBWP.0.1      |    |
| Active DL BWP configuration         |      | 1, 2   | DLBWP.1.2                   |    | DLBWP.1.1                   |    |
| Active UL BWP configuration         |      | 1, 2   | ULBWP.1.2                   |    | ULBWP.1.1                   |    |
| RLM-RS                              |      | 1, 2   | CSI-RS                      |    | SSB                         |    |
| PDSCH RMC configuration             |      | 1      | SR.3.2 TDD                  |    | N/A                         |    |
|                                     |      | 2      | SR.3.3 TDD                  |    |                             |    |
| RMSI CORESET RMC configuration      |      | 1      | CR.3.1 TDD                  |    | N/A                         |    |
|                                     |      | 2      | CR.3.2 TDD                  |    | N/A                         |    |
| Dedicated CORESET RMC configuration |      | 1      | CCR.3.1 TDD                 |    | N/A                         |    |
|                                     |      | 2      | CCR.3.7 TDD                 |    | N/A                         |    |
| TRS configuration                   |      | 1, 2   | TRS.2.1 TDD                 |    | N/A                         |    |
| PDSCH/PDCCH TCI states              |      | 1, 2   | TCI.State.2                 |    | N/A                         |    |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1, 2   | 120                         |    | 120                         |    |
| OCNG Patterns                       |      | 1, 2   | OP.5                        |    | N/A                         |    |
| cellIndividualOffset                | dB   | 1~2    | N/A                         |    | 16                          |    |
| SSB                                 |      | 1      | SSB.3 FR2                   |    | SSB.7 FR2                   |    |
|                                     |      | 2      | SSB.4 FR2                   |    | SSB.8 FR2                   |    |
| Propagation Condition               |      | 1, 2   | AWGN                        |    | AWGN                        |    |

**Table A.7.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX**

| Parameter | Unit | Config | Cell 1 |    | Cell 2 |    |
|-----------|------|--------|--------|----|--------|----|
|           |      |        | T1     | T2 | T1     | T2 |

|   |              |      |                                 |        |           |        |
|---|--------------|------|---------------------------------|--------|-----------|--------|
| AoA setup   |              | 1, 2 | Setup 3 defined in A.3.15.3     |        |           |        |
|   |              |      | AoA1                            |        | AoA2      |        |
| Beam Assumption <sup>Note 4</sup>   |              | 1,2  | Rough                           |        | Rough     |        |
| $E_s$   | dBm/SCS      | 1    | -89                             | -89    | -Infinity | -89    |
|   |              | 2    | -86                             | -86    | -Infinity | -86    |
| $\hat{E}_s/I_{ot}$ <sup>BB Note 5</sup>   | dB           | 1, 2 | -0.12                           | -0.12  | -Infinity | -0.12  |
| SSB_RP  | dBm/SCS      | 1    | -89                             | -89    | -Infinity | -89    |
|   |              | 2    | -86                             | -86    | -Infinity | -86    |
| $I_o$   | dBm/95.04MHz | 1    | -64.41                          | -64.41 | -Infinity | -64.41 |
|   |              | 2    | -61.41                          | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA   |              | 1    | Defined in Figure A.7.6.1.3.1-1 |        |           |        |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Void</p> <p>Note 3: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 5: Calculation of <math>E_s/I_{ot_{BB}}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |              |      |                                 |        |           |        |

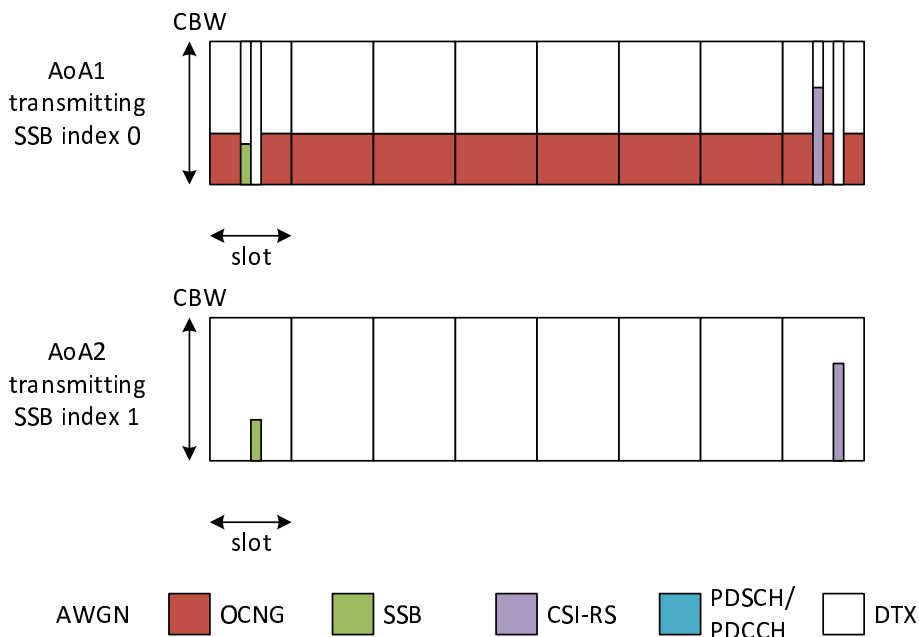


Figure A.7.6.1.3.1-1: Time multiplexed downlink transmissions (Config 1 example)

A.7.6.1.3.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,
- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.1.4 SA event triggered reporting test with per-UE gaps under DRX

### A.7.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.4.1-1.

**Table A.7.6.1.4.1-1: supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.4.1-2, A.7.6.1.4.1-3 and A.7.6.1.4.1-4 below.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX**

| Parameter                              | Unit | Config | Value                |        | Comment   |
|--|------|--------|----------------------|--------|---|
|  |      |        | Test 1               | Test 2 |   |
| Active cell                            |      | 1, 2   | PCell (Cell 1)       |        |   |
| Neighbour cell                         |      | 1, 2   | Cell 2               |        | Cell to be identified.                                    |
| RF Channel Number                      |      | 1, 2   | 1: Cell 1 and Cell 2 |        | One TDD carrier frequency is used for the NR cells.       |
| Gap type                               |      | 1, 2   | Per-UE gaps          |        |   |
| Measurement gap repetition periodicity | ms   | 1, 2   | 40                   |        |   |
| Measurement gap length                 | ms   | 1, 2   | 6                    |        |   |
| Measurement gap offset                 | ms   | 1, 2   | 39                   |        |   |
| SMTC configuration                     |      | 1, 2   | SMTC.1               |        |   |
| CSI-RS parameters                      |      | 1, 2   | CSI-RS.3.2 TDD       |        |   |
| A3-Offset                              | dB   | 1, 2   | -6                   |        |   |
| CP length                              |      | 1, 2   | Normal               |        |   |
| Hysteresis                             | dB   | 1, 2   | 0                    |        |   |
| Time To Trigger                        | s    | 1, 2   | 0                    |        |   |
| Filter coefficient                     |      | 1, 2   | 0                    |        | L3 filtering is not used                                  |
| DRX                                    |      | 1, 2   | DRX.1                | DRX.7  | DRX related parameters are defined in Table A.7.6.1.2.1-5 |
| Time offset between Cell 1 and Cell 2  |      | 1, 2   | 3 $\mu$ s            |        | Synchronous cells   |
| T1                                     | s    | 1, 2   | 5                    |        |   |
| T2                                     | s    | 1, 2   | 10                   | 52     |   |

**Table A.7.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX**

| Parameter                           | Unit | Config | Cell 1                      |                        | Cell 2                      |                        |
|-------------------------------------|------|--------|-----------------------------|------------------------|-----------------------------|------------------------|
|                                     |      |        | T1                          | T2                     | T1                          | T2                     |
| TDD configuration                   |      | 1, 2   | TDDConf.3.1                 |                        | TDDConf.3.1                 |                        |
| BW <sub>channel</sub>               | MHz  | 1, 2   | 100: N <sub>RB,c</sub> = 66 |                        | 100: N <sub>RB,c</sub> = 66 |                        |
| Data RBs allocated                  |      | 1, 2   | 66                          |                        | 66                          |                        |
| Initial BWP configuration           |      | 1, 2   | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1 |
| Active DL BWP configuration         |      | 1, 2   | DLBWP.1.2                   |                        | DLBWP.1.1                   |                        |
| Active UL BWP configuration         |      | 1, 2   | ULBWP.1.2                   |                        | ULBWP.1.1                   |                        |
| RLM-RS                              |      | 1, 2   | SCSI-RS                     |                        | SSB                         |                        |
| PDSCH RMC configuration             |      | 1      | SR.3.12TDD                  |                        | N/A                         |                        |
|                                     |      | 2      | SR.3.3 TDD                  |                        | N/A                         |                        |
| RMSI CORESET RMC configuration      |      | 1      | CR.3.1 TDD                  |                        | N/A                         |                        |
|                                     |      | 2      | CR.3.2 TDD                  |                        | N/A                         |                        |
| Dedicated CORESET RMC configuration |      | 1      | CCR.3.1 TDD                 |                        | N/A                         |                        |
|                                     |      | 2      | CCR.3.7 TDD                 |                        | N/A                         |                        |
| TRS configuration                   |      | 1, 2   | TRS.2.1 TDD                 |                        | N/A                         |                        |
| PDSCH/PDCCH TCI state               |      | 1, 2   | TCI.State.2                 |                        | N/A                         |                        |
| PDSCH/PDCCH subcarrier spacing      | kHz  | 1, 2   | 120                         |                        | 120                         |                        |
| OCNG Patterns                       |      | 1, 2   | OP.1                        |                        | OP.1                        |                        |
| SSB                                 |      | 1      | SSB.3 FR2                   |                        | SSB.3 FR2                   |                        |
|                                     |      | 2      | SSB.4 FR2                   |                        | SSB.4 FR2                   |                        |
| Propagation Condition               |      | 1, 2   | AWGN                        |                        | AWGN                        |                        |

**Table A.7.6.1.4.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX**

| Parameter                                 | Unit  | Config | Cell 1                      |        | Cell 2             |       |
|---|---|--------|-----------------------------|--------|--------------------|-------|
|   |   |        | T1                          | T2     | T1                 | T2    |
| AoA setup                                 |   | 1, 2   | Setup 1 defined in A.3.15.1 |        |                    |       |
| Beam Assumption <sup>Note 4</sup>         |   | 1,2    | Rough                       |        |                    |       |
| $\hat{E}_s/I_{ot}^{BB}$ <sup>Note 5</sup> | dB  | 1, 2   | 3.77                        | -1.52  | -Infinity          | -1.52 |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/15 KHz  | 1, 2   | -98                         |        |                    |       |
| $N_{oc}$ <sup>Note 2</sup>                | dBm/SCS   | 1      | -89                         |        |                    |       |
|   |   | 2      | -86                         |        |                    |       |
| SSB_RP                                    | dBm/SCS   | 1      | -85                         | -85    | -Infinity          | -85   |
|   |   | 2      | -82                         | -82    | -Infinity          | -82   |
| $\hat{E}_s/N_{oc}$                        | dB  | 1, 2   | 4                           | 4      | -Infinity          | 4     |
| $I_o$                                     | dBm/95.04MHz  | 1,2    | -54.53                      | -52.18 | See Cell 1 columns |       |
| Note 1:                                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |        |                             |        |                    |       |
| Note 2:                                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |        |                             |        |                    |       |
| Note 3:                                   | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |        |                             |        |                    |       |
| Note 4:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |        |                             |        |                    |       |
| Note 5:                                   | Calculation of Es/Iot <sup>BB</sup> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |        |                             |        |                    |       |

**Table A.7.6.1.4.1-5: Void****Table A.7.6.1.4.1-6: Void**

#### A.7.6.1.4.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.2 Inter-frequency Measurements

### A.7.6.2.1 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2)

#### A.7.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.1.1-1, A.7.6.2.1.1-2, and A.7.6.2.1.1-3.

Measurement gap pattern configuration # 13 as defined in Table A.7.6.2.1.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.1.1-1.

**Table A.7.6.2.1.1-1 SA event triggered reporting tests without SSB index reading for FR2-FR2**

| Config        | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. |   |

**Table A.7.6.2.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                         | Comment                                 |
|---|------|--------------------|-------------------------------|---|
| NR RF Channel Number                            |      | Config 1           | 1, 2                          | Two FR2 NR carrier frequencies is used. |
| Active cell                                     |      | Config 1           | NR cell 1 (Pcell)             | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1           | NR cell 2                     | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id                                  |      | Config 1           | 13                            | As specified in clause 9.1.2-1.         |
| Measurement gap offset                          |      | Config 1           | 39                            |   |
| offsetMO  | dB   | Config 1           | 16                            | Applied to NR Cell 2 measurement object |
| A3-Offset                                       | dB   | Config 1           | -11                           |   |
| Hysteresis                                      | dB   | Config 1           | 0                             |   |
| CP length                                       |      | Config 1           | Normal                        |   |
| TimeToTrigger                                   | s    | Config 1           | 0                             |   |
| Filter coefficient                              |      | Config 1           | 0                             | L3 filtering is not used                |
| DRX   |      | Config 1           | OFF                           | DRX is not used                         |
| Time offset between serving and neighbour cells |      | Config 1           | 3µs                           | Synchronous cells.                      |
| T1  | s    | Config 1           | 5                             |   |
| T2  | s    | Config 1           | 5.2 for PC1; 3.5 for other PC |   |

**Table A.7.6.2.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1                                |    | Cell 2 |    |
|-----------|------|--------------------|---------------------------------------|----|--------|----|
|           |      |                    | T1                                    | T2 | T1     | T2 |
| AoA setup |      | Config 1           | Setup 3 as specified in clause A.3.15 |    |        |    |
|           |      |                    | AoA1                                  |    | AoA2   |    |



|   |                                |          |          |                             |           |                             |  |
|---|--------------------------------|----------|----------|-----------------------------|-----------|-----------------------------|--|
| Beam Assumption <sup>Note 7</sup>                   |                                |          | 1,2      | Rough                       |           | Rough                       |  |
| NR RF Channel Number                                |                                |          | Config 1 | 1                           |           | 2                           |  |
| Duplex mode   |                                |          | Config 1 | TDD                         |           | TDD                         |  |
| TDD configuration                                   |                                |          | Config 1 | TDDConf.3.1                 |           | TDDConf.3.1                 |  |
| BW <sub>channel</sub>                               |                                | MHz      | Config 1 | 100: N <sub>RB,c</sub> = 66 |           | 100: N <sub>RB,c</sub> = 66 |  |
| Data RBs allocated                                  |                                |          | Config 1 | 66                          |           | 66                          |  |
| BWP BW  |                                | MHz      | Config 1 | 100: N <sub>RB,c</sub> = 66 |           | 100: N <sub>RB,c</sub> = 66 |  |
| BWP configuration                                   | Initial DL BWP                 |          | Config 1 | DLBWP.0.1                   |           | N/A                         |  |
|   | Initial UL BWP                 |          |          | ULBWP.0.1                   |           | N/A                         |  |
|   | Dedicated DL BWP               |          |          | DLBWP.1.1                   |           | N/A                         |  |
|   | Dedicated UL BWP               |          |          | ULBWP.1.1                   |           | N/A                         |  |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                                |          | Config 1 | OP.1                        |           | OP.1                        |  |
| PDSCH Reference measurement channel                 |                                |          | Config 1 | SR.3.1 TDD                  |           | -                           |  |
| CORESET Reference Channel                           |                                |          | Config 1 | CR.3.1 TDD                  |           | -                           |  |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |                                |          | Config 1 | SMTC.1                      |           | SMTC.1                      |  |
| PDSCH/PDCCH subcarrier spacing                      |                                | kHz      | Config 1 | 120                         |           | 120                         |  |
| TRS configuration                                   |                                |          | Config 1 | TRS.2.1 TDD                 |           | N/A                         |  |
| PDSCH/PDCCH TCI state                               |                                |          | Config 1 | TCI.State.2                 |           | N/A                         |  |
| EPRE ratio of PSS to SSS                            |                                |          | Config 1 | 0                           |           | 0                           |  |
| EPRE ratio of PBCH DMRS to SSS                      |                                |          |          |                             |           |                             |  |
| EPRE ratio of PBCH to PBCH DMRS                     |                                |          |          |                             |           |                             |  |
| EPRE ratio of PDCCH DMRS to SSS                     |                                |          |          |                             |           |                             |  |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                                |          |          |                             |           |                             |  |
| EPRE ratio of PDSCH DMRS to SSS                     |                                |          |          |                             |           |                             |  |
| EPRE ratio of PDSCH to PDSCH                        |                                |          |          |                             |           |                             |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                                |          |          |                             |           |                             |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                                |          |          |                             |           |                             |  |
| $\hat{E}_s$   | dBm/S CS                       | Config 1 | -87      |                             | -87       |                             |  |
| SSB-RP <sup>Note 3</sup>                            | dBm/S CS <sup>Note5</sup>      | Config 1 | -87      | -87                         | -Infinity | -87                         |  |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note 8</sup>          | dB                             | Config 1 | 1.89     | 1.89                        | -Infinity | 1.89                        |  |
| $I_o$ <sup>Note3</sup>                              | dBm/95.04 MHz <sup>Note5</sup> | Config 1 | -58.01   | -58.01                      | -Infinity | -58.01                      |  |
| Propagation Condition                               |                                |          | Config 1 | AWGN                        |           | AWGN                        |  |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Void   |
| Note 3: | SSB-RP, Es/lot and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Void   |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone  |
| Note 7: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |
| Note 8: | Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBs from TS 38.101-2 [19] Table 6.2.1.3-4. |

#### A.7.6.2.1.2 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 5120 for UE supporting power class 1, or
- 3200 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

#### A.7.6.2.2 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is used (PCell in FR2)

##### A.7.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.2.1-1, A.7.6.2.2.1-2, and A.7.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 13 as defined in Table A.7.6.2.2.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.2.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.2.2.1-1: SA event triggered reporting tests without SSB index reading for FR2-FR2**

| Config  | Description   |
|---------|---|
| 1       | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: | Void.   |

**Table A.7.6.2.2.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                        |                                | Comment                                 |
|---|------|--------------------|------------------------------|--------------------------------|---|
|   |      |                    | Test 1                       | Test 2                         |   |
| NR RF Channel Number                            |      | Config 1           | 1, 2                         |                                | Two FR2 NR carrier frequencies is used. |
| Active cell                                     |      | Config 1           | NR cell 1 (Pcell)            |                                | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1           | NR cell 2                    |                                | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id                                  |      | Config 1           | 13                           |                                | As specified in clause 9.1.2-1.         |
| Measurement gap offset                          |      | Config 1           | 39                           |                                |   |
| SMTC-SSB parameters                             |      | Config 1           | SSB.3 FR2                    |                                | As specified in clause A.3.10.2         |
| A3-Offset                                       | dB   | Config 1           | -6                           |                                |   |
| Hysteresis                                      | dB   | Config 1           | 0                            |                                |   |
| CP length                                       |      | Config 1           | Normal                       |                                |   |
| TimeToTrigger                                   | s    | Config 1           | 0                            |                                |   |
| Filter coefficient                              |      | Config 1           | 0                            |                                | L3 filtering is not used                |
| DRX   |      | Config 1           | DRX.1                        | DRX.7                          | As specified in clause A.3.3            |
| Time offset between serving and neighbour cells |      | Config 1           | 3 $\mu$ s                    |                                | Synchronous cells.                      |
| T1  | s    | Config 1           | 5                            |                                |   |
| T2  | s    | Config 1           | 8 for PC1;<br>5 for other PC | 82 for PC1;<br>52 for other PC |   |

**Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection**

| Parameter   |                        | Unit     | Test configuration | Cell 1                                |           | Cell 2                      |    |
|---|------------------------|----------|--------------------|---------------------------------------|-----------|-----------------------------|----|
|   |                        |          |                    | T1                                    | T2        | T1                          | T2 |
| AoA setup   |                        |          | Config 1           | Setup 1 as specified in clause A.3.15 |           |                             |    |
| Beam Assumption <sup>Note 7</sup>                   |                        |          | Config 1           | Rough                                 |           | Rough                       |    |
| NR RF Channel Number                                |                        |          | Config 1           | 1                                     |           | 2                           |    |
| TDD configuration                                   |                        |          | Config 1           | TDDConf.3.1                           |           | TDDConf.3.1                 |    |
| Duplex mode   |                        |          | Config 1           | TDD                                   |           | TDD                         |    |
| BW <sub>channel</sub>                               |                        | MHz      | Config 1           | 100: N <sub>RB,c</sub> = 66           |           | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                                  |                        |          | Config 1           | 66                                    |           | 66                          |    |
| BWP BW  |                        | MHz      | Config 1           | 100: N <sub>RB,c</sub> = 66           |           | 100: N <sub>RB,c</sub> = 66 |    |
| BWP configuration                                   | Initial DL BWP         |          | Config 1           | DLBWP.0.1                             |           | N/A                         |    |
|   | Initial UL BWP         |          |                    | ULBWP.0.1                             |           | N/A                         |    |
|   | Dedicated DL BWP       |          |                    | DLBWP.1.1                             |           | N/A                         |    |
|   | Dedicated UL BWP       |          |                    | ULBWP.1.1                             |           | N/A                         |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                        |          | Config 1           | OP.1                                  |           | OP.1                        |    |
| PDSCH Reference measurement channel                 |                        |          | Config 1           | SR.3.1 TDD                            |           | -                           |    |
| CORESET Reference Channel                           |                        |          | Config 1           | CR.3.1 TDD                            |           | -                           |    |
| SMTc configuration defined in A.3.11.1 and A.3.11.2 |                        |          | Config 1           | SMTc.1                                |           | SMTc.1                      |    |
| PDSCH/PDCCH subcarrier spacing                      |                        | kHz      | Config 1           | 120                                   |           | 120                         |    |
| TRS configuration                                   |                        |          | Config 1           | TRS.2.1 TDD                           |           | N/A                         |    |
| PDSCH/PDCCH TCI state                               |                        |          | Config 1           | TCI.State.2                           |           | N/A                         |    |
| EPRE ratio of PSS to SSS                            |                        |          | Config 1           | 0                                     |           | 0                           |    |
| EPRE ratio of PBCH DMRS to SSS                      |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PBCH to PBCH DMRS                     |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDCCH DMRS to SSS                     |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDSCH DMRS to SSS                     |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDSCH to PDSCH                        |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                        |          |                    |                                       |           |                             |    |
| $N_{oc}$ <sup>Note2</sup>                           | dBm/15 kHz<br>Note5    |          | -104.7             |                                       | -104.7    |                             |    |
| $N_{oc}$ <sup>Note2</sup>                           | dBm/S CS<br>Note4      | Config 1 | -95.7              |                                       | -95.7     |                             |    |
| SS-RSRP <sup>Note 3</sup>                           | dBm/S CS<br>Note5      | Config 1 | -89.7              | -89.7                                 | -Infinity | -86.7                       |    |
| $\hat{E}_s/I_{ot}$                                  | dB                     | Config 1 | 6                  | 6                                     | -Infinity | 9                           |    |
| $\hat{E}_s/N_{oc}$                                  | dB                     | Config 1 | 6                  | 6                                     | -Infinity | 9                           |    |
| $I_0$ <sup>Note3</sup>                              | dBm/95.04 MHz<br>Note5 | Config 1 | -59.7              | -59.7                                 | -66.7     | -57.2                       |    |

| Propagation Condition | Config 1   | AWGN | AWGN |
|-----------------------|--|------|------|
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |      |
| Note 3:               | SSB_RP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |      |
| Note 4:               | Void   |      |      |
| Note 5:               | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |      |      |
| Note 6:               | As observed with 0 dBi gain antenna at the centre of the quiet zone  |      |      |
| Note 7:               | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |      |      |

#### A.7.6.2.2.2 Test Requirements

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X1$  ms from the beginning of time period T2, where  $X1$  is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X2$  ms from the beginning of time period T2, where  $X2$  is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

#### A.7.6.2.3 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is not used (PCell in FR2)

##### A.7.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.3.1-1, A.7.6.2.3.1-2, and A.7.6.2.3.1-3.

Measurement gap pattern configuration # 13 as defined in Table A.7.6.2.3.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.3.1-1.

**Table A.7.6.2.3.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2**

| Config  | Description   |
|---------|---|
| 1       | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: | Void.   |

**Table A.7.6.2.3.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                       | Comment                                 |
|---|------|--------------------|-----------------------------|---|
| NR RF Channel Number                            |      | Config 1           | 1, 2                        | Two FR2 NR carrier frequencies is used. |
| Active cell                                     |      | Config 1           | NR cell 1 (Pcell)           | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1           | NR cell 2                   | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id                                  |      | Config 1           | 13                          | As specified in clause 9.1.2-1.         |
| Measurement gap offset                          |      | Config 1           | 39                          |   |
| SMTCS-SSB parameters                            |      | Config 1           | SSB.3 FR2                   | As specified in clause A.3.10.2         |
| offsetMO  | dB   | Config 1           | 16                          | Applied to NR Cell 2 measurement object |
| A3-Offset                                       | dB   | Config 1           | -11                         |   |
| Hysteresis                                      | dB   | Config 1           | 0                           |   |
| CP length                                       |      | Config 1           | Normal                      |   |
| TimeToTrigger                                   | s    | Config 1           | 0                           |   |
| Filter coefficient                              |      | Config 1           | 0                           | L3 filtering is not used                |
| DRX   |      | Config 1           | OFF                         | DRX is not used                         |
| Time offset between serving and neighbour cells |      | Config 1           | 3µs                         | Synchronous cells.                      |
| T1  | s    | Config 1           | 5                           |   |
| T2  | s    | Config 1           | 7 for PC1; 4.5 for other PC |   |

**Table A.7.6.2.3.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**



| Parameter   |                                | Unit     | Test configuration | Cell 1                                |           | Cell 2                      |    |
|---|--------------------------------|----------|--------------------|---------------------------------------|-----------|-----------------------------|----|
|   |                                |          |                    | T1                                    | T2        | T1                          | T2 |
| AoA setup   |                                |          | Config 1           | Setup 3 as specified in clause A.3.15 |           |                             |    |
|   |                                |          |                    | AoA1                                  |           | AoA2                        |    |
| Beam Assumption <sup>Note 7</sup>                   |                                |          | Config 1           | Rough                                 |           | Rough                       |    |
| NR RF Channel Number                                |                                |          | Config 1           | 1                                     |           | 2                           |    |
| Duplex mode   |                                |          | Config 1           | TDD                                   |           | TDD                         |    |
| TDD configuration                                   |                                |          | Config 1           | TDDConf.3.1                           |           | TDDConf.3.1                 |    |
| BW <sub>channel</sub>                               |                                | MHz      | Config 1           | 100: N <sub>RB,c</sub> = 66           |           | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                                  |                                |          | Config 1           | 66                                    |           | 66                          |    |
| BWP BW  |                                | MHz      | Config 1           | 100: N <sub>RB,c</sub> = 66           |           | 100: N <sub>RB,c</sub> = 66 |    |
| BWP configuration                                   | Initial DL BWP                 |          | Config 1           | DLBWP.0.1                             |           | N/A                         |    |
|   | Initial UL BWP                 |          |                    | ULBWP.0.1                             |           | N/A                         |    |
|   | Dedicated DL BWP               |          |                    | DLBWP.1.1                             |           | N/A                         |    |
|   | Dedicated UL BWP               |          |                    | ULBWP.1.1                             |           | N/A                         |    |
| OCNG Patterns defined in A.3.2.1.1                  |                                |          | Config 1           | OP.1                                  |           | OP.1                        |    |
| PDSCH Reference measurement channel                 |                                |          | Config 1           | SR.3.1 TDD                            |           | -                           |    |
| CORESET Reference Channel                           |                                |          | Config 1           | CR.3.1 TDD                            |           | -                           |    |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |                                |          | Config 1           | SMTC.1                                |           | SMTC.1                      |    |
| PDSCH/PDCCH subcarrier spacing                      |                                | kHz      | Config 1           | 120                                   |           | 120                         |    |
| TRS configuration                                   |                                |          | Config 1           | TRS.2.1 TDD                           |           | N/A                         |    |
| PDSCH/PDCCH TCI state                               |                                |          | Config 1           | TCI.State.2                           |           | N/A                         |    |
| EPRE ratio of PSS to SSS                            |                                |          | Config 1           | 0                                     |           | 0                           |    |
| EPRE ratio of PBCH DMRS to SSS                      |                                |          |                    |                                       |           |                             |    |
| EPRE ratio of PBCH to PBCH DMRS                     |                                |          |                    |                                       |           |                             |    |
| EPRE ratio of PDCCH DMRS to SSS                     |                                |          |                    |                                       |           |                             |    |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                                |          |                    |                                       |           |                             |    |
| EPRE ratio of PDSCH DMRS to SSS                     |                                |          |                    |                                       |           |                             |    |
| EPRE ratio of PDSCH to PDSCH                        |                                |          |                    |                                       |           |                             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                                |          |                    |                                       |           |                             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                                |          |                    |                                       |           |                             |    |
| $\hat{E}_s$   | dBm/S CS                       | Config 1 | -87                |                                       | -87       |                             |    |
| SSB-RP <sup>Note 3</sup>                            | dBm/S CS <sup>Note5</sup>      | Config 1 | -87                | -87                                   | -Infinity | -87                         |    |
| $\hat{E}_s/I_{ot, BB}$ <sup>Note 8</sup>            | dB                             | Config 1 | 1.89               | 1.89                                  | N/A       | 1.89                        |    |
| $I_o$ <sup>Note3</sup>                              | dBm/95.04 MHz <sup>Note5</sup> | Config 1 | -58.01             | -58.01                                | -Infinity | -58.01                      |    |
| Propagation Condition                               |                                |          | Config 1           | AWGN                                  |           | AWGN                        |    |

|         |   |
|---------|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |
| Note 2: | Void  |
| Note 3: | SSB-RP, Es/lot and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | Void  |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone   |
| Note 7: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |
| Note 8: | Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4. |

#### A.7.6.2.3.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

The UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

#### A.7.6.2.4 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is used (PCell in FR2)

##### A.7.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.4.1-1, A.7.6.2.4.1-2, and A.7.6.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 13 as defined in Table A.7.6.2.4.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.4.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.2.4.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2**

| Config        | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. |   |

**Table A.7.6.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                           |                                 | Comment                                 |
|---|------|--------------------|---------------------------------|---------------------------------|---|
|   |      |                    | Test 1                          | Test 2                          |   |
| NR RF Channel Number                            |      | Config 1           | 1, 2                            |                                 | Two FR2 NR carrier frequencies is used. |
| Active cell                                     |      | Config 1           | NR cell 1 (Pcell)               |                                 | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1           | NR cell 2                       |                                 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id                                  |      | Config 1           | 13                              |                                 | As specified in clause 9.1.2-1.         |
| Measurement gap offset                          |      | Config 1           | 39                              |                                 |   |
| SMTC-SSB parameters                             |      | Config 1           | SSB.3 FR2                       |                                 | As specified in clause A.3.10.2         |
| A3-Offset                                       | dB   | Config 1           | -6                              |                                 |   |
| Hysteresis                                      | dB   | Config 1           | 0                               |                                 |   |
| CP length                                       |      | Config 1           | Normal                          |                                 |   |
| TimeToTrigger                                   | s    | Config 1           | 0                               |                                 |   |
| Filter coefficient                              |      | Config 1           | 0                               |                                 | L3 filtering is not used                |
| DRX   |      | Config 1           | DRX.1                           | DRX.7                           | As specified in clause A.3.3            |
| Time offset between serving and neighbour cells |      | Config 1           | 3µs                             |                                 | Synchronous cells.                      |
| T1  | s    | Config 1           | 5                               |                                 |   |
| T2  | s    | Config 1           | 11 for PC1;<br>6.5 for other PC | 108 for PC1;<br>67 for other PC |   |

**Table A.7.6.2.4.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection**

| Parameter   |                        | Unit     | Test configuration | Cell 1                                |           | Cell 2                      |    |
|---|------------------------|----------|--------------------|---------------------------------------|-----------|-----------------------------|----|
|   |                        |          |                    | T1                                    | T2        | T1                          | T2 |
| AoA setup   |                        |          | Config 1           | Setup 1 as specified in clause A.3.15 |           |                             |    |
| Beam Assumption <sup>Note 7</sup>                   |                        |          | Config 1           | Rough                                 |           | Rough                       |    |
| NR RF Channel Number                                |                        |          | Config 1           | 1                                     |           | 2                           |    |
| Duplex mode   |                        |          | Config 1           | TDD                                   |           | TDD                         |    |
| TDD configuration                                   |                        |          | Config 1           | TDDConf.3.1                           |           | TDDConf.3.1                 |    |
| BW <sub>channel</sub>                               |                        | MHz      | Config 1           | 100: N <sub>RB,c</sub> = 66           |           | 100: N <sub>RB,c</sub> = 66 |    |
| Data RBs allocated                                  |                        |          | Config 1           | 66                                    |           | 66                          |    |
| BWP BW  |                        | MHz      | Config 1           | 100: N <sub>RB,c</sub> = 66           |           | 100: N <sub>RB,c</sub> = 66 |    |
| BWP configuration                                   | Initial DL BWP         |          | Config 1           | DLBWP.0.1                             |           | N/A                         |    |
|   | Initial UL BWP         |          |                    | ULBWP.0.1                             |           | N/A                         |    |
|   | Dedicated DL BWP       |          |                    | DLBWP.1.1                             |           | N/A                         |    |
|   | Dedicated UL BWP       |          |                    | ULBWP.1.1                             |           | N/A                         |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                        |          | Config 1           | OP.1                                  |           | OP.1                        |    |
| PDSCH Reference measurement channel                 |                        |          | Config 1           | SR.3.1 TDD                            |           | -                           |    |
| CORESET Reference Channel                           |                        |          | Config 1           | CR.3.1 TDD                            |           | -                           |    |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |                        |          | Config 1           | SMTC.1                                |           | SMTC.1                      |    |
| PDSCH/PDCCH subcarrier spacing                      |                        | kHz      | Config 1           | 120                                   |           | 120                         |    |
| TRS configuration                                   |                        |          | Config 1           | TRS.2.1 TDD                           |           | N/A                         |    |
| PDSCH/PDCCH TCI state                               |                        |          | Config 1           | TCI.State.2                           |           | N/A                         |    |
| EPRE ratio of PSS to SSS                            |                        |          | Config 1           | 0                                     |           | 0                           |    |
| EPRE ratio of PBCH DMRS to SSS                      |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PBCH to PBCH DMRS                     |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDCCH DMRS to SSS                     |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDSCH DMRS to SSS                     |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of PDSCH to PDSCH                        |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                        |          |                    |                                       |           |                             |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                        |          |                    |                                       |           |                             |    |
| $N_{oc}$ <sup>Note2</sup>                           | dBm/15 kHz<br>Note5    |          | -104.7             |                                       | -104.7    |                             |    |
| $N_{oc}$ <sup>Note2</sup>                           | dBm/S CS<br>Note4      | Config 1 | -95.7              |                                       | -95.7     |                             |    |
| SS-RSRP <sup>Note 3</sup>                           | dBm/S CS<br>Note5      | Config 1 | -89.7              | -89.7                                 | -Infinity | -86.7                       |    |
| $\hat{E}_s/I_{ot}$                                  | dB                     | Config 1 | 6                  | 6                                     | -Infinity | 9                           |    |
| $\hat{E}_s/N_{oc}$                                  | dB                     | Config 1 | 6                  | 6                                     | -Infinity | 9                           |    |
| $I_o$ <sup>Note3</sup>                              | dBm/95.04 MHz<br>Note5 | Config 1 | -59.7              | -59.7                                 | -66.7     | -57.2                       |    |

| Propagation Condition | Config 1   | AWGN | AWGN |
|-----------------------|--|------|------|
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |      |
| Note 3:               | SSB_RP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |      |
| Note 4:               | Void   |      |      |
| Note 5:               | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |      |      |
| Note 6:               | As observed with 0 dBi gain antenna at the centre of the quiet zone  |      |      |
| Note 7:               | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |      |      |

#### A.7.6.2.4.2 Test Requirements

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X_1$  ms from the beginning of time period T2, where  $X_1$  is

- 10080 for UE supporting power class 1, or
- 6240 for UE supporting other power class.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X_2$  ms from the beginning of time period T2, where  $X_2$  is

- 107520 for UE supporting power class 1, or
- 66560 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

#### A.7.6.2.5 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1)

##### A.7.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.5.1-1, A.7.6.2.5.1-2, and A.7.6.2.5.1-3.

In test 1 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 no gap pattern is configured as defined in Table A.7.6.2.5.1-2. If the UE supports per-FR gap, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.5.1-1.

**Table A.7.6.2.5.1-1 SA event triggered reporting tests without SSB index reading for FR1-FR2**

| Config   | Description of serving cell                          | Description of target cell                                |
|--|--|---|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS,<br>100 MHz bandwidth, TDD<br>duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 3  | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |   |
| Note: The UE is only required to be tested in one of the supported test configurations |  |   |

**Table A.7.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter   | Unit | Test configuration | Value                            |                           | Comment   |
|---|------|--------------------|----------------------------------|---------------------------|---|
|   |      |                    | Test 1                           | Test 2                    |   |
| NR RF Channel Number                              |      | Config 1,2,3       | 1, 2                             |                           | One NR FR1 and one NR FR2 carrier frequency is used.                                |
| Active cell                                       |      | Config 1,2,3       | NR cell 1 (Pcell)                |                           | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                    |      | Config 1,2,3       | NR cell 2                        |                           | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                    |      | Config 1,2,3       | 0                                | Gap not configured        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                            |      | Config 1,2,3       | 39                               | N/A                       |   |
| SMTC-SSB parameters on NR RF Channel 1            |      | Config 1           | SSB.1 FR1                        |                           | As specified in clause A.3.10.1   |
|   |      | Config 2           | SSB.1 FR1                        |                           | As specified in clause A.3.10.1   |
|   |      | Config 3           | SSB.2 FR1                        |                           | As specified in clause A.3.10.1   |
| CSI-RS for tracking parameters on NR RF Channel 1 |      | Config 1           | TRS.1.1 FDD                      |                           |   |
|   |      | Config 2           | TRS.1.1 TDD                      |                           |   |
|   |      | Config 3           | TRS.1.2 TDD                      |                           |   |
| SMTC-SSB parameters on NR RF Channel 2            |      | Config 1,2,3       | SSB.3 FR2                        |                           | As specified in clause A.3.10.2   |
| <i>offsetMO</i>                                   | dB   | Config 1,2,3       | 6                                |                           |   |
| Hysteresis  | dB   | Config 1,2,3       | 0                                |                           |   |
| <i>a4-Threshold</i>                               | dBm  | Config 1,2,3       | -105                             |                           |   |
| CP length   |      | Config 1,2,3       | Normal                           |                           |   |
| TimeToTrigger                                     | s    | Config 1,2,3       | 0                                |                           |   |
| Filter coefficient                                |      | Config 1,2,3       | 0                                |                           | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | OFF                              |                           | DRX is not used   |
| Time offset between serving and neighbour cells   |      | Config 1           | 3ms                              |                           | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs                              |                           | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                                |                           |   |
| T2  | s    | Config 1,2,3       | 5.2 for PC1;<br>3.5 for other PC | 3 for PC1; 2 for other PC |   |

**Table A.7.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**



| Parameter   |                  | Unit | Test configuration | Cell 1                      |    | Cell 2                                |    |
|---|------------------|------|--------------------|-----------------------------|----|---------------------------------------|----|
|   |                  |      |                    | T1                          | T2 | T1                                    | T2 |
| AoA setup   |                  |      | Config 1,2,3       | N/A                         |    | Setup 1 as specified in clause A.3.15 |    |
| Beam Assumption <sup>Note 7</sup>                   |                  |      | Config 1,2,3       | N/A                         |    | Rough                                 |    |
| NR RF Channel Number                                |                  |      | Config 1,2,3       | 1                           |    | 2                                     |    |
| Duplex mode   |                  |      | Config 1           | FDD                         |    | TDD                                   |    |
|   |                  |      | Config 2,3         | TDD                         |    | TDD                                   |    |
| TDD configuration                                   |                  |      | Config 1           | Not Applicable              |    | TDDConf.3.1                           |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |    | TDDConf.3.1                           |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |    | TDDConf.3.1                           |    |
| BW <sub>channel</sub>                               |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| BWP BW  |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| Data RBs allocated                                  |                  |      | Config 1           | 52                          |    | 66                                    |    |
|   |                  |      | Config 2           | 52                          |    | 66                                    |    |
|   |                  |      | Config 3           | 106                         |    | 66                                    |    |
| BWP configuration                                   | Initial DL BWP   |      | Config 1,2,3       | DLBWP.0.1                   |    | N/A                                   |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                   |    | N/A                                   |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   |    | N/A                                   |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   |    | N/A                                   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                  |      | Config 1,2,3       | OP.1                        |    | OP.1                                  |    |
| PDSCH Reference measurement channel                 |                  |      | Config 1           | SR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | SR2.1 TDD                   |    |                                       |    |
| RMSI CORESET Reference Channel                      |                  |      | Config 1           | CR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | CR2.1 TDD                   |    |                                       |    |
| Dedicated CORESET RMC configuration                 |                  |      | Config 1           | CCR.1.1 FDD                 |    | -                                     |    |
|   |                  |      | Config 2           | CCR.1.1 TDD                 |    |                                       |    |
|   |                  |      | Config 3           | CCR.2.1 TDD                 |    |                                       |    |
| SMTc configuration defined in A.3.11.1 and A.3.11.2 |                  |      | Config 1           | SMTc.2                      |    | SMTc.2                                |    |
|   |                  |      | Config 2,3         | SMTc.1                      |    | SMTc.1                                |    |
| PDSCH/PDCCH subcarrier spacing                      |                  | kHz  | Config 1,2         | 15                          |    | 120                                   |    |
|   |                  |      | Config 3           | 30                          |    | 120                                   |    |
| EPRE ratio of PSS to SSS                            |                  |      | Config 1,2,3       | 0                           |    | 0                                     |    |
| EPRE ratio of PBCH DMRS to SSS                      |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PBCH to PBCH DMRS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH to PDSCH                        |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                  |      |                    |                             |    |                                       |    |

|   |                               |              |                                       |           |       |
|---|-------------------------------|--------------|---------------------------------------|-----------|-------|
| $\hat{E}_s$   | dBm/S<br>CS                   | Config 1,2,3 | NA<br>Link only, see clause<br>A.3.7A | -Infinity | -87   |
| SSB_RP <sup>Note 3</sup>  | dBm/S<br>CS                   | Config 1,2   |                                       | -Infinity | -87   |
|   | Note5                         | Config 3     |                                       | -Infinity | -87   |
| $\hat{E}_s / I_{ot\text{BB}}$ <sup>Note 8</sup>   | dB                            | Config 1,2,3 |                                       | -Infinity | 14.69 |
| $I_o$ <sup>Note3</sup>  | dBm/95<br>.04<br>MHz<br>Note5 | Config 1,2,3 | -Infinity                             | -58.01    |       |
| Propagation Condition   |                               | Config 1,2,3 | AWGN                                  | AWGN      |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: SSB_RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 8: Calculation of <math>E_s/I_{ot\text{BB}}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta M B_s</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                               |              |                                       |           |       |

#### A.7.6.2.5.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 5120 for UE supporting power class 1, or
- 3200 for UE supporting other power class.

In test 2, without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2560 for UE supporting power class 1, or
- 1600 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.7.6.2.6 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1)

##### A.7.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.6.1-1, A.7.6.2.6.1-2, and A.7.6.2.6.1-3.

In test 1&2 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 no gap pattern is configured as defined in Table A.7.6.2.6.1-2. If a UE supports per-FR gap it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.6.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.2.6.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR2**

| Config   | Description of serving cell                          | Description of target cell |
|--|--|----------------------------|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS,           |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 100 MHz bandwidth, TDD     |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | duplex mode                |
| Note: The UE is only required to be tested in one of the supported test configurations |  |                            |

**Table A.7.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter   | Unit | Test configuration | Value                        |                                |                              |                                | Comment   |
|---|------|--------------------|------------------------------|--------------------------------|------------------------------|--------------------------------|---|
|   |      |                    | Test 1                       | Test 2                         | Test 3                       | Test 4                         |   |
| NR RF Channel Number                              |      | Config 1,2,3       | 1, 2                         |                                |                              |                                | One NR FR1 and one NR FR2 carrier frequency is used.                                |
| Active cell                                       |      | Config 1,2,3       | NR cell 1 (Pcell)            |                                |                              |                                | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                    |      | Config 1,2,3       | NR cell 2                    |                                |                              |                                | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                    |      | Config 1,2,3       | 0                            | Gap not configured             |                              |                                | As specified in clause 9.1.2-1.   |
| Measurement gap offset                            |      | Config 1,2,3       | 39                           | N/A                            |                              |                                |   |
| SMTC-SSB parameters on NR RF Channel 1            |      | Config 1           | SSB.1 FR1                    |                                |                              |                                | As specified in clause A.3.10.1   |
|   |      | Config 2           | SSB.1 FR1                    |                                |                              |                                | As specified in clause A.3.10.1   |
|   |      | Config 3           | SSB.2 FR1                    |                                |                              |                                | As specified in clause A.3.10.1   |
| SMTC-SSB parameters on NR RF Channel 2            |      | Config 1,2,3       | SSB.3 FR2                    |                                |                              |                                | As specified in clause A.3.10.2   |
| CSI-RS for tracking parameters on NR RF Channel 1 |      | Config 1           | TRS.1.1 FDD                  |                                |                              |                                |   |
|   |      | Config 2           | TRS.1.1 TDD                  |                                |                              |                                |   |
|   |      | Config 3           | TRS.1.2 TDD                  |                                |                              |                                |   |
| <i>offsetMO</i>                                   | dB   | Config 1,2,3       | 6                            |                                |                              |                                |   |
| Hysteresis  | dB   | Config 1,2,3       | 0                            |                                |                              |                                |   |
| <i>a4-Threshold</i>                               | dBm  | Config 1,2,3       | -105                         |                                |                              |                                |   |
| CP length   |      | Config 1,2,3       | Normal                       |                                |                              |                                |   |
| TimeToTrigger                                     | s    | Config 1,2,3       | 0                            |                                |                              |                                |   |
| Filter coefficient                                |      | Config 1,2,3       | 0                            |                                |                              |                                | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | DRX .1                       | DRX .7                         | DRX .1                       | DRX .7                         | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells   |      | Config 1           | 3ms                          |                                |                              |                                | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs                          |                                |                              |                                | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                            |                                |                              |                                |   |
| T2  | s    | Config 1,2,3       | 8 for PC1;<br>5 for other PC | 82 for PC1;<br>52 for other PC | 8 for PC1;<br>5 for other PC | 82 for PC1;<br>52 for other PC |   |

**Table A.7.6.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter   |                  | Unit | Test configuration | Cell 1                      |    | Cell 2                                |    |
|---|------------------|------|--------------------|-----------------------------|----|---------------------------------------|----|
|   |                  |      |                    | T1                          | T2 | T1                                    | T2 |
| AoA setup   |                  |      | Config 1,2,3       | NA                          |    | Setup 1 as specified in clause A.3.15 |    |
| NR RF Channel Number                                |                  |      | Config 1,2,3       | 1                           |    | 2                                     |    |
| Duplex mode   |                  |      | Config 1           | FDD                         |    | TDD                                   |    |
|   |                  |      | Config 2,3         | TDD                         |    | TDD                                   |    |
| TDD configuration                                   |                  |      | Config 1           | Not Applicable              |    | TDDConf.3.1                           |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |    | TDDConf.3.1                           |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |    | TDDConf.3.1                           |    |
| BW <sub>channel</sub>                               |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| Data RBs allocated                                  |                  |      | Config 1           | 52                          |    | 66                                    |    |
|   |                  |      | Config 2           | 52                          |    | 66                                    |    |
|   |                  |      | Config 3           | 106                         |    | 66                                    |    |
| BWP BW  |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| BWP configuration                                   | Initial DL BWP   |      | Config 1,2,3       | DLBWP.0.1                   |    | N/A                                   |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                   |    | N/A                                   |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   |    | N/A                                   |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   |    | N/A                                   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                  |      | Config 1,2,3       | OP.1                        |    | OP.1                                  |    |
| PDSCH Reference measurement channel                 |                  |      | Config 1           | SR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | SR2.1 TDD                   |    |                                       |    |
| RMSI CORESET Reference Channel                      |                  |      | Config 1           | CR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | CR2.1 TDD                   |    |                                       |    |
| Dedicated CORESET RMC configuration                 |                  |      | Config 1           | CCR.1.1 FDD                 |    | -                                     |    |
|   |                  |      | Config 2           | CCR.1.1 TDD                 |    |                                       |    |
|   |                  |      | Config 3           | CCR.2.1 TDD                 |    |                                       |    |
| SMTc configuration defined in A.3.11.1 and A.3.11.2 |                  |      | Config 1           | SMTc.2                      |    | SMTc.2                                |    |
|   |                  |      | Config 2,3         | SMTc.1                      |    | SMTc.1                                |    |
| PDSCH/PDCCH subcarrier spacing                      |                  | kHz  | Config 1,2         | 15                          |    | 120                                   |    |
|   |                  |      | Config 3           | 30                          |    | 120                                   |    |
| EPRE ratio of PSS to SSS                            |                  |      | Config 1,2,3       | 0                           |    | 0                                     |    |
| EPRE ratio of PBCH DMRS to SSS                      |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PBCH to PBCH DMRS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH to PDSCH                        |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                  |      |                    |                             |    |                                       |    |

|  |                        |              |                                    |           |       |
|--|------------------------|--------------|------------------------------------|-----------|-------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                        |              |                                    |           |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz<br>Note5    |              | NA<br>Link only, see clause A.3.7A | -104.7    |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS<br>Note4      | Config 1,2   |                                    | -95.7     |       |
|  |                        | Config 3     |                                    | -95.7     |       |
| SSB_RP <sup>Note 3</sup>   | dBm/S CS<br>Note5      | Config 1,2   |                                    | -Infinity | -86.7 |
|  |                        | Config 3     |                                    | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$   | dB                     | Config 1,2,3 |                                    | -Infinity | 9     |
| $\hat{E}_s/N_{oc}$   | dB                     | Config 1,2,3 |                                    | -Infinity | 9     |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz            | Config 1,2   | -                                  | -         |       |
|  | dBm/38.16MHz           | Config 3     | -                                  | -         |       |
|  | dBm/95.04 MHz<br>Note5 | Config 1,2,3 | -66.7                              | -57.2     |       |
| Propagation Condition  |                        | Config 1,2,3 | AWGN                               |           |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> |                        |              |                                    |           |       |

**A.7.6.2.6.2 Test Requirements**

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

- 7680 for UE supporting power class 1, or
- 4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

- 81920 for UE supporting power class 1, or
- 51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.7.6.2.7 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1)

#### A.7.6.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.7.1-1, A.7.6.2.7.1-2, and A.7.6.2.7.1-3.

In test 1 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement no gap pattern is configured as defined in Table A.7.6.2.7.1-2. If the UE supports per-FR gap, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.7.1-1.

**Table A.7.6.2.7.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2**

| Config | Description of serving cell  | Description of target cell |
|--------|--|----------------------------|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                             | 120 kHz SSB SCS,           |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                             | 100 MHz bandwidth, TDD     |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                             | duplex mode                |
| Note:  | The UE is only required to be tested in one of the supported test configurations |                            |



**Table A.7.6.2.7.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter   | Unit | Test configuration | Value                          |                                  | Comment   |
|---|------|--------------------|--------------------------------|----------------------------------|---|
|   |      |                    | Test 1                         | Test 2                           |   |
| NR RF Channel Number                              |      | Config 1,2,3       | 1, 2                           |                                  | One NR FR1 and one NR FR2 carrier frequency is used.                                |
| Active cell                                       |      | Config 1,2,3       | NR cell 1 (Pcell)              |                                  | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                    |      | Config 1,2,3       | NR cell 2                      |                                  | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                    |      | Config 1,2,3       | 0                              | Gap not configured               | As specified in clause 9.1.2-1.   |
| Measurement gap offset                            |      | Config 1,2,3       | 39                             | N/A                              |   |
| SMTC-SSB parameters on NR RF Channel 1            |      | Config 1           | SSB.1 FR1                      |                                  | As specified in clause A.3.10.1   |
|   |      | Config 2           | SSB.1 FR1                      |                                  | As specified in clause A.3.10.1   |
|   |      | Config 3           | SSB.2 FR1                      |                                  | As specified in clause A.3.10.1   |
| CSI-RS for tracking parameters on NR RF Channel 1 |      | Config 1           | TRS.1.1 FDD                    |                                  |   |
|   |      | Config 2           | TRS.1.1 TDD                    |                                  |   |
|   |      | Config 3           | TRS.1.2 TDD                    |                                  |   |
| SMTC-SSB parameters on NR RF Channel 2            |      | Config 1,2,3       | SSB.3 FR2                      |                                  | As specified in clause A.3.10.2   |
| <i>offsetMO</i>                                   | dB   | Config 1,2,3       | 6                              |                                  |   |
| Hysteresis  | dB   | Config 1,2,3       | 0                              |                                  |   |
| <i>a4-Threshold</i>                               | dBm  | Config 1,2,3,4,5,6 | -105                           |                                  |   |
| CP length   |      | Config 1,2,3       | Normal                         |                                  |   |
| TimeToTrigger                                     | s    | Config 1,2,3       | 0                              |                                  |   |
| Filter coefficient                                |      | Config 1,2,3       | 0                              |                                  | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | OFF                            |                                  | DRX is not used   |
| Time offset between serving and neighbour cells   |      | Config 1           | 3ms                            |                                  | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3μs                            |                                  | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                              |                                  |   |
| T2  | s    | Config 1,2,3       | 7 for PC1;<br>4.5 for other PC | 3.5 for PC1;<br>2.5 for other PC |   |

**Table A.7.6.2.7.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter   |                  | Unit | Test configuration | Cell 1                      |    | Cell 2                                |    |
|---|------------------|------|--------------------|-----------------------------|----|---------------------------------------|----|
|   |                  |      |                    | T1                          | T2 | T1                                    | T2 |
| AoA setup   |                  |      | Config 1,2,3       | NA                          |    | Setup 1 as specified in clause A.3.15 |    |
| Beam Assumption <sup>Note 7</sup>                   |                  |      | Config 1,2,3       | N/A                         |    | Rough                                 |    |
| NR RF Channel Number                                |                  |      | Config 1,2,3       | 1                           |    | 2                                     |    |
| Duplex mode   |                  |      | Config 1           | FDD                         |    | TDD                                   |    |
|   |                  |      | Config 2,3         | TDD                         |    | TDD                                   |    |
| TDD configuration                                   |                  |      | Config 1           | Not Applicable              |    | TDDConf.3.1                           |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |    | TDDConf.3.1                           |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |    | TDDConf.3.1                           |    |
| BW <sub>channel</sub>                               |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| Data RBs allocated                                  |                  |      | Config 1           | 52                          |    | 66                                    |    |
|   |                  |      | Config 2           | 52                          |    | 66                                    |    |
|   |                  |      | Config 3           | 106                         |    | 66                                    |    |
| BWP BW  |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| BWP configuration                                   | Initial DL BWP   |      | Config 1,2,3       | DLBWP.0.1                   |    | N/A                                   |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                   |    | N/A                                   |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   |    | N/A                                   |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   |    | N/A                                   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                  |      | Config 1,2,3       | OP.1                        |    | OP.1                                  |    |
| PDSCH Reference measurement channel                 |                  |      | Config 1           | SR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | SR2.1 TDD                   |    |                                       |    |
| RMSI CORESET Reference Channel                      |                  |      | Config 1           | CR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | CR2.1 TDD                   |    |                                       |    |
| Dedicated CORESET RMC configuration                 |                  |      | Config 1           | CCR.1.1 FDD                 |    | -                                     |    |
|   |                  |      | Config 2           | CCR.1.1 TDD                 |    |                                       |    |
|   |                  |      | Config 3           | CCR.2.1 TDD                 |    |                                       |    |
| SMTc configuration defined in A.3.11.1 and A.3.11.2 |                  |      | Config 1           | SMTc.2                      |    | SMTc.2                                |    |
|   |                  |      | Config 2,3         | SMTc.1                      |    | SMTc.1                                |    |
| PDSCH/PDCCH subcarrier spacing                      |                  | kHz  | Config 1,2         | 15                          |    | 120                                   |    |
|   |                  |      | Config 3           | 30                          |    | 120                                   |    |
| EPRE ratio of PSS to SSS                            |                  |      | Config 1,2,3       | 0                           |    | 0                                     |    |
| EPRE ratio of PBCH DMRS to SSS                      |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PBCH to PBCH DMRS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH to PDSCH                        |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                  |      |                    |                             |    |                                       |    |

|   |                               |               |  |           |       |
|---|-------------------------------|---------------|--|-----------|-------|
| $\hat{E}_s$   | dBm/S<br>CS                   | Config 1,2, 3 | NA<br>Link only, see<br>clause<br>A.3.7A | -Infinity | -87   |
| SSB_RP <sup>Note 3</sup>  | dBm/S<br>CS                   | Config 1,2    |  | -Infinity | -87   |
|   | Note5                         | Config 3      |  | -Infinity | -87   |
| $\hat{E}_s / I_{ot\ BB}$ <sup>Note 8</sup>  | dB                            | Config 1,2,3  |  | -Infinity | 14.69 |
| $I_o$ <sup>Note3</sup>  | dBm/95<br>.04<br>MHz<br>Note5 | Config 1,2,3  | Infinity                                 | -58.01    |       |
| Propagation Condition   |                               | Config 1,2,3  |  | AWGN      |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: SSB_RP, <math>\hat{E}_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 8: Calculation of <math>\hat{E}_s/I_{ot\ BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_S</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |                               |               |  |           |       |

#### A.7.6.2.7.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 2 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

3360 for UE supporting power class 1, or

2080 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

#### A.7.6.2.8 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1)

##### A.7.6.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.8.1-1, A.7.6.2.8.1-2, and A.7.6.2.8.1-3.

In test 1&2 per-UE measurement gap pattern configuration # 0 as defined in Table A.7.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement no gap pattern is configured as defined in Table

A.7.6.2.8.1-2.If a UE supports per-FR gap , it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.8.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.2.8.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2**

| Config   | Description of serving cell                          | Description of target cell                                |
|--|--|---|
| 1  | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS,<br>100 MHz bandwidth, TDD<br>duplex mode |
| 2  | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 3  | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |
| Note: The UE is only required to be tested in one of the supported test configurations |  |   |

**Table A.7.6.2.8.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter   | Unit | Test configuration | Value                            |                                  |                                  |                                  | Comment   |
|---|------|--------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|---|
|   |      |                    | Test 1                           | Test 2                           | Test 3                           | Test 4                           |   |
| NR RF Channel Number                              |      | Config 1,2,3       | 1, 2                             |                                  |                                  |                                  | One NR FR1 and one NR FR2 carrier frequency is used.                                |
| Active cell                                       |      | Config 1,2,3       | NR cell 1 (Pcell)                |                                  |                                  |                                  | NR Cell 1 is on NR RF channel number 1.   |
| Neighbour cell                                    |      | Config 1,2,3       | NR cell 2                        |                                  |                                  |                                  | NR cell 2 is on NR RF channel number 2.   |
| Gap Pattern Id                                    |      | Config 1,2,3       | 0                                | Gap not configured               |                                  |                                  | As specified in clause 9.1.2-1.   |
| Measurement gap offset                            |      | Config 1,2,3       | 39                               | N/A                              |                                  |                                  |   |
| SMTC-SSB parameters on NR RF Channel 1            |      | Config 1           | SSB.1 FR1                        |                                  |                                  |                                  | As specified in clause A.3.10.1   |
|   |      | Config 2           | SSB.1 FR1                        |                                  |                                  |                                  | As specified in clause A.3.10.1   |
|   |      | Config 3           | SSB.2 FR1                        |                                  |                                  |                                  | As specified in clause A.3.10.1   |
| CSI-RS for tracking parameters on NR RF Channel 1 |      | Config 1           | TRS.1.1 FDD                      |                                  |                                  |                                  |   |
|   |      | Config 2           | TRS.1.1 TDD                      |                                  |                                  |                                  |   |
|   |      | Config 3           | TRS.1.2 TDD                      |                                  |                                  |                                  |   |
| SMTC-SSB parameters on NR RF Channel 2            |      | Config 1,2,3       | SSB.3 FR2                        |                                  |                                  |                                  | As specified in clause A.3.10.2   |
| <i>offsetMO</i>                                   | dB   | Config 1,2,3       | 6                                |                                  |                                  |                                  |   |
| Hysteresis  | dB   | Config 1,2,3       | 0                                |                                  |                                  |                                  |   |
| <i>a4-Threshold</i>                               | dBm  | Config 1,2,3       | -105                             |                                  |                                  |                                  |   |
| CP length   |      | Config 1,2,3       | Normal                           |                                  |                                  |                                  |   |
| TimeToTrigger                                     | s    | Config 1,2,3       | 0                                |                                  |                                  |                                  |   |
| Filter coefficient                                |      | Config 1,2,3       | 0                                |                                  |                                  |                                  | L3 filtering is not used  |
| DRX   |      | Config 1,2,3       | DRX .1                           | DRX .7                           | DRX .1                           | DRX .7                           | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells   |      | Config 1           | 3ms                              |                                  |                                  |                                  | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 2,3         | 3µs                              |                                  |                                  |                                  | Synchronous cells.  |
| T1  | s    | Config 1,2,3       | 5                                |                                  |                                  |                                  |   |
| T2  | s    | Config 1,2,3       | 11 for PC1; 6.5 for other PCT BD | 108 for PC1; 67 for other PCT BD | 11 for PC1; 6.5 for other PCT BD | 108 for PC1; 67 for other PCT BD |   |

**Table A.7.6.2.8.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter   |                  | Unit | Test configuration | Cell 1                      |    | Cell 2                                |    |
|---|------------------|------|--------------------|-----------------------------|----|---------------------------------------|----|
|   |                  |      |                    | T1                          | T2 | T1                                    | T2 |
| AoA setup   |                  |      | Config 1,2,3       | NA                          |    | Setup 1 as specified in clause A.3.15 |    |
| Beam Assumption <sup>Note 7</sup>                   |                  |      | Config 1,2,3       | N/A                         |    | Rough                                 |    |
| NR RF Channel Number                                |                  |      | Config 1,2,3       | 1                           |    | 2                                     |    |
| Duplex mode   |                  |      | Config 1           | FDD                         |    | TDD                                   |    |
|   |                  |      | Config 2,3         | TDD                         |    | TDD                                   |    |
| TDD configuration                                   |                  |      | Config 1           | Not Applicable              |    | TDDConf.3.1                           |    |
|   |                  |      | Config 2           | TDDConf.1.1                 |    | TDDConf.3.1                           |    |
|   |                  |      | Config 3           | TDDConf.2.1                 |    | TDDConf.3.1                           |    |
| BW <sub>channel</sub>                               |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| Data RBs allocated                                  |                  |      | Config 1           | 52                          |    | 66                                    |    |
|   |                  |      | Config 2           | 52                          |    | 66                                    |    |
|   |                  |      | Config 3           | 106                         |    | 66                                    |    |
| BWP BW  |                  | MHz  | Config 1           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 2           | 10: N <sub>RB,c</sub> = 52  |    | 100: N <sub>RB,c</sub> = 66           |    |
|   |                  |      | Config 3           | 40: N <sub>RB,c</sub> = 106 |    | 100: N <sub>RB,c</sub> = 66           |    |
| BWP configuration                                   | Initial DL BWP   |      | Config 1,2,3       | DLBWP.0.1                   |    | N/A                                   |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                   |    | N/A                                   |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                   |    | N/A                                   |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                   |    | N/A                                   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                  |      | Config 1,2,3       | OP.1                        |    | OP.1                                  |    |
| PDSCH Reference measurement channel                 |                  |      | Config 1           | SR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | SR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | SR2.1 TDD                   |    |                                       |    |
| RMSI CORESET Reference Channel                      |                  |      | Config 1           | CR.1.1 FDD                  |    | -                                     |    |
|   |                  |      | Config 2           | CR.1.1 TDD                  |    |                                       |    |
|   |                  |      | Config 3           | CR2.1 TDD                   |    |                                       |    |
| Dedicated CORESET RMC configuration                 |                  |      | Config 1           | CCR.1.1 FDD                 |    | -                                     |    |
|   |                  |      | Config 2           | CCR.1.1 TDD                 |    |                                       |    |
|   |                  |      | Config 3           | CCR.2.1 TDD                 |    |                                       |    |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |                  |      | Config 1           | SMTC.2                      |    | SMTC.2                                |    |
|   |                  |      | Config 2,3         | SMTC.1                      |    | SMTC.1                                |    |
| PDSCH/PDCCH subcarrier spacing                      |                  | kHz  | Config 1,2         | 15                          |    | 120                                   |    |
|   |                  |      | Config 3           | 30                          |    | 120                                   |    |
| EPRE ratio of PSS to SSS                            |                  |      | Config 1,2,3       | 0                           |    | 0                                     |    |
| EPRE ratio of PBCH DMRS to SSS                      |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PBCH to PBCH DMRS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH DMRS to SSS                     |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of PDSCH to PDSCH                        |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                  |      |                    |                             |    |                                       |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                  |      |                    |                             |    |                                       |    |



|  |                        |              |                                    |           |       |
|--|------------------------|--------------|------------------------------------|-----------|-------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz<br>Note5    |              | NA<br>Link only, see clause A.3.7A | -104.7    |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS<br>Note4      | Config 1,2   |                                    | -95.7     |       |
|  |                        | Config 3     |                                    | -95.7     |       |
| SSB_RP <sup>Note3</sup>  | dBm/S CS<br>Note5      | Config 1,2   |                                    | -Infinity | -86.7 |
|  |                        | Config 3     |                                    | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$   | dB                     | Config 1,2,3 |                                    | -Infinity | 9     |
| $\hat{E}_s/N_{oc}$   | dB                     | Config 1,2,3 |                                    | -Infinity | 9     |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz            | Config 1,2   |                                    | -         | -     |
|  | dBm/38.16MHz           | Config 3     |                                    | -         | -     |
|  | dBm/95.04 MHz<br>Note5 | Config 1,2,3 |                                    | -66.7     | -57.2 |
| Propagation Condition  |                        | Config 1,2,3 | AWGN                               |           |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                        |              |                                    |           |       |

### A.7.6.2.8.2 Test Requirements

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

- 10080 for UE supporting power class 1, or
- 6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

- 107520 for UE supporting power class 1, or
- 66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.2.9 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2) (rel16 additional mandatory gap pattern 17)

#### A.7.6.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.9.1-1, A.7.6.2.9.1-2, and A.7.6.2.9.1-3.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.9.1-1.

**Table A.7.6.2.9.1-1 SA event triggered reporting tests without SSB index reading for FR2-FR2**

| Config        | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. |   |

**Table A.7.6.2.9.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection (GP17)**

| Parameter                                       | Unit | Test configuration | Value                   | Comment                                 |
|---|------|--------------------|-------------------------|---|
| NR RF Channel Number                            |      | Config 1           | 1, 2                    | Two FR2 NR carrier frequencies is used. |
| Active cell                                     |      | Config 1           | NR cell 1 (Pcell)       | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1           | NR cell 2               | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id                                  |      | Config 1           | 17                      | As specified in clause 9.1.2-1.         |
| Measurement gap offset                          |      | Config 1           | 39                      |   |
| SMTTC-SSB parameters                            |      | Config 1           | SSB.3 FR2               | As specified in clause A.3.10.2         |
| A3-Offset                                       | dB   | Config 1           | -30                     |   |
| Hysteresis                                      | dB   | Config 1           | 0                       |   |
| CP length                                       |      | Config 1           | Normal                  |   |
| TimeToTrigger                                   | s    | Config 1           | 0                       |   |
| Filter coefficient                              |      | Config 1           | 0                       | L3 filtering is not used                |
| DRX   |      | Config 1           | OFF                     | DRX is not used                         |
| Time offset between serving and neighbour cells |      | Config 1           | 3µs                     | Synchronous cells.                      |
| T1  | s    | Config 1           | 5                       |   |
| T2  | s    | Config 1           | 6 (PC1)<br>4 (other PC) |   |

**Table A.7.6.2.9.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection (GP17)**

| Parameter                         |                  | Unit | Test configuration | Cell 1                                |    | Cell 1                      |    |
|-----------------------------------|------------------|------|--------------------|---------------------------------------|----|-----------------------------|----|
|                                   |                  |      |                    | T1                                    | T2 | T1                          | T2 |
| AoA setup                         |                  |      | Config 1           | Setup 3 as specified in clause A.3.15 |    |                             |    |
|                                   |                  |      |                    | AoA1                                  |    | AoA2                        |    |
| Beam assumption <sup>Note 7</sup> |                  |      | Config 1           | Rough                                 |    | Rough                       |    |
| NR RF Channel Number              |                  |      | Config 1           | 1                                     |    | 2                           |    |
| Duplex mode                       |                  |      | Config 1           | TDD                                   |    | TDD                         |    |
| TDD configuration                 |                  |      | Config 1           | TDDConf.3.1                           |    | TDDConf.3.1                 |    |
| BW <sub>channel</sub>             |                  | MHz  | Config 1           | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| BWP BW                            |                  | MHz  | Config 1           | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| BWP configuration                 | Initial DL BWP   |      | Config 1           | DLBWP.0.1                             |    | N/A                         |    |
|                                   | Initial UL BWP   |      |                    | ULBWP.0.1                             |    | N/A                         |    |
|                                   | Dedicated DL BWP |      |                    | DLBWP.1.1                             |    | N/A                         |    |
|                                   | Dedicated UL BWP |      |                    | ULBWP.1.1                             |    | N/A                         |    |

|  |                        |          |                 |        |           |        |
|--|------------------------|----------|-----------------|--------|-----------|--------|
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |                        | Config 1 | OP.1            |        | OP.1      |        |
| PDSCH Reference measurement channel  |                        | Config 1 | SR.3.1 TDD      |        | -         |        |
| CORESET Reference Channel  |                        | Config 1 | CR.3.1 TDD      |        | -         |        |
| SMTTC configuration defined in A.3.11.1 and A.3.11.2   |                        | Config 1 | SMTTC.1         |        | SMTTC.1   |        |
| PDSCH/PDCCH subcarrier spacing   | kHz                    | Config 1 | 120             |        | 120       |        |
| TRS configuration  |                        | Config 1 | TRS.2.1 TDD     |        | N/A       |        |
| TCI configuration  |                        | Config 1 | CSI-RS.Config.0 |        | N/A       |        |
| EPRE ratio of PSS to SSS   |                        | Config 1 | 0               |        | 0         |        |
| EPRE ratio of PBCH DMRS to SSS   |                        |          |                 |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS  |                        |          |                 |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS  |                        |          |                 |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                        |          |                 |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS  |                        |          |                 |        |           |        |
| EPRE ratio of PDSCH to PDSCH   |                        |          |                 |        |           |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                        |          |                 |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                        |          |                 |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz<br>Note5    |          | N/A             |        | N/A       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS<br>Note4      | Config 1 | N/A             |        | N/A       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS<br>Note5      | Config 1 | -87             | -87    | -Infinity | -87    |
| $\hat{E}_s / I_{ot}$   | dB                     | Config 1 | N/A             | N/A    | -Infinity | N/A    |
| $\hat{E}_s / N_{oc}$   | dB                     | Config 1 | N/A             | N/A    | -Infinity | N/A    |
| $I_o$ <sup>Note3</sup>   | dBm/95.04 MHz<br>Note5 | Config 1 | -58.01          | -58.01 | -Infinity | -58.01 |
| Propagation Condition  |                        | Config 1 | AWGN            |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                        |          |                 |        |           |        |

### A.7.6.2.9.2 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 5120ms (PC1) or 3200ms (other than PC1) from the beginning of time period T2.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.2.10 SA event triggered reporting test without gap under non-DRX

#### A.7.6.2.10.1 Test Purpose and Environment

The purpose of this test is to verify that if UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the network, the UE makes correct reporting of an event. This test will partly verify the inter-frequency without gap cell search requirements in clause 9.3.9. Supported test configurations are shown in table A.7.6.2.10.1-1.

**Table A.7.6.2.10.1-1: supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

There are two cells in the test, NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The SSB of Cell 2 is completely within UE's active BWP BW. The RBs containing SSB from cell 1 and cell 2 should be different in frequency location within the cell bandwidth. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.2.10.1-2, A.7.6.2.10.1-3 and A.7.6.2.10.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

**Table A.7.6.2.10.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter                             | Unit | Config | Value          | Comment                                 |
|---------------------------------------|------|--------|----------------|---|
| Active cell                           |      | 1      | PCell (Cell 1) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell                        |      | 1      | Cell 2         | NR cell 2 is on NR RF channel number 2. |
| RF Channel Number                     |      | 1      | 1, 2           | Two FR2 NR carrier frequencies is used. |
| SMTC configuration                    |      | 1      | SMTC.1         |   |
| A3-Offset                             | dB   | 1      | -6             |   |
| CP length                             |      | 1      | Normal         |   |
| Hysteresis                            | dB   | 1      | 0              |   |
| Time To Trigger                       | s    | 1      | 0              |   |
| Filter coefficient                    |      | 1      | 0              | L3 filtering is not used                |
| DRX                                   |      | 1      | OFF            |   |
| Time offset between Cell 1 and Cell 2 |      | 1      | 3 $\mu$ s      | Synchronous cells                       |
| T1                                    | s    | 1      | 5              |   |
| T2                                    | s    | 1      | 5              |   |

**Table A.7.6.2.10.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter                           | Unit | Config | Cell 1                      |    | Cell 2                      |    |
|-------------------------------------|------|--------|-----------------------------|----|-----------------------------|----|
|                                     |      |        | T1                          | T2 | T1                          | T2 |
| TDD configuration                   |      | 1      | TDDConf.3.1                 |    | TDDConf.3.1                 |    |
| BW <sub>channel</sub>               | MHz  | 1      | 100: N <sub>RB,c</sub> = 66 |    | 100: N <sub>RB,c</sub> = 66 |    |
| Initial BWP configuration           |      | 1      | DLBWP.0.1<br>ULBWP.0.1      |    | DLBWP.0.1<br>ULBWP.0.1      |    |
| Active DL BWP configuration         |      | 1      | DLBWP.1.1                   |    | DLBWP.1.1                   |    |
| Active UL BWP configuration         |      | 1      | ULBWP.1.1                   |    | ULBWP.1.1                   |    |
| RLM-RS                              |      | 1      | SSB                         |    | SSB                         |    |
| PDSCH RMC configuration             |      | 1      | SR.3.1 TDD                  |    | N/A                         |    |
| RMSI CORESET RMC configuration      |      | 1      | CR.3.1 TDD                  |    | CR.3.1 TDD                  |    |
| Dedicated CORESET RMC configuration |      | 1      | CCR.3.1 TDD                 |    | CCR.3.1 TDD                 |    |
| TRS configuration                   |      | 1      | TRS.2.1 TDD                 |    | N/A                         |    |
| PDSCH/PDCCH TCI states              |      | 1      | TCI.State.2                 |    | N/A                         |    |
| OCNG Patterns                       |      | 1      | OP.1                        |    | OP.1                        |    |
| SSB                                 |      | 1      | SSB.3 FR2                   |    | SSB.3 FR2                   |    |
| Propagation Condition               |      | 1      | AWGN                        |    |                             |    |

**Table A.7.6.2.10.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter                         | Unit   | Config | Cell 1                      |     | Cell 2    |     |
|-----------------------------------|--|--------|-----------------------------|-----|-----------|-----|
|                                   |  |        | T1                          | T2  | T1        | T2  |
| AoA setup                         |  | 1      | Setup 1 defined in A.3.15.1 |     |           |     |
| Beam assumption <sup>Note 4</sup> |  | 1      | Rough                       |     | Rough     |     |
| $\hat{E}_s/I_{ot}$                | dB   | 1      | 4                           | 4   | -Infinity | 8   |
| $N_{oc}$ <sup>Note 2</sup>        | dBm/15 KHz   | 1      | -102                        |     |           |     |
| $N_{oc}$ <sup>Note 2</sup>        | dBm/SCS  | 1      | -93                         |     |           |     |
| SS-RSRP                           | dBm/SCS  | 1      | -89                         | -89 | -Infinity | -85 |
| $\hat{E}_s/N_{oc}$                | dB   | 1      | 4                           | 4   | -Infinity | 8   |
| $I_o$                             | dBm/95.04MHz   | 1      | -58.56                      |     | -55.38    |     |
| Note 1:                           | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |        |                             |     |           |     |
| Note 2:                           | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |        |                             |     |           |     |
| Note 3:                           | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |        |                             |     |           |     |
| Note 4:                           | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |        |                             |     |           |     |

### A.7.6.2.10.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.7.6.2.11 SA event triggered reporting test without gap under DRX

#### A.7.6.2.11.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD inter-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.2.11.1-1.

**Table A.7.6.2.11.1-1: supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

There are two cells in the test: PCell (Cell 1) on NR RF channel 1 and a FR2 neighbour cell (Cell 2) on NR RF channel 2. The SSB of Cell 2 is completely within UE's active BWP BW. The RBs containing SSB from cell 1 and cell 2 should be different in frequency location within the cell bandwidth. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.2.11.1-2 ~ 6.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.2.11.1-2: General test parameters for inter-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                             | Unit | Config | Value          | Comment   |
|---------------------------------------|------|--------|----------------|---|
| NR RF Channel Number                  |      | 1, 2   | 1, 2           | 2 TDD carrier frequency are used for the NR cells.          |
| Active cell                           |      | 1, 2   | PCell (Cell 1) | Cell 1 is on NR RF channel number 1.                        |
| Neighbour cell                        |      | 1, 2   | Cell 2         | Cell to be identified. Cell 2 is on NR RF channel number 2. |
| SMTc configuration                    |      | 1, 2   | SMTc.1         |   |
| A3-Offset                             | dB   | 1, 2   | -6             |   |
| CP length                             |      | 1, 2   | Normal         |   |
| Hysteresis                            | dB   | 1, 2   | 0              |   |
| Time To Trigger                       | s    | 1, 2   | 0              |   |
| Filter coefficient                    |      | 1, 2   | 0              | L3 filtering is not used                                    |
| DRX                                   |      | 1, 2   | DRX.7          |   |
| Time offset between Cell 1 and Cell 2 |      | 1, 2   | 3 $\mu$ s      | Synchronous cells   |
| T1                                    | s    | 1, 2   | 5              |   |
| T2                                    | s    | 1, 2   | 52             |   |

**Table A.7.6.2.11.1-3: NR Cell specific test parameters for inter-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                           | Unit | Config | Cell 1                      |    | Cell 2                      |    |
|-------------------------------------|------|--------|-----------------------------|----|-----------------------------|----|
|                                     |      |        | T1                          | T2 | T1                          | T2 |
| NR RF Channel Number                |      | 1, 2   | 1                           |    | 2                           |    |
| TDD configuration                   |      | 1, 2   | TDDConf.3.1                 |    | TDDConf.3.1                 |    |
| BW <sub>channel</sub>               | MHz  | 1, 2   | 100: N <sub>RB,c</sub> = 66 |    | 100: N <sub>RB,c</sub> = 66 |    |
| Initial BWP configuration           |      | 1, 2   | DLBWP.0.1<br>ULBWP.0.1      |    | N/A                         |    |
| Active DL BWP configuration         |      | 1, 2   | DLBWP.1.1                   |    | N/A                         |    |
| Active UL BWP configuration         |      | 1, 2   | ULBWP.1.1                   |    | N/A                         |    |
| RLM-RS                              |      | 1, 2   | SSB                         |    | N/A                         |    |
| PDSCH RMC configuration             |      | 1, 2   | SR.3.1 TDD                  |    | N/A                         |    |
| RMSI CORESET RMC configuration      |      | 1, 2   | CR.3.1 TDD                  |    | N/A                         |    |
| Dedicated CORESET RMC configuration |      | 1, 2   | CCR.3.1 TDD                 |    | N/A                         |    |
| TRS configuration                   |      | 1, 2   | TRS.2.1 TDD                 |    | N/A                         |    |
| PDSCH/PDCCH TCI states              |      | 1, 2   | TCI.State.2                 |    | N/A                         |    |
| OCNG Patterns                       |      | 1, 2   | OP.1                        |    | OP.1                        |    |
| SSB                                 |      | 1      | SSB.3 FR2                   |    | SSB.3 FR2                   |    |
|                                     |      | 2      | SSB.4 FR2                   |    | SSB.4 FR2                   |    |
| Propagation Condition               |      | 1, 2   | AWGN                        |    |                             |    |



**Table A.7.6.2.11.1-4: NR OTA Cell specific test parameters for inter-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                         | Unit   | Config | Cell 1                      |        | Cell 2    |        |
|-----------------------------------|--|--------|-----------------------------|--------|-----------|--------|
|                                   |  |        | T1                          | T2     | T1        | T2     |
| AoA setup                         |  | 1, 2   | Setup 1 defined in A.3.15.1 |        |           |        |
| Beam assumption <sup>Note 4</sup> |  | 1,2    | Rough                       |        | Rough     |        |
| $\hat{E}_s/I_{ot}$                | dB   | 1, 2   | 4                           | -1.46  | -Infinity | -1.46  |
| $N_{oc}$ <sup>Note 2</sup>        | dBm/15 KHz   | 1, 2   | -98                         |        |           |        |
| $N_{oc}$ <sup>Note 2</sup>        | dBm/SCS  | 1      | -89                         |        |           |        |
|                                   |  | 2      | -86                         |        |           |        |
| SS-RSRP                           | dBm/SCS  | 1      | -85                         | -85    | -Infinity | -85    |
|                                   |  | 2      | -82                         | -82    | -Infinity | -82    |
| $\hat{E}_s/N_{oc}$                | dB   | 1, 2   | 4                           | 4      | -Infinity | 4      |
| $I_o$                             | dBm/95.04MHz   | 1      | -54.53                      | -52.18 | -54.53    | -52.18 |
| Note 1:                           | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |        |                             |        |           |        |
| Note 2:                           | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |        |                             |        |           |        |
| Note 3:                           | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |        |                             |        |           |        |
| Note 4:                           | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  |        |                             |        |           |        |

### A.7.6.2.11.2 Test Requirements

In test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4est

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.3 L1-RSRP measurement for beam reporting

#### A.7.6.3.1 SSB based L1-RSRP measurement when DRX is not used

#### A.7.6.3.1 SSB based L1-RSRP measurement when DRX is not used

##### A.7.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.7.6.3.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

**Table A.7.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test**

| <b>Config</b> | <b>Description</b>   |
|---------------|--|
| 1             | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                           |
| 2             | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                           |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

#### A.7.6.3.1.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.1.2-1 and Table A.7.6.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.7.6.3.1.2-1: General test parameters

| Parameter  | Config | Unit | Value                       |
|--|--------|------|-----------------------------|
| SSB GSCN   | 1~2    |      | freq1                       |
| Duplex mode  | 1~2    |      | TDD                         |
| TDD Configuration  | 1~2    |      | TDDConf.3.1                 |
| BW <sub>channel</sub>  | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | 1~2    |      | 66                          |
| PDSCH Reference measurement channel  | 1      |      | SR.3.2 TDD                  |
|  | 2      |      | SR.3.3 TDD                  |
| RMSI CORESET Reference Channel   | 1      |      | CR.3.1 TDD                  |
|  | 2      |      | CR.3.2 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |      | CCR.3.1 TDD                 |
|  | 2      |      | CCR.3.7 TDD                 |
| SSB configuration  | 1      |      | SSB.1 FR2                   |
|  | 2      |      | SSB.2 FR2                   |
| OCNG Patterns  | 1~2    |      | OP.1                        |
| Initial BWP Configuration  | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~2    |      | DLBWP.1.3<br>ULBWP.1.3      |
| SMTC configuration   | 1~2    |      | SMTC.1                      |
| TRS Configuration  | 1~2    |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration  | 1~2    |      | TCI.State.2                 |
| DRX configuration  | 1~2    |      | Off                         |
| reportConfigType   | 1~2    |      | periodic                    |
| reportQuantity   | 1~2    |      | ssb-Index-RSRP              |
| Number of reported RS  | 1~2    |      | 2                           |
| L1-RSRP reporting period   | 1~2    | slot | 320                         |
| T1   | 1~2    | s    | 5                           |
| T2   | 1~2    | s    | 2                           |
| EPRE ratio of PSS to SSS   | 1~2    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                             |
| Propagation condition  |        |      |                             |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |

Table A.7.6.3.1.2-2: SSB specific test parameters

| Parameter   | Config | Unit         | SSB#0                         |        | SSB#1     |        |
|---|--------|--------------|-------------------------------|--------|-----------|--------|
|   |        |              | T1                            | T2     | T1        | T2     |
| Angle of arrival configuration  |        |              | Setup 1 according to A.3.15.1 |        |           |        |
| Beam Assumption <sup>Note 4</sup>   | 1-2    |              | Rough                         |        |           |        |
| $N_{oc}$ <sup>Note2</sup>   | 1~2    | dBm/15kHz    | -105                          |        |           |        |
| $N_{oc}$ <sup>Note2</sup>   | 1      | dBm/SSB SCS  | -96                           |        |           |        |
|   | 2      |              | -93                           |        |           |        |
| $\hat{E}_s / I_{ot}$  | 1~2    | dB           | 0                             | 0      | -Infinity | 9      |
| SSB_RP <sup>Note3</sup>   | 1      | dBm/SSB SCS  | -96                           | -96    | -Infinity | -87    |
|   | 2      |              | -93                           | -93    | -Infinity | -84    |
| $I_o$ <sup>Note3</sup>  | 1      | dBm/95.04MHz | -63.97                        | -63.97 | -66.98    | -57.47 |
|   | 2      |              | -63.97                        | -63.97 | -66.98    | -57.47 |
| $\hat{E}_s / N_{oc}$  | 1~2    | dB           | 0                             | 0      | -Infinity | 9      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |        |           |        |

### A.7.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

### A.7.6.3.2 SSB based L1-RSRP measurement when DRX is used

#### A.7.6.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.7.6.3.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.7.6.3.2.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

| Config   | Description  |
|--|--|
| 1  | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.7.6.3.2.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.2.2-1 and Table A.7.6.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.7.6.3.2.2-1: General test parameters

| Parameter  | Config | Unit | Value                       |
|--|--------|------|-----------------------------|
| SSB GSCN   | 1~2    |      | freq1                       |
| Duplex mode  | 1~2    |      | TDD                         |
| TDD Configuration  | 1~2    |      | TDDConf.3.1                 |
| BW <sub>channel</sub>  | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated   | 1~2    |      | 66                          |
| PDSCH Reference measurement channel  | 1      |      | SR.3.2 TDD                  |
|  | 2      |      | SR.3.3 TDD                  |
| RMSI CORESET Reference Channel   | 1      |      | CR.3.1 TDD                  |
|  | 2      |      | CR.3.2 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |      | CCR.3.1 TDD                 |
|  | 2      |      | CCR.3.7 TDD                 |
| SSB configuration  | 1      |      | SSB.1 FR2                   |
|  | 2      |      | SSB.2 FR2                   |
| OCNG Patterns  | 1~2    |      | OP.1                        |
| Initial BWP Configuration  | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1~2    |      | DLBWP.1.3<br>ULBWP.1.3      |
| SMTC configuration   | 1~2    |      | SMTC.1                      |
| TRS Configuration  | 1~2    |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration  | 1~2    |      | TCI.State.2                 |
| DRX configuration  | 1~2    |      | DRX.3                       |
| reportConfigType   | 1~2    |      | periodic                    |
| reportQuantity   | 1~2    |      | ssb-Index-RSRP              |
| Number of reported RS  | 1~2    |      | 2                           |
| L1-RSRP reporting period   | 1~2    | slot | 320                         |
| T1   | 1~2    | s    | 5                           |
| T2   | 1~2    | s    | 3                           |
| EPRE ratio of PSS to SSS   | 1~2    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                             |
| Propagation condition  |        |      |                             |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |

Table A.7.6.3.2.2-2: SSB specific test parameters

| Parameter   | Config | Unit         | SSB#0                         |        | SSB#1     |        |
|---|--------|--------------|-------------------------------|--------|-----------|--------|
|   |        |              | T1                            | T2     | T1        | T2     |
| Angle of arrival configuration  |        |              | Setup 1 according to A.3.15.1 |        |           |        |
| Beam Assumption <sup>Note 4</sup>   | 1-2    |              | Rough                         |        |           |        |
| $N_{oc}$ <sup>Note2</sup>   | 1~2    | dBm/15kHz    | -105                          |        |           |        |
| $N_{oc}$ <sup>Note2</sup>   | 1      | dBm/SSB SCS  | -96                           |        |           |        |
|   | 2      |              | -93                           |        |           |        |
| $\hat{E}_s / I_{ot}$  | 1~2    | dB           | 0                             | 0      | -Infinity | 9      |
| SSB_RP <sup>Note3</sup>   | 1      | dBm/SSB SCS  | -96                           | -96    | -Infinity | -87    |
|   | 2      |              | -93                           | -93    | -Infinity | -84    |
| $I_o$ <sup>Note3</sup>  | 1      | dBm/95.04MHz | -63.97                        | -63.97 | -66.98    | -57.47 |
|   | 2      |              | -63.97                        | -63.97 | -66.98    | -57.47 |
| $\hat{E}_s / N_{oc}$  | 1~2    | dB           | 0                             | 0      | -Infinity | 9      |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |        |           |        |

### A.7.6.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

### A.7.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

#### A.7.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.7.6.3.3.1-1.

Table A.7.6.3.3.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                        |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.7.6.3.3.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.3.2-1 and Table A.7.6.3.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 480ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.3.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.



Table A.7.6.3.3.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1      |      | freq1  |
| Duplex mode                                       | 1      |      | TDD  |
| TDD Configuration                                 | 1      |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>                             | 1      | MHz  | 100: N <sub>RB,C</sub> = 66                  |
| PDSCH Reference measurement channel               | 1      |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel                    | 1      |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel               | 1      |      | CCR.3.1 TDD                                  |
| SSB configuration                                 | 1      |      | SSB.1 FR2                                    |
| CSI-RS configuration                              | 1      |      | CSI-RS.3.3 TDD                               |
| OCNG Patterns                                     | 1      |      | OP.1   |
| Initial BWP Configuration                         | 1      |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration                       | 1      |      | DLBWP.1.1<br>ULBWP.1.1                       |
| SMTTC configuration                               | 1      |      | SMTTC.1                                      |
| TRS Configuration                                 | 1      |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration                     | 1      |      | TCI.State.2                                  |
| DRX configuration                                 | 1      |      | Off  |
| reportConfigType                                  | 1      |      | aperiodic                                    |
| reportQuantity                                    | 1      |      | cri-RSRP                                     |
| Number of reported RS                             | 1      |      | 2  |
| qcl-Info  | 1      |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList                              | 1      |      | 8  |
| Propagation condition                             | 1      |      | AWGN   |
| T1  | 1      | s    | 5  |
| EPRE ratio of PSS to SSS                          | 1      | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |        |      |  |
| Note 1:   |        |      |  |

Table A.7.6.3.3.2-1: CSI-RS specific test parameters

| Parameter  | Config | Unit         | CSI-RS#0                      | CSI-RS#1 |
|--|--------|--------------|-------------------------------|----------|
| Angle of arrival configuration   | 1      |              | Setup 1 according to A.3.15.1 |          |
| Beam Assumption <sup>Note 4</sup>  | 1      |              | Rough                         | Rough    |
| $N_{oc}$ <sup>Note1</sup>  | 1      | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>  | 1      | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s / I_{ot}$   | 1      | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note2</sup>   | 1      | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>   | 1      | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s / N_{oc}$   | 1      | dB           | 0                             | 9        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |          |

### A.7.6.3.3.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of [-10 ~ +20] dB.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.6.3.3.3-1.

For relative accuracy of CSI-RS0 compared with CSI-RS1, the UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.7.6.3.3.3-1: L1-RSRP absolute accuracy test requirement

|   | Test requirement <sup>Notes1,2,3</sup>  |
|---|---|
| CSI-RS0   | $CSI-RS\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP0 + \delta + G_{max}$ |
| CSI-RS1   | $CSI-RS\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP1 + \delta + G_{max}$ |
| <p>Note 1: <math>CSI-RS\_RPn</math> is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration</p> <p>Note 2: <math>\delta</math> is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the <math>I_o</math> used in the test</p> <p>Note 3: <math>G_{min}</math> and <math>G_{max}</math> are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class</p> |   |

### A.7.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

#### A.7.6.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.7.6.3.4.1-1.

**Table A.7.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test**

| <b>Config</b> | <b>Description</b>   |
|---------------|--|
| 1             | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                        |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

#### A.7.6.3.4.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.4.2-1 and Table A.7.6.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 1440ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.3.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.7.6.3.4.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1      |      | freq1  |
| Duplex mode                                       | 1      |      | TDD  |
| TDD Configuration                                 | 1      |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>                             | 1      | MHz  | 100: N <sub>RB,C</sub> = 66                  |
| PDSCH Reference measurement channel               | 1      |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel                    | 1      |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel               | 1      |      | CCR.3.1 TDD                                  |
| SSB configuration                                 | 1      |      | SSB.1 FR2                                    |
| CSI-RS configuration                              | 1      |      | CSI-RS.3.3 TDD                               |
| OCNG Patterns                                     | 1      |      | OP.1   |
| Initial BWP Configuration                         | 1      |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration                       | 1      |      | DLBWP.1.1<br>ULBWP.1.1                       |
| SMTc configuration                                | 1      |      | SMTc.1                                       |
| TRS Configuration                                 | 1      |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration                     | 1      |      | TCI.State.2                                  |
| DRX configuration                                 | 1      |      | DRX.3  |
| reportConfigType                                  | 1      |      | aperiodic                                    |
| reportQuantity                                    | 1      |      | cri-RSRP                                     |
| Number of reported RS                             | 1      |      | 2  |
| qcl-Info  | 1      |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList                              | 1      |      | 8  |
| Propagation condition                             | 1      |      | AWGN   |
| T1  | 1      | s    | 5  |
| EPRE ratio of PSS to SSS                          | 1      | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |        |      |  |
| Note 1:   |        |      |  |

Table A.7.6.3.4.2-1: CSI-RS specific test parameters

| Parameter  | Config | Unit         | CSI-RS#0                      | CSI-RS#1 |
|--|--------|--------------|-------------------------------|----------|
| Angle of arrival configuration   | 1      |              | Setup 1 according to A.3.15.1 |          |
| Beam Assumption <sup>Note 4</sup>  | 1      |              | Rough                         | Rough    |
| $N_{oc}$ <sup>Note1</sup>  | 1      | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>  | 1      | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s / I_{ot}$   | 1      | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note2</sup>   | 1      | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>   | 1      | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s / N_{oc}$   | 1      | dB           | 0                             | 9        |
| <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |          |

### A.7.6.3.3.3 Test Requirements

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of [-10 ~ +20] dB.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.6.3.4.3-1.

For relative accuracy of CSI-RS0 compared with CSI-RS1, the UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.7.6.3.4.3-1: L1-RSRP absolute accuracy test requirement

|   | Test requirement <sup>Notes1,2,3</sup>  |
|---|---|
| CSI-RS0   | $CSI-RS\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP0 + \delta + G_{max}$ |
| CSI-RS1   | $CSI-RS\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP1 + \delta + G_{max}$ |
| <p>Note 1: CSI-RS_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration</p> <p>Note 2: <math>\delta</math> is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the <math>I_o</math> used in the test</p> <p>Note 3: <math>G_{min}</math> and <math>G_{max}</math> are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class</p> |   |

## A.7.6.4 CLI measurements

### A.7.6.4.1 SRS-RSRP measurement with non-DRX

#### A.7.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 9.7.2.5 with the testing configurations for NR cells in Table A.7.6.4.1.1-1.

**Table A.7.6.4.1.1-1: Applicable NR configurations for FR2 SRS-RSRP test**

| Configuration | Description  |
|---------------|--|
| 1             | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |

#### A.7.6.4.1.2 Test Parameters

One cell is deployed in the test, which is FR2 PCell (Cell 1). The test parameters for PCell is given in Table A.7.6.4.1.2-1 ~ A.7.6.4.1.2-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table A.7.6.4.1.2-4 and the test parameters for the (virtual) neighbour cell UE in Table A. 7.6.4.1.2-3. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

**Table A.7.6.4.1.2-1: General test parameters for SRS-RSRP event triggered reporting for PCell in FR2**

| Parameter   | Unit | Test configuration | Value     | Comment                  |
|---|------|--------------------|-----------|--------------------------|
| Active cell   |      | 1                  | Cell 1    |                          |
| RF Channel Number   |      | 1                  | 1: Cell 1 |                          |
| SSB configuration   |      | 1                  | SSB.1 FR2 |                          |
| SMTC configuration  |      | 1                  | SMTC.1    |                          |
| SRS configuration   |      | 1                  | SRSCnf.1  | Table A.7.6.4.1.2-4      |
| CP length   |      | 1                  | Normal    |                          |
| i1-Threshold  | dBm  | 1                  | -103      |                          |
| Hysteresis  | dB   | 1                  | 0         |                          |
| Time To Trigger   | s    | 1                  | 0         |                          |
| Filter coefficient  |      | 1                  | 0         | L3 filtering is not used |
| DRX   | ms   | 1                  | OFF       | Non-DRX                  |
| Time offset between DL from serving cell and SRS from test system | µs   | 1                  | 10.67     |                          |
| T1  | s    | 1                  | 5         |                          |
| T2  | s    | 1                  | 1         |                          |

**Table A.7.6.4.1.2-2: NR Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell in FR2**

| Parameter                           | Unit | Test configuration | Cell 1              |    |
|-------------------------------------|------|--------------------|---------------------|----|
|                                     |      |                    | T1                  | T2 |
| TDD configuration                   |      | 1                  | TDDConf.3.1         |    |
| PDSCH RMC configuration             |      | 1                  | SR.3.1 TDD          |    |
| RMSI CORESET RMC configuration      |      | 1                  | CR.3.1 TDD          |    |
| Dedicated CORESET RMC configuration |      | 1                  | CCR.3.1 TDD         |    |
| OCNG Patterns                       |      | 1                  | OP.1                |    |
| TRS configuration                   |      |                    | TRS.2.1. TDD        |    |
| PDSCH/PDCCH TCI state               |      | 1                  | TCI.State.2         |    |
| Initial BWP configuration           |      | 1                  | DLBWP.0.1 ULBWP.0.1 |    |
| Active DL BWP configuration         |      | 1                  | DLBWP.1.1           |    |
| Active UL BWP configuration         |      | 1                  | ULBWP.1.1           |    |
| Propagation Condition               |      | 1                  | AWGN                |    |

**Table A.7.6.4.1.2-3: NR OTA Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell and neighbour cell UE in FR2**

| Parameter                 | Unit   | Test configuration | Cell 1                      |        | Neighbour cell UE |        |
|---------------------------|--|--------------------|-----------------------------|--------|-------------------|--------|
|                           |  |                    | T1                          | T2     | T1                | T2     |
| AoA setup                 |  | 1                  | Setup 1 defined in A.3.15.1 |        |                   |        |
| Beam assumption<br>Note 4 |  | 1                  | Fine                        |        |                   |        |
| $N_{oc}$ Note 2           | dBm/15 kHz   | 1                  | -98                         |        | -98               |        |
| $N_{oc}$ Note 2           | dBm/SCS  | 1                  | -89                         |        | -89               |        |
| $\hat{E}_s / I_{ot}$      | dB   | 1                  | -                           | -      | -infinity         | 4      |
| $\hat{E}_s / N_{oc}$      | dB   | 1                  | -                           | -      | -infinity         | 4      |
| SRS-RSRP Note 3           | dBm/SCS kHz  | 1                  | -                           | -      | -infinity         | -94    |
| $l_o$                     | dBm/95.04 MHz  | 1                  | -70.01                      | -68.82 | -70.01            | -68.82 |
| Note 1:                   | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |                    |                             |        |                   |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |                             |        |                   |        |
| Note 3:                   | SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                    |                             |        |                   |        |
| Note 4:                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  |                    |                             |        |                   |        |

**Table A.7.6.4.1.2-4: SRS configuration for measurement reporting**

|                 | Field                            | SRSCnf.1          | Comments |
|-----------------|----------------------------------|-------------------|----------|
| SRS-ResourceSet | srs-ResourceSetId                | 0                 |          |
|                 | srs-ResourceIdList               | 0                 |          |
|                 | resourceType                     | Periodic          |          |
|                 | Usage                            | Codebook          |          |
| SRS-Resource    | SRS-ResourceId                   | 0                 |          |
|                 | nrofSRS-Ports                    | Port1             |          |
|                 | transmissionComb                 | n2                |          |
|                 | combOffset-n2                    | 0                 |          |
|                 | cyclicShift-n2                   | 0                 |          |
|                 | resourceMapping startPosition    | 0                 |          |
|                 | resourceMapping nrofSymbols      | n1                |          |
|                 | resourceMapping repetitionFactor | n1                |          |
|                 | freqDomainPosition               | 0                 |          |
|                 | freqDomainShift                  | 0                 |          |
|                 | freqHopping c-SRS                | 12                |          |
|                 | freqHopping b-SRS                | 0                 |          |
|                 | freqHopping b-hop                | 0                 |          |
|                 | groupOrSequenceHopping           | Neither           |          |
|                 | resourceType                     | Periodic          |          |
|                 | periodicityAndOffset             | sl40, 25          |          |
| sequenceld      | 0                                | Any 10 bit number |          |

**A.7.6.4.1.3 Test Requirements**

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.7.6.4.2 CLI-RSSI measurement with non-DRX

##### A.7.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of CLI-RSSI measurement. This test will verify the CLI-RSSI measurement requirements in clause 9.7.3.5 with the testing configurations for NR cells in Table A.7.6.4.2.1-1.

**Table A.7.6.4.2.1-1: Applicable NR configurations for FR2 CLI-RSSI test**

| Configuration | Description  |
|---------------|--|
| 1             | NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |

##### A.7.6.4.2.2 Test Parameters

One cell is deployed in the test, which is FR2 PCell (Cell 1). The test parameters for PCell is given in Table A.7.6.4.2.2-1 ~ A.7.6.4.2.2-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI measurement resource and on 2 data symbols before. The CLI-RSSI measurement resource configuration is in Table A.7.6.4.2.2-4.

**Table A.7.6.4.2.2-1: General test parameters for CLI-RSSI event triggered reporting for PCell in FR2**

| Parameter  | Unit    | Test configuration | Value           | Comment                  |
|--|---------|--------------------|-----------------|--------------------------|
| Active cell  |         | 1                  | NR Cell 1       |                          |
| RF Channel Number  |         | 1                  | 1: Cell 1       |                          |
| SSB configuration  |         | 1                  | SSB.1 FR2       |                          |
| SMTC configuration   |         | 1                  | SMTC.1          |                          |
| CLI-RSSI configuration   |         | 1                  | CLI-RSSICConf.1 | Table A.7.6.4.2.2-4      |
| CP length  |         | 1                  | Normal          |                          |
| i1-Threshold   | dBm     | 1                  | -94.5           |                          |
| Hysteresis   | dB      | 1                  | 0               |                          |
| Time To Trigger  | s       | 1                  | 0               |                          |
| Filter coefficient   |         | 1                  | 0               | L3 filtering is not used |
| DRX  |         | 1                  | OFF             | Non-DRX                  |
| Time offset between DL from serving cell and OCNG from test system | $\mu$ s | 1                  | 10.67           |                          |
| T1   | s       | 1                  | 5               |                          |
| T2   | s       | 1                  | 1               |                          |



**Table A.7.6.4.2.2-2: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2**

| Parameter  | Unit | Test configuration | Cell 1              |    |
|--|------|--------------------|---------------------|----|
|  |      |                    | T1                  | T2 |
| TDD configuration  |      | 1                  | TDDConf.3.1         |    |
| PDSCH RMC configuration  |      | 1                  | SR.3.1 TDD          |    |
| PUSCH parameters   |      | 1                  | N/A                 |    |
| RMSI CORESET RMC configuration   |      | 1                  | CR.3.1 TDD          |    |
| Dedicated CORESET RMC configuration                                    |      | 1                  | CCR.3.1 TDD         |    |
| OCNG Patterns <sup>Note 1</sup>  |      | 1                  | OP.1                |    |
| TRS configuration  |      |                    | TRS.2.1. TDD        |    |
| PDSCH/PDCCH TCI state  |      | 1                  | TCI.State.2         |    |
| Initial BWP configuration  |      | 1                  | DLBWP.0.1 ULBWP.0.1 |    |
| Active DL BWP configuration  |      | 1                  | DLBWP.1.1           |    |
| Active UL BWP configuration  |      | 1                  | ULBWP.1.1           |    |
| Propagation Condition  |      | 1                  | AWGN                |    |
| Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources. |      |                    |                     |    |

**Table A.7.6.4.2.2-3: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2**

| Parameter   | Unit          | Test configuration | Cell 1                      |        |
|---|---------------|--------------------|-----------------------------|--------|
|   |               |                    | T1                          | T2     |
| AoA setup   |               | 1                  | Setup 1 defined in A.3.15.1 |        |
| Beam assumption <sup>Note 3</sup>   |               | 1                  | Fine                        | Fine   |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>   | dBm/15 kHz    | 1                  | -119                        | -108   |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note 2</sup>   | dBm/SCS       | 1                  | -110                        | -99    |
| lo on CLI-RSSI measurement resource   | dBm/95.04 MHz | 1                  | -81.01                      | -70.01 |
| lo on CLI-RSSI measurement resource   | dBm/1.08 MHz  | 1                  | -100.46                     | -89.46 |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |               |                    |                             |        |

**Table A.7.6.4.2.2-4: CLI-RSSI measurement resource configuration for measurement reporting**

|               | Field                     | CLI-RSSICnf.1 |
|---------------|---------------------------|---------------|
| RSSI-Resource | rssI-ResourceId           | 0             |
|               | rssI-SCS                  | 120           |
|               | startPRB                  | 0             |
|               | nrofPRBs                  | 66            |
|               | startPosition             | 3             |
|               | nrofSymbols               | 11            |
|               | rssI-PeriodicityAndOffset | sl40, 25      |

### A.7.6.4.2.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 5ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on  $I_o$ .

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.5 NR Measurements with autonomous gaps

### A.7.6.5.1 SA interfrequency CGI reporting in autonomous gaps test (PCell in FR2)

#### A.7.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an CGI. This test will partly verify the SA inter-frequency NR cell search requirements in clause 8.2.1.2.16 and 9.11

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.5.1.1-1, A.7.6.5.1.1-2, and A.7.6.5.1.1-3.

Measurement gap patterns are configured. During T1 the UE shall report event A3 for cell 2. Within 3 seconds of the event report, the test equipment shall add a measurement reporting configuration using *ReportConfigNR* which contains a ReportCGI IE with cellForWhichToReportCGI set to the physical Cell ID of cell 2 and including the optional IE useAutonomousGaps-r16

In the measurement control information, it is indicated to the UE to decode the CGI of the neighbour cell using autonomous gaps. The test consists of two time phases, T1 and T2. Time period T2 begins 10ms after the test equipment has transmitted the RRC reconfiguration message containing the ReportCGI IE.

Supported test configurations are shown in table A.7.6.5.1.1-1.

**Table A.7.6.5.1.1-1 SA interfrequency CGI reporting test in autonomous gaps**

| Config | Description   |
|--------|---|
| 1      | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.6.5.1.1-2: General test parameters for SA interfrequency CGI reporting in autonomous gaps**

| Parameter                                       | Unit | Test configuration | Value             | Comment  |
|---|------|--------------------|-------------------|--|
| NR RF Channel Number                            |      | Config 1           | 1, 2              | Two FR2 NR carrier frequencies is used.  |
| Active cell                                     |      | Config 1           | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1.  |
| Neighbour cell                                  |      | Config 1           | NR cell 2         | NR cell 2 is on NR RF channel number 2.  |
| Gap Pattern Id                                  |      | Config 1           | 13                | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1           | 39                |  |
| SMTC-SSB parameters                             |      | Config 1           | SSB.3 FR2         | As specified in clause A.3.10.2  |
| SI-RNTI scheduling rate                         | ms   |                    | 40 ms             | S-RNTI scheduled on four occasions per 160ms transmission period   |
| A3-Offset                                       | dB   | Config 1           | -30               |  |
| Hysteresis                                      | dB   | Config 1           | 0                 |  |
| CP length                                       |      | Config 1           | Normal            |  |
| TimeToTrigger                                   | s    | Config 1           | 0                 |  |
| Filter coefficient                              |      | Config 1           | 0                 | L3 filtering is not used   |
| DRX   |      | Config 1           | OFF               | DRX is not used  |
| Time offset between serving and neighbour cells |      | Config 1           | 3µs               | Synchronous cells.   |
| T1  | s    | Config 1           | <10               | UE expected to report event A3 for cell 2 within 5,2s (PC1) or 3.5s (other PC) of the start of T1. Test equipment shall configure CGI reporting within 3s after receiving the event A3 report. T2 begins 10ms after test equipment has transmitted the RRC reconfiguration to configure CGI reporting. |
| T2  | s    | Config 1           | 1                 |  |

**Table A.7.6.5.1.1-3: Cell specific test parameters SA interfrequency CGI reporting in autonomous gaps**

| Parameter | Unit | Test configuration | Cell 1                                |    | Cell 2 |    |
|-----------|------|--------------------|---------------------------------------|----|--------|----|
|           |      |                    | T1                                    | T2 | T1     | T2 |
| AoA setup |      | Config 1           | Setup 3 as specified in clause A.3.15 |    |        |    |
|           |      |                    | AoA1                                  |    | AoA2   |    |

|   |                  |                        |          |                             |                             |
|---|------------------|------------------------|----------|-----------------------------|-----------------------------|
| Beam Assumption <sup>Note 7</sup>                   |                  |                        | 1,2      | Rough                       |                             |
| NR RF Channel Number                                |                  |                        | Config 1 | 1                           | 2                           |
| Duplex mode   |                  |                        | Config 1 | TDD                         | TDD                         |
| TDD configuration                                   |                  |                        | Config 1 | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>                               |                  | MHz                    | Config 1 | 100: N <sub>RB,C</sub> = 66 | 100: N <sub>RB,C</sub> = 66 |
| BWP BW  |                  | MHz                    | Config 1 | 100: N <sub>RB,C</sub> = 66 | 100: N <sub>RB,C</sub> = 66 |
| BWP configuration                                   | Initial DL BWP   |                        | Config 1 | DLBWP.0.1                   | N/A                         |
|   | Initial UL BWP   |                        |          | ULBWP.0.1                   | N/A                         |
|   | Dedicated DL BWP |                        |          | DLBWP.1.1                   | N/A                         |
|   | Dedicated UL BWP |                        |          | ULBWP.1.1                   | N/A                         |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)           |                  |                        | Config 1 | OP.1                        | Not sent                    |
| PDSCH Reference measurement channel                 |                  |                        | Config 1 | SR.3.1 TDD                  | -                           |
| CORESET Reference Channel                           |                  |                        | Config 1 | CR.3.1 TDD                  | -                           |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 |                  |                        | Config 1 | SMTC.1                      | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing                      |                  | kHz                    | Config 1 | 120                         | 120                         |
| TRS configuration                                   |                  |                        | Config 1 | TRS.2.1 TDD                 | N/A                         |
| TCI configuration                                   |                  |                        | Config 1 | CSI-RS.Config.0             | N/A                         |
| EPRE ratio of PSS to SSS                            |                  |                        | Config 1 | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS                      |                  |                        |          |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS                     |                  |                        |          |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS                     |                  |                        |          |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                  |                        |          |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS                     |                  |                        |          |                             |                             |
| EPRE ratio of PDSCH to PDSCH                        |                  |                        |          |                             |                             |
| EPRE ratio of OCNG DMRS to SSS(Note 1)              |                  |                        |          |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)            |                  |                        |          |                             |                             |
| $N_{oc}$ <sup>Note2</sup>                           |                  | dBm/15 kHz<br>Note5    |          |                             |                             |
| $N_{oc}$ <sup>Note2</sup>                           |                  | dBm/S CS<br>Note4      | Config 1 | -90                         | -90                         |
| SS-RSRP <sup>Note 3</sup>                           |                  | dBm/S CS<br>Note5      | Config 1 | -87                         | -93                         |
| $\hat{E}_s/I_{ot}$                                  |                  | dB                     | Config 1 | 3                           | -3                          |
| $\hat{E}_s/N_{oc}$                                  |                  | dB                     | Config 1 | 3                           | -3                          |
| $I_o$ <sup>Note3</sup>                              |                  | dBm/95.04 MHz<br>Note5 | Config 1 | -56.25                      | -59.25                      |
| Propagation Condition                               |                  |                        | Config 1 | AWGN                        |                             |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone  |
| Note 7: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |

### A.7.6.5.1.2 Test Requirements

The UE shall report the CGI of cell 2 within  $25 \cdot T_{smtc} + 6 \cdot T_{si-rnti} + 20\text{ms} + 2\text{ms} = 762\text{ms}$  from the start of T2, allow 765ms. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 775 ms the number of interrupted slots shall not exceed the allowed number [as defined in clause 8.2.1.2.16 plus TBD].

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

NOTE: The actual overall delays measured in the test may be up to  $2 \cdot T_{TI_{DCC}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

## A.7.6.6 L1-SINR measurement for beam reporting

### A.7.6.6.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured when DRX is not used

#### A.7.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.1, with the testing configurations for NR cells in Table A.7.6.6.1.1-1.

**Table A.7.6.6.1.1-1: Applicable NR configurations for FR2 CSI-RS based L1-SINR test**

| Config | Description  |
|--------|--|
| 1      | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode                        |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.7.6.6.1.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.6.1.2-1 and Table A.7.6.6.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. After 160ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.6.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.7.6.6.1.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1      |      | freq1  |
| Duplex mode   | 1      |      | TDD  |
| TDD Configuration   | 1      |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>   | 1      | MHz  | 100: N <sub>RB,c</sub> = 66                  |
| PDSCH Reference measurement channel   | 1      |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel  | 1      |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel   | 1      |      | CCR.3.1 TDD                                  |
| SSB configuration   | 1      |      | SSB.1 FR2                                    |
| CSI-RS configuration  | 1      |      | CSI-RS.3.3 TDD                               |
| OCNG Patterns   | 1      |      | OP.1   |
| Initial BWP Configuration   | 1      |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration   | 1      |      | DLBWP.1.3<br>ULBWP.1.3                       |
| SMTC configuration  | 1      |      | SMTC.1                                       |
| TRS Configuration   | 1      |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration   | 1      |      | TCI.State.2                                  |
| DRX configuration   | 1      |      | Off  |
| reportConfigType  | 1      |      | aperiodic                                    |
| reportQuantity  | 1      |      | cri-SINR                                     |
| reportQuantity-r16  | 1      |      | cri-SINR-r16                                 |
| Number of reported RS   | 1      |      | 2  |
| qcl-Info  | 1      |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList  | 1      |      | 26   |
| Propagation condition   | 1      |      | AWGN   |
| T1  | 1      | s    | 5  |
| EPRE ratio of PSS to SSS  | 1      | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS  |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |  |

Table A.7.6.6.1.2-2: CSI-RS specific test parameters

| Parameter  | Config | Unit         | CSI-RS#0                      | CSI-RS#1 |
|--|--------|--------------|-------------------------------|----------|
| Angle of arrival configuration   | 1      |              | Setup 1 according to A.3.15.1 |          |
| Beam assumption <sup>Note 3</sup>  | 1      |              | Rough                         |          |
| $N_{oc}$ <sup>Note1</sup>  | 1      | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>  | 1      | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s / I_{ot}$   | 1      | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note3</sup>   | 1      | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>   | 1      | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s / N_{oc}$   | 1      | dB           | 0                             | 9        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |          |

### A.7.6.6.1.3 Test Requirements

After 160ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.28.1.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.6.2 L1-SINR measurement with SSB based CMR and dedicated IMR when DRX is used

#### A.7.6.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.2, with the testing configurations for NR cells in Table A.7.6.6.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

**Table A.7.6.6.2.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| Config   | Description  |
|--|--|
| 1  | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2  | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

### A.7.6.6.2.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.6.2.2-1 and Table A.7.6.6.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the SSBs and the associated CSI-IM resources, and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD measurements based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR.

**Table A.7.6.6.2.2-1: General test parameters**

| Parameter   | Config | Unit | Value                       |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1~2    |      | freq1                       |
| Duplex mode   | 1~2    |      | TDD                         |
| TDD Configuration   | 1~2    |      | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel   | 1~2    |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel  | 1~2    |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1~2    |      | CCR.3.1 TDD                 |
| SSB configuration   | 1      |      | SSB.1 FR2                   |
|   | 2      |      | SSB.2 FR2                   |
| CSI-IM configuration  | 1~2    |      | CSI-IM.3.1 TDD              |
| OCNG Patterns   | 1~2    |      | OP.1                        |
| Initial BWP Configuration   | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~2    |      | DLBWP.1.3<br>ULBWP.1.3      |
| SMTTC configuration   | 1~2    |      | SMTTC.1                     |
| TRS Configuration   | 1~2    |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1~2    |      | TCI.State.2                 |
| DRX configuration   | 1~2    |      | DRX.3                       |
| reportConfigType  | 1~2    |      | periodic                    |
| reportQuantity-r16  | 1~2    |      | ssb-Index-SINR-r16          |
| Number of reported RS   | 1~2    |      | 2                           |
| L1-SINR reporting period  | 1~2    | slot | 640                         |
| T1  | 1~2    | s    | 5                           |
| T2  | 1~2    | s    | 2                           |
| Propagation condition   | 1~2    |      | AWGN                        |
| EPRE ratio of PSS to SSS  | 1~2    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| Propagation condition   |        |      |                             |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |



Table A.7.6.6.2.2-2: SSB specific test parameters

| Parameter   | Config | Unit         | SSB#0                         |     | SSB#1     |       |
|---|--------|--------------|-------------------------------|-----|-----------|-------|
|   |        |              | T1                            | T2  | T1        | T2    |
| Angle of arrival configuration  | 1~2    |              | Setup 1 according to A.3.15.1 |     |           |       |
| Beam assumption <sup>Note 4</sup>   | 1~2    |              | Rough                         |     |           |       |
| $N_{oc}$ <sup>Note2</sup>   | 1~2    | dBm/15kHz    | -105                          |     |           |       |
| $N_{oc}$ <sup>Note2</sup>   | 1      | dBm/SSB SCS  | -96                           |     |           |       |
|   | 2      |              | -93                           |     |           |       |
| $\hat{E}_s / I_{ot}$  | 1~2    | dB           | 0                             | 0   | -Infinity | 9     |
| SSB RSRP <sup>Note3</sup>   | 1      | dBm/SSB SCS  | -96                           | -96 | -Infinity | -87   |
|   | 2      |              | -93                           | -93 | -Infinity | -84   |
| $I_o$ <sup>Note3</sup>  | 1      | dBm/95.04MHz | -64                           | -64 | -67       | -57.5 |
|   | 2      |              | -64                           | -64 | -67       | -57.5 |
| $\hat{E}_s / N_{oc}$  | 1~2    | dB           | 0                             | 0   | -Infinity | 9     |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SSB RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |     |           |       |

### A.7.6.6.2.3 Test Requirements

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.6.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR configured when DRX is used

#### A.7.6.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with CSI-RS based CMR and dedicated IMR configured in clause 9.8.4.3, with the testing configurations for NR cells in Table A.7.6.6.3.1-1.

**Table A.7.6.6.3.1-1: Applicable NR configurations for FR2 L1-SINR test with CMR and dedicated IMR**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode               |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.7.6.6.3.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.6.3.2-1 and Table A.7.6.6.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the configured CSI-RS as CMR and an associated CSI-RS as IMR, and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources and the associated IMR. UE is also configured to measure L1-SINR based on SSB. After 1440ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.6.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs, and UE is configured to perform L1-SINR measurement based on the CSI-RS as CMR and the CSI-RS as IMR.

Table A.7.6.6.3.2-1: General test parameters

| Parameter   | Config  | Unit | Value  |
|---|---|------|--|
| SSB GSCN  | 1   |      | freq1  |
| Duplex mode                                       | 1   |      | TDD  |
| TDD Configuration                                 | 1   |      | TDDConf.3.1                                  |
| BW <sub>channel</sub>                             | 1   | MHz  | 100: N <sub>RB,c</sub> = 66                  |
| PDSCH Reference measurement channel               | 1   |      | SR.3.1 TDD                                   |
| RMSI CORESET Reference Channel                    | 1   |      | CR.3.1 TDD                                   |
| Dedicated CORESET Reference Channel               | 1   |      | CCR.3.1 TDD                                  |
| SSB configuration                                 | 1   |      | SSB.1 FR2                                    |
| CSI-RS as CMR configuration                       | 1   |      | CSI-RS.3.3 TDD                               |
| CSI-RS as IMR configuration                       | 1   |      | CSI-RS.3.2A TDD                              |
| OCNG Patterns                                     | 1   |      | OP.1   |
| Initial BWP Configuration                         | 1   |      | DLBWP.0.1<br>ULBWP.0.1                       |
| Dedicated BWP configuration                       | 1   |      | DLBWP.1.3<br>ULBWP.1.3                       |
| SMTTC configuration                               | 1   |      | SMTTC.1                                      |
| TRS Configuration                                 | 1   |      | TRS.2.1 TDD                                  |
| PDCCH/PDSCH TCI Configuration                     | 1   |      | TCI.State.2                                  |
| DRX configuration                                 | 1   |      | DRX.3  |
| reportConfigType                                  | 1   |      | aperiodic                                    |
| reportQuantity-r16                                | 1   |      | cri-SINR-r16                                 |
| Number of reported RS                             | 1   |      | 2  |
| qcl-Info  | 1   |      | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList                              | 1   |      | 26   |
| T1  | 1   | s    | 5  |
| EPRE ratio of PSS to SSS                          | 1   | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |   |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |   |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |   |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |   |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |      |  |
| Propagation condition                             | 1   |      | AWGN   |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |  |

Table A.7.6.6.3.2-2: CSI-RS specific test parameters

| Parameter  | Config | Unit         | CSI-RS#0                      | CSI-RS#1 |
|--|--------|--------------|-------------------------------|----------|
| Angle of arrival configuration   | 1~2    |              | Setup 1 according to A.3.15.1 |          |
| Assumption for UE beams <sup>Note 3</sup>  | 1~2    |              | Rough                         |          |
| $N_{oc}$ <sup>Note1</sup>  | 1~2    | dBm/15kHz    | -105                          |          |
| $N_{oc}$ <sup>Note1</sup>  | 1~2    | dBm/SSB SCS  | -95.97                        |          |
| $\hat{E}_s / I_{ot}$   | 1~2    | dB           | 0                             | 9        |
| CSI-RS RSRP <sup>Note2</sup>   | 1~2    | dBm/SSB SCS  | -95.97                        | -86.97   |
| $I_o$ <sup>Note2</sup>   | 1~2    | dBm/95.04MHz | -63.97                        | -57.47   |
| $\hat{E}_s / N_{oc}$   | 1~2    | dB           | 0                             | 9        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RS RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |              |                               |          |

### A.7.6.6.3.3 Test Requirements

After 1440ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR while meeting the accuracy requirement in clause 10.1.28.3. The reported L1-SINR value shall consider the Rx antenna gain in the range of [-10 ~ +20] dB when calculated.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.7 CSI-RS based intra-frequency Measurements

### A.7.6.7.1 SA event triggered reporting test without gap under DRX for CSI-RS based intra-frequency measurement

#### A.7.6.7.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency measurement requirements in clause 9.10.2 and 9.10.3. Supported test configurations are shown in table A.7.6.7.1.1-1.

Table A.7.6.7.1.1-1: supported test configurations

| Configuration   | Description                                 |
|---|---|
| 1   | 120 kHz SSB and CSI-RS SCS, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |   |

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.7.1.1-2 ~ 6.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.7.1.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                             | Unit | Config | Value                | Comment   |
|---------------------------------------|------|--------|----------------------|---|
|                                       |      |        | Test 1               |   |
| Active cell                           |      | 1      | PCell (Cell 1)       |   |
| Neighbour cell                        |      | 1      | Cell 2               | Cell to be identified.                              |
| RF Channel Number                     |      | 1      | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| CSI-RS resource configuration         |      | 1      | CSI-RS.RRM.FR2.1 TDD |   |
| A3-Offset                             | dB   | 1      | -6                   |   |
| CP length                             |      | 1      | Normal               |   |
| Hysteresis                            | dB   | 1      | 0                    |   |
| Time To Trigger                       | s    | 1      | 0                    |   |
| Filter coefficient                    |      | 1      | 0                    | L3 filtering is not used                            |
| DRX                                   |      | 1      | DRX.1                | DRX related parameters are defined in Table A.3.3   |
| Time offset between Cell 1 and Cell 2 | µs   | 1      | 0.58                 |   |
| T1                                    | s    | 1      | 5                    |   |
| T2                                    | s    | 1      | 10                   |   |

**Table A.7.6.7.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                           | Unit | Config | Cell 1                      |    | Cell 2                      |    |
|-------------------------------------|------|--------|-----------------------------|----|-----------------------------|----|
|                                     |      |        | T1                          | T2 | T1                          | T2 |
| TDD configuration                   |      | 1      | TDDConf.3.1                 |    | TDDConf.3.1                 |    |
| BW <sub>channel</sub>               | MHz  | 1      | 100: N <sub>RB,c</sub> = 66 |    | 100: N <sub>RB,c</sub> = 66 |    |
| Initial BWP configuration           |      | 1      | DLBWP.0.1<br>ULBWP.0.1      |    | DLBWP.0.1<br>ULBWP.0.1      |    |
| Active DL BWP configuration         |      | 1      | DLBWP.1.1                   |    | DLBWP.1.1                   |    |
| Active UL BWP configuration         |      | 1      | ULBWP.1.1                   |    | ULBWP.1.1                   |    |
| RLM-RS                              |      | 1      | SSB                         |    | SSB                         |    |
| PDSCH RMC configuration             |      | 1      | SR.3.1 TDD                  |    | N/A                         |    |
| RMSI CORESET RMC configuration      |      | 1      | CR.3.1 TDD                  |    | CR.3.1 TDD                  |    |
| Dedicated CORESET RMC configuration |      | 1      | CCR.3.1 TDD                 |    | CCR.3.1 TDD                 |    |
| TRS configuration                   |      | 1      | TRS.2.1 TDD                 |    | N/A                         |    |
| PDSCH/PDCCH TCI states              |      | 1      | TCI.State.2                 |    | N/A                         |    |
| OCNG Patterns                       |      | 1      | OP.1                        |    | OP.1                        |    |
| SMTc                                |      | 1      | SMTc.1                      |    |                             |    |
| SSB                                 |      | 1      | SSB.3 FR2                   |    | SSB.3 FR2                   |    |
| CSI-RS                              |      | 1      | CSI-RS.RRM.FR2.1 TDD        |    |                             |    |
| Propagation Condition               |      | 1      | AWGN                        |    |                             |    |

**Table A.7.6.7.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX**

| Parameter                         | Unit   | Config | Cell 1                      |        | Cell 2    |        |
|-----------------------------------|--|--------|-----------------------------|--------|-----------|--------|
|                                   |  |        | T1                          | T2     | T1        | T2     |
| AoA setup                         |  | 1      | Setup 1 defined in A.3.15.1 |        |           |        |
| Beam assumption <sup>Note 4</sup> |  | 1      | Fine                        |        | Fine      |        |
| $\hat{E}_s/I_{ot}$                | dB   | 1      | 4                           | -1.46  | -Infinity | -1.46  |
| $N_{oc}$ <sup>Note 2</sup>        | dBm/15 KHz   | 1      | -98                         |        |           |        |
| $N_{oc}$ <sup>Note 2</sup>        | dBm/SCS  | 1      | -86                         |        |           |        |
| CSI-RSRP                          | dBm/SCS  | 1      | -82                         | -82    | -Infinity | -82    |
| SS-RSRP                           | dBm/SCS  | 1      | -82                         | -82    | -Infinity | -82    |
| $\hat{E}_s/N_{oc}$                | dB   | 1      | 4                           | 4      | -Infinity | 4      |
| $I_o$                             | dBm/95.04MHz   | 1      | -54.53                      | -52.18 | -54.53    | -52.18 |
| Note 1:                           | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |        |                             |        |           |        |
| Note 2:                           | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |        |                             |        |           |        |
| Note 3:                           | CSI-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |        |                             |        |           |        |
| Note 4:                           | Information about types of UE beam is given in B.2.1, and does not limit UE implementation or test system implementation.  |        |                             |        |           |        |

#### A.7.6.7.1.2 Test Requirements

In this test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

- 9.6s for a UE supporting power class 1,
- 5.76s for a UE supporting power class 2, 3 and 4

The UE is required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.8 CSI-RS based inter-frequency Measurements

### A.7.6.8.1 SA event triggered reporting tests for FR2 CSI-RS based measurement when non-DRX is used (PCell in FR2)

#### A.7.6.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event for CSI-RS based L3 measurement. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.10.3.5.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.8.1.1-1, A.7.6.8.1.1-2, and A.7.6.8.1.1-3.

In test 1&2 measurement gap pattern configuration # 13 as defined in Table A.7.6.8.1.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.8.1.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.7.6.8.1.1-1: SA event triggered reporting tests for CSI-RS based L3 measurement for FR2-FR2**

| Config | Description  |
|--------|--|
| 1      | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.6.8.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 CSI-RS based L3 measurement**

| Parameter                                       | Unit | Test configuration | Value                          | Comment                                 |
|---|------|--------------------|--------------------------------|---|
| NR RF Channel Number                            |      | Config 1           | 1, 2                           | Two FR2 NR carrier frequencies is used. |
| Active cell                                     |      | Config 1           | NR cell 1 (Pcell)              | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1           | NR cell 2                      | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id                                  |      | Config 1           | 13                             | As specified in clause 9.1.2-1.         |
| Measurement gap offset                          |      | Config 1           | 39                             |   |
| SSB parameters                                  |      | Config 1           | SSB.3 FR2                      | As specified in clause A.3.10.2         |
| SMTTC configuration                             |      | Config 1           | SMTTC.1                        | As specified in clause A.3.11           |
| A3-Offset                                       | dB   | Config 1           | -6                             |   |
| Hysteresis                                      | dB   | Config 1           | 0                              |   |
| CP length                                       |      | Config 1           | Normal                         |   |
| TimeToTrigger                                   | s    | Config 1           | 0                              |   |
| Filter coefficient                              |      | Config 1           | 0                              | L3 filtering is not used                |
| DRX   |      | Config 1           | OFF                            | DRX is not used                         |
| Time offset between serving and neighbour cells | µs   | Config 1           | 0.58                           | Synchronous cells.                      |
| T1  | s    | Config 1           | 5                              |   |
| T2  | s    | Config 1           | 7 for PC1;<br>4.5 for other PC |   |

**Table A.7.6.8.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 CSI-RS based L3 measurement**

| Parameter                                 |                  | Unit | Test configuration | Cell 1                                |    | Cell 2                      |    |
|---|------------------|------|--------------------|---------------------------------------|----|-----------------------------|----|
|   |                  |      |                    | T1                                    | T2 | T1                          | T2 |
| AoA setup                                 |                  |      | Config 1           | Setup 1 as specified in clause A.3.15 |    |                             |    |
| Beam Assumption <sup>Note 7</sup>         |                  |      | Config 1           | Rough                                 |    | Rough                       |    |
| NR RF Channel Number                      |                  |      | Config 1           | 1                                     |    | 2                           |    |
| TDD configuration                         |                  |      | Config 1           | TDDConf.3.1                           |    | TDDConf.3.1                 |    |
| Duplex mode                               |                  |      | Config 1           | TDD                                   |    | TDD                         |    |
| BW <sub>channel</sub>                     |                  | MHz  | Config 1           | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| BWP BW                                    |                  | MHz  | Config 1           | 100: N <sub>RB,c</sub> = 66           |    | 100: N <sub>RB,c</sub> = 66 |    |
| BWP configuration                         | Initial DL BWP   |      | Config 1           | DLBWP.0.1                             |    | N/A                         |    |
|   | Initial UL BWP   |      |                    | ULBWP.0.1                             |    | N/A                         |    |
|   | Dedicated DL BWP |      |                    | DLBWP.1.1                             |    | N/A                         |    |
|   | Dedicated UL BWP |      |                    | ULBWP.1.1                             |    | N/A                         |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |      | Config 1           | OP.1                                  |    | OP.1                        |    |
| PDSCH Reference measurement channel       |                  |      | Config 1           | SR.3.1 TDD                            |    | -                           |    |
| CORESET Reference Channel                 |                  |      | Config 1           | CR.3.1 TDD                            |    | -                           |    |



|   |                      |          |                 |       |                      |       |
|---|----------------------|----------|-----------------|-------|----------------------|-------|
| SMTC configuration defined in A.3.11.1 and A.3.11.2   |                      | Config 1 | SMTC.1          |       | SMTC.1               |       |
| PDSCH/PDCCH subcarrier spacing  | kHz                  | Config 1 | 120             |       | 120                  |       |
| TRS configuration   |                      | Config 1 | TRS.2.1 TDD     |       | N/A                  |       |
| TCI configuration   |                      | Config 1 | CSI-RS.Config.0 |       | N/A                  |       |
| CSI-RS configuration for RRM  |                      |          | -               |       | CSI-RS.RRM.FR2.1 TDD |       |
| EPRE ratio of PSS to SSS  |                      | Config 1 | 0               |       | 0                    |       |
| EPRE ratio of PBCH DMRS to SSS  |                      |          |                 |       |                      |       |
| EPRE ratio of PBCH to PBCH DMRS   |                      |          |                 |       |                      |       |
| EPRE ratio of PDCCH DMRS to SSS   |                      |          |                 |       |                      |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |                      |          |                 |       |                      |       |
| EPRE ratio of PDSCH DMRS to SSS   |                      |          |                 |       |                      |       |
| EPRE ratio of PDSCH to PDSCH  |                      |          |                 |       |                      |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                      |          |                 |       |                      |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                      |          |                 |       |                      |       |
| $N_{oc}$ Note2  | dBm/15 kHz Note5     |          | -104.7          |       | -104.7               |       |
| $N_{oc}$ Note2  | dBm/S CS Note4       | Config 1 | -95.7           |       | -95.7                |       |
| CSI-RSRP Note 3   | dBm/S CS Note5       | Config 1 | -89.7           | -89.7 | -Infinity            | -86.7 |
| SS-RSRP Note 3  | dBm/S CS Note5       | Config 1 | -89.7           | -89.7 | -Infinity            | -86.7 |
| $\hat{E}_s/I_{ot}$  | dB                   | Config 1 | 6               | 6     | -Infinity            | 9     |
| $\hat{E}_s/N_{oc}$  | dB                   | Config 1 | 6               | 6     | -Infinity            | 9     |
| $I_o$ Note3   | dBm/95 .04 MHz Note5 | Config 1 | -59.7           | -59.7 | -66.7                | -57.2 |
| Propagation Condition   |                      | Config 1 | AWGN            |       |                      |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: CSI-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                      |          |                 |       |                      |       |

### A.7.6.2.2.2 Test Requirements

In the test the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $X1$  ms from the beginning of time period  $T2$ , where  $X1$  is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.9 RSTD measurements

### A.7.6.9.1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA

#### A.7.6.9.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

Supported test configurations are shown in table A.7.7.1.1-1. The test parameters are as given in Table 7.6.7.1.1-2, Table A.7.6.9.1.1-3 and Table A.7.6.9.1.1-4.

**Table A.7.6.9.1.1-1: Supported test configurations for NR RSTD**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the same RF channel distributed in single positioning frequency layers.

The test consists of two consecutive time intervals, with duration of  $T1$  and  $T2$ . During time duration  $T1$ , the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during  $T2$ .

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during  $T1$ . The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of  $T2$ , where  $\Delta T = 50$  ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval  $T2$  shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #13 before  $T2$ .

**Table A.7.6.9.1.1-2: General test parameters for RSTD measurement reporting delay**

| Parameter   |          | Unit | Value   | Comment  |
|---|----------|------|---|--|
| Reference cell  |          |      | Cell 1  | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355[34]. The reference cell is the PCell in this test case. |
| Neighbor cells  |          |      | Cell 2 and Cell 3   | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data.   |
| SSB configuration   | Config 1 |      | SSB.2 FR2   |  |
| SMTC configuration  | Config 1 |      | SMTC.1  |  |
| PDSCH RMC configuration   | Config 1 |      | SR.1.1 FDD  |  |
| RMSI CORESET RMC configuration  | Config 1 |      | CR.3.1 TDD  | As specified in clause A.3.1.2.1   |
| Dedicated CORESET RMC configuration   | Config 1 |      | CR.1.1 FDD  |  |
| PRS Configuration   | Config 1 |      | PRS.1.1. FR2  | As specified in clause A.3.31  |
| Physical cell ID PCI  |          |      | (PCI of Cell 1 – PCI of Cell 2)mod6=0<br>and<br>(PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters   |
| CP length   |          |      | Normal  |  |
| DRX   |          |      | OFF   |  |
| Measurement gap   |          |      | GP#24 or GP#[13]  | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured  |
| Radio frame receive time offset between the cells at the UE antenna connector |          | µs   | Cell 2 to Cell 1: 0<br>Cell 3 to Cell 1: 3  | PRS are transmitted from synchronous cells   |
| Expected RSTD   |          | µs   | Cell 2: 3<br>Cell 3: 3<br>Other neighbour cells: randomly between -3 and 3            | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator   |
| Expected RSTD uncertainty for all neighbour cells                             |          | µs   | 500   | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index  |
| Number of cells provided in DL-TDOA assistance data                           |          |      | 16  | Including the reference cell   |
| PRS muting info   |          |      | Cell 1: '10'<br>Cell 2: '01'<br>Cell 3: '10'  | Corresponds to prs-MutingInfo defined in TS 37.355 [24]  |

|                        |   |                                     |  |
|------------------------|---|-------------------------------------|--|
| PRS resource RE offset |   | Cell 1: 0<br>Cell 2: 0<br>Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets   |
| T1                     | s | 3                                   | The length of the time interval from the beginning of each test  |
| T2                     | s | [1.28]                              | The length of the time interval that follows immediately after time interval T1  |
| AoA setup              |   | Setup 1                             | As defined in A.3.15.1   |
| Beam assumption        |   | Rough                               | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

**Table A.7.6.9.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

| Parameter  |          | Unit         | Cell 1    | Cell 2    | Cell 3    |
|--|----------|--------------|-----------|-----------|-----------|
| NR RF Channel Number   |          |              | 1         | 1         | 1         |
| Positioning frequency layer  |          |              | 1         | 1         | 1         |
| Correlation Matrix and Antenna Configuration   |          |              | 1x2 Low   | 1x2 Low   | 1x2 Low   |
| OCNG patterns defined in A.3.2.1   |          |              | OP.5 FDD  | N/A       | N/A       |
| $N_{oc}$ <sup>Note 3</sup>   | Config 1 | dBm/SCS      | -89       |           |           |
| PRS $\hat{E}_s/N_{oc}$   |          | dB           | -Infinity | -Infinity | -Infinity |
| $I_o$ <sup>Note 4</sup>  | Config 1 | dBm/95.04MHz | -58.86    | -60.01    | -60.01    |
| SSB RP <sup>Note 4</sup>   | Config 1 | dBm/SCS      | -89       | -Infinity | -Infinity |
| $\hat{E}_s/N_{oc}$   |          | dB           | 0         | -Infinity | -Infinity |
| Propagation Condition  |          |              | AWGN      |           |           |
| <p>Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 4: SSB RP and <math>I_o</math> levels have been derived from other parameters and are given for information purpose. These are not settable test parameters.</p> |          |              |           |           |           |

**Table A.7.6.9.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|-----------|------|--------|--------|--------|
|           |      | T2     | T2     | T2     |

|  |   |             |                           |                           |                           |
|--|---|-------------|---------------------------|---------------------------|---------------------------|
| RF Channel Number                            |   |             | 1                         | 1                         | 1                         |
| Positioning frequency layer                  |   |             | 1                         | 1                         | 1                         |
| Correlation Matrix and Antenna Configuration |   |             | 1x2 Low                   | 1x2 Low                   | 1x2 Low                   |
| OCNG patterns defined in A.3.2.1             |   |             | OP.1                      | OP.1                      | OP.1                      |
| PRACH configuration                          |   |             | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| $N_{oc}$ Note 3                              | Config 1  | dBm/SCS     | -89                       | -89                       | -89                       |
| PRS $\hat{E}_s/N_{oc}$                       | Config 1  | dB          | -5.44                     | -11.67                    | -11.67                    |
| $I_o$  | Config 1  | dBm/9.36MHz | -59.65                    | -59.92                    | -59.92                    |
| PRS $\hat{E}_s/I_{ot}$                       |   | dB          | -6                        | -13                       | -13                       |
| Propagation Condition                        |   |             | AWGN                      |                           |                           |
| Note 1:                                      | OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS. |             |                           |                           |                           |
| Note 2:                                      | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |             |                           |                           |                           |
| Note 3:                                      | Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.                           |             |                           |                           |                           |

Table A.7.6.9.1.-5: Void

### A.7.6.9.1.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.1.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

### A.7.6.9.2 NR RSTD measurement reporting delay test case for dual positioning frequency layers in FR2 SA

#### A.7.6.9.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR2 in standalone scenario when dual positioning frequency layer is configured.

Supported test configurations are shown in table A.7.6.9.2.1-1. The test parameters are as given in Table 7.6.7.2.1-2, Table A.7.6.9.2.1-3 and , Table A.7.6.9.2.1-4.

**Table A.7.6.9.2.1-1: Supported test configurations for NR RSTD**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the 2 RF channels distributed in dual positioning frequency layers.

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2. Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of T2, where  $\Delta T = 50$  ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #13 before T2.

**Table A.7.6.9.2.1-2: General test parameters for RSTD measurement reporting delay**



| Parameter   |          | Unit | Value   | Comment   |
|---|----------|------|---|---|
| Reference cell  |          |      | Cell 1  | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells  |          |      | Cell 2 and Cell 3   | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data.  |
| SSB configuration   | Config 1 |      | SSB.2 FR2   |   |
| SMTC configuration  | Config 1 |      | SMTC.1  |   |
| PDSCH RMC configuration   | Config 1 |      | SR.1.1 FDD  |   |
| RMSI CORESET RMC configuration  | Config 1 |      | CR.3.1 TDD  | As specified in clause A.3.1.2.1  |
| Dedicated CORESET RMC configuration   | Config 1 |      | CR.1.1 FDD  |   |
| PRS Configuration   | Config 1 |      | PRS.1.1. FR2  | As specified in clause A.3.31   |
| Physical cell ID PCI  |          |      | (PCI of Cell 1 – PCI of Cell 2)mod6=0<br>and<br>(PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters  |
| CP length   |          |      | Normal  |   |
| DRX   |          |      | OFF   |   |
| Measurement gap   |          |      | GP#24 or GP#13  | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured   |
| Radio frame receive time offset between the cells at the UE antenna connector |          | µs   | Cell 2 to Cell 1: 0<br>Cell 3 to Cell 1: 3  | PRS are transmitted from synchronous cells  |
| Expected RSTD   |          | µs   | Cell 2: 3<br>Cell 3: 3<br>Other neighbour cells: randomly between -3 and 3            | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator  |
| Expected RSTD uncertainty for all neighbour cells                             |          | µs   | 5   | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index   |
| Number of cells provided in DL-TDOA assistance data                           |          |      | 16  | Including the reference cell  |
| PRS muting info   |          |      | Cell 1: '10'<br>Cell 2: '01'<br>Cell 3: '10'  | Corresponds to prs-MutingInfo defined in TS 37.355 [24]   |
| PRS resource RE offset  |          |      | Cell 1: 0<br>Cell 2: 0<br>Cell 3: 1   | Cell 1 and Cell 3 are configured with different resource offsets  |
| T1  |          | s    | 3   | The length of the time interval from the beginning of each test   |

|                 |   |         |  |
|-----------------|---|---------|--|
| T2              | s | 1.28    | The length of the time interval that follows immediately after time interval T1  |
| AoA setup       |   | Setup 1 | As defined in A.3.15.1   |
| Beam assumption |   | Rough   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

**Table A.7.6.9.2.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

| Parameter  | Unit     | Cell 1              | Cell 2    | Cell 3    |
|--|----------|---------------------|-----------|-----------|
| NR RF Channel Number   |          | 1                   | 1         | 2         |
| Positioning frequency layer  |          | 1                   | 1         | 2         |
| Correlation Matrix and Antenna Configuration   |          | 1x2 Low             | 1x2 Low   | 1x2 Low   |
| OCNG patterns defined in A.3.2.1   |          | OP.1                | N/A       | N/A       |
| EPRE ratio of PBCH DMRS to SSS   |          |                     |           |           |
| EPRE ratio of PBCH to PBCH DMRS  |          |                     |           |           |
| EPRE ratio of PDCCH DMRS to SSS  |          |                     |           |           |
| EPRE ratio of PDCCH to PDCCH DMRS  |          |                     |           |           |
| EPRE ratio of PDSCH DMRS to SSS  |          |                     |           |           |
| EPRE ratio of PDSCH to PDSCH   |          |                     |           |           |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |          |                     |           |           |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |          |                     |           |           |
| $N_{oc}$ <sup>Note 3</sup>   | Config 1 | dBm/SCS -89         |           |           |
| PRS $\hat{E}_s/N_{oc}$   |          | -Infinity           | -Infinity | -Infinity |
| $I_o$ <sup>Note 4</sup>  | Config 1 | dBm/95.04MHz -58.86 | -60.01    | -60.01    |
| SSB RP <sup>Note 4</sup>   | Config 1 | dBm/SCS -89         | -Infinity | -Infinity |
| $\hat{E}_s/N_{oc}$   |          | dB 0                | -Infinity | -Infinity |
| Propagation Condition  |          | AWGN                |           |           |
| <p>Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 4: SSB RP and <math>I_o</math> levels have been derived from other parameters and are given for information purpose. These are not settable test parameters.</p> |          |                     |           |           |

**Table A.7.6.9.2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2 and T3**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|-----------|------|--------|--------|--------|
|           |      | T2     | T2     | T2     |
|           |      |        |        |        |

|  |   |             |                           |                           |                           |
|--|---|-------------|---------------------------|---------------------------|---------------------------|
| RF Channel Number                            |   |             | 1                         | 1                         | 2                         |
| Positioning frequency layer                  |   |             | 1                         | 1                         | 2                         |
| Correlation Matrix and Antenna Configuration |   |             | 1x2 Low                   | 1x2 Low                   | 1x2 Low                   |
| OCNG patterns defined in A.3.2.1             |   |             | OP.1                      | OP.1                      | OP.1                      |
| PRACH configuration                          |   |             | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| $N_{oc}$ Note 3                              | Config 1  | dBm/SCS     | -89                       | -89                       | -89                       |
| PRS $\hat{E}_s/N_{oc}$                       | Config 1  | dB          | -5.44                     | -11.67                    | -11.67                    |
| $I_o$  | Config 1  | dBm/9.36MHz | -59.65                    | -59.92                    | -59.92                    |
| PRS $\hat{E}_s/I_{ot}$                       |   | dB          | -6                        | -13                       | -13                       |
| Propagation Condition                        |   |             | AWGN                      |                           |                           |
| Note 1:                                      | OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS. |             |                           |                           |                           |
| Note 2:                                      | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |             |                           |                           |                           |
| Note 3:                                      | Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.                           |             |                           |                           |                           |

Table A.7.6.9.2.1-5: Void

### A.7.6.9.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.1.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## A.7.6.10 PRS-RSRP measurements

### A.7.6.10.1 PRS-RSRP reporting delay test case for single positioning frequency layer

#### A.7.6.10.1.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 9.9.3.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.6.10.1.1-1

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is  $\Delta T$  after slot #n, where  $\Delta T = 50$  ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.7.6.10.1.1-2, and table A.7.6.10.1.1-3.

**Table A. 7.6.1.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2**

| Config | Description   |
|--------|---|
| 1      | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.6.10.1.1-2: General test parameters for PRS RSRP measurement reporting delay**

| Parameter                                       | Unit    | Test configuration | Value                           | Comment   |
|---|---------|--------------------|---------------------------------|---|
| NR RF Channel Number                            |         | Config 1           | 1: Cell 1 and Cell 2            | One TDD carrier frequency is used for the NR cells.                                   |
| Active cell                                     |         | Config 1           | NR cell 1 (Pcell)               | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell                                  |         | Config 1           | NR cell 2                       | Cell 2 is a neighbour cell in the positioning assistance data.                        |
| Gap Pattern Id                                  |         | Config 1           | GP#13 or GP#24 <sup>Note1</sup> | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |         | Config 1           | 39                              |   |
| SMTC parameters                                 |         | Config 1           | SMTC.1                          | As specified in clause A.3.11   |
| SSB parameters                                  |         | Config 1           | SSB.3 FR2                       | As specified in clause A.3.10.2   |
| A3-Offset                                       | dB      | Config 1           | -6                              |   |
| Hysteresis                                      | dB      | Config 1           | 0                               |   |
| CP length                                       |         | Config 1           | Normal                          |   |
| TimeToTrigger                                   | s       | Config 1           | 0                               |   |
| Filter coefficient                              |         | Config 1           | 0                               | L3 filtering is not used  |
| DRX   |         | Config 1           | OFF                             | DRX is not used   |
| Time offset between serving and neighbour cells |         | Config 1           | 3 $\mu$ s                       | Synchronous cells.  |
| Expected RSTD                                   | $\mu$ s | Config 1           | 3                               |   |
| Expected RSTD uncertainty                       | $\mu$ s | Config 1           | 5                               |   |
| T1  | s       | Config 1           | 5                               |   |
| T2  | s       | Config 1           | 7                               |   |

Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#[13] is configured.

**Table A.7.6.10.1.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay**

| Parameter                                 |                  | Unit                   | Test configuration | Cell 1                                |       | Cell 2                      |       |
|---|------------------|------------------------|--------------------|---------------------------------------|-------|-----------------------------|-------|
|   |                  |                        |                    | T1                                    | T2    | T1                          | T2    |
| AoA setup                                 |                  |                        | Config 1           | Setup 1 as specified in clause A.3.15 |       |                             |       |
| Beam Assumption <sup>Note 7</sup>         |                  |                        | Config 1           | Rough                                 |       | Rough                       |       |
| TDD configuration                         |                  |                        | Config 1           | TDDConf.3.1                           |       | TDDConf.3.1                 |       |
| Duplex mode                               |                  |                        | Config 1           | TDD                                   |       | TDD                         |       |
| BW <sub>channel</sub>                     |                  | MHz                    | Config 1           | 100: N <sub>RB,c</sub> = 66           |       | 100: N <sub>RB,c</sub> = 66 |       |
| BWP BW                                    |                  | MHz                    | Config 1           | 100: N <sub>RB,c</sub> = 66           |       | 100: N <sub>RB,c</sub> = 66 |       |
| BWP configuration                         | Initial DL BWP   |                        | Config 1           | DLBWP.0.1                             |       | N/A                         |       |
|   | Initial UL BWP   |                        |                    | ULBWP.0.1                             |       | N/A                         |       |
|   | Dedicated DL BWP |                        |                    | DLBWP.1.1                             |       | N/A                         |       |
|   | Dedicated UL BWP |                        |                    | ULBWP.1.1                             |       | N/A                         |       |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |                        | Config 1           | OP.1                                  |       | OP.1                        |       |
| PDSCH Reference measurement channel       |                  |                        | Config 1           | SR.3.1 TDD                            |       | -                           |       |
| CORESET Reference Channel                 |                  |                        | Config 1           | CR.3.1 TDD                            |       | -                           |       |
| Dedicated CORESET RMC configuration       |                  |                        | Config 1           | CCR.3.1 TDD                           |       | -                           |       |
| TRS configuration                         |                  |                        | Config 1           | TRS.2.1 TDD                           |       | -                           |       |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz                    | Config 1           | 120                                   |       | 120                         |       |
| PRS configuration                         |                  |                        | Config 1           | PRS.1.1 FR2                           |       | PRS.1.2 FR2                 |       |
| PRS muting configuration                  |                  |                        | Config 1           | '10'                                  |       | '01'                        |       |
| EPRE ratio of PSS to SSS                  |                  |                        | Config 1           | 0                                     |       | 0                           |       |
| EPRE ratio of PBCH DMRS to SSS            |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PBCH to PBCH DMRS           |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDCCH DMRS to SSS           |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDSCH DMRS to SSS           |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDSCH to PDSCH              |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |                        |                    |                                       |       |                             |       |
| $N_{oc}$ <sup>Note2</sup>                 |                  | dBm/15 kHz<br>Note5    |                    | -102                                  |       | -102                        |       |
| $N_{oc}$ <sup>Note2</sup>                 |                  | dBm/S CS<br>Note4      | Config 1           | -93                                   |       | -93                         |       |
| SS-RSRP <sup>Note 3</sup>                 |                  | dBm/S CS<br>Note5      | Config 1           | -89.7                                 | -89.7 | -Infinity                   | -86.7 |
| PRS-RSRP <sup>Note 3</sup>                |                  | dBm/S CS<br>Note5      | Config 1           | -Infinity                             | -96   | -Infinity                   | -103  |
| PRS $\hat{E}_s / I_{ot}$                  |                  | dB                     | Config 1           | -Infinity                             | -3    | -Infinity                   | -10   |
| PRS $\hat{E}_s / N_{oc}$                  |                  | dB                     | Config 1           | -Infinity                             | -3    | -Infinity                   | -10   |
| $I_o$ <sup>Note3</sup>                    |                  | dBm/95.04 MHz<br>Note5 | Config 1           | -58.56                                |       | -55.38                      |       |
| Propagation Condition                     |                  |                        | Config 1           | AWGN                                  |       |                             |       |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP/PRS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone  |
| Note 7: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |

### A.7.6.10.1.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 9.9.3.5. The UE shall perform and report the PRS RSRP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 9.9.3.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRP measurement for each correct event shall be within the PRS RSRP reporting range specified in Clause 10.1.24.3, i.e., between PRS RSRP\_0 and PRS RSRP\_126.

## A.7.6.10.2 PRS-RSRP reporting delay test case for dual positioning frequency layer

### A.7.6.10.2.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 9.9.3.5 for dual positioning frequency layers under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.6.10.2.1-1

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the different frequency from the PCell.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is  $\Delta T$  after slot #n, where  $\Delta T = 50$  ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.7.6.10.2.1-2, and table A.7.6.10.2.1-3.

**Table A.7.6.10.2.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2**

| Config | Description   |
|--------|---|
| 1      | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.6.10.2.1-2: General test parameters for PRS RSRP measurement reporting delay

| Parameter  | Unit | Test configuration | Value                             | Comment   |
|--|------|--------------------|-----------------------------------|---|
| Active cell  |      | Config 1           | NR cell 1 (Pcell)                 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell   |      | Config 1           | NR cell 2                         | Cell 2 is a neighbour cell in the positioning assistance data.                        |
| Gap Pattern Id   |      | Config 1           | GP#[13] or GP#24 <sup>Note1</sup> | As specified in clause 9.1.2-1.   |
| Measurement gap offset   |      | Config 1           | 39                                |   |
| SMTC parameters  |      | Config 1           | SMTC.1                            | As specified in clause A.3.11   |
| SSB parameters   |      | Config 1           | SSB.3 FR2                         | As specified in clause A.3.10.2   |
| A3-Offset  | dB   | Config 1           | -6                                |   |
| Hysteresis   | dB   | Config 1           | 0                                 |   |
| CP length  |      | Config 1           | Normal                            |   |
| TimeToTrigger  | s    | Config 1           | 0                                 |   |
| Filter coefficient   |      | Config 1           | 0                                 | L3 filtering is not used  |
| DRX  |      | Config 1           | OFF                               | DRX is not used   |
| Time offset between serving and neighbour cells                                    |      | Config 1           | 3μs                               | Synchronous cells.  |
| Expected RSTD  | μs   | Config 1           | 3                                 |   |
| Expected RSTD uncertainty  | μs   | Config 1           | 5                                 |   |
| T1   | s    | Config 1           | 5                                 |   |
| T2   | s    | Config 1           | 7                                 |   |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#[13] is configured. |      |                    |                                   |   |



**Table A.7.6.10.2.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay**

| Parameter                                 |                  | Unit                   | Test configuration | Cell 1                                |       | Cell 2                      |       |
|---|------------------|------------------------|--------------------|---------------------------------------|-------|-----------------------------|-------|
|   |                  |                        |                    | T1                                    | T2    | T1                          | T2    |
| AoA setup                                 |                  |                        | Config 1           | Setup 1 as specified in clause A.3.15 |       |                             |       |
| Beam Assumption <sup>Note 7</sup>         |                  |                        | Config 1           | Rough                                 |       | Rough                       |       |
| NR RF Channel Number                      |                  |                        | Config 1           | 1                                     |       | 2                           |       |
| TDD configuration                         |                  |                        | Config 1           | TDDConf.3.1                           |       | TDDConf.3.1                 |       |
| Duplex mode                               |                  |                        | Config 1           | TDD                                   |       | TDD                         |       |
| BW <sub>channel</sub>                     |                  | MHz                    | Config 1           | 100: N <sub>RB,c</sub> = 66           |       | 100: N <sub>RB,c</sub> = 66 |       |
| BWP BW                                    |                  | MHz                    | Config 1           | 100: N <sub>RB,c</sub> = 66           |       | 100: N <sub>RB,c</sub> = 66 |       |
| BWP configuration                         | Initial DL BWP   |                        | Config 1           | DLBWP.0.1                             |       | N/A                         |       |
|   | Initial UL BWP   |                        |                    | ULBWP.0.1                             |       | N/A                         |       |
|   | Dedicated DL BWP |                        |                    | DLBWP.1.1                             |       | N/A                         |       |
|   | Dedicated UL BWP |                        |                    | ULBWP.1.1                             |       | N/A                         |       |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |                  |                        | Config 1           | OP.1                                  |       | OP.1                        |       |
| PDSCH Reference measurement channel       |                  |                        | Config 1           | SR.3.1 TDD                            |       | -                           |       |
| CORESET Reference Channel                 |                  |                        | Config 1           | CR.3.1 TDD                            |       | -                           |       |
| Dedicated CORESET RMC configuration       |                  |                        | Config 1           | CCR.3.1 TDD                           |       | -                           |       |
| TRS configuration                         |                  |                        | Config 1           | TRS.2.1 TDD                           |       | -                           |       |
| PDSCH/PDCCH subcarrier spacing            |                  | kHz                    | Config 1           | 120                                   |       | 120                         |       |
| PRS configuration                         |                  |                        | Config 1           | PRS.1.1 FR2                           |       | PRS.1.2 FR2                 |       |
| PRS muting configuration                  |                  |                        | Config 1           | '10'                                  |       | '01'                        |       |
| EPRE ratio of PSS to SSS                  |                  |                        | Config 1           | 0                                     |       | 0                           |       |
| EPRE ratio of PBCH DMRS to SSS            |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PBCH to PBCH DMRS           |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDCCH DMRS to SSS           |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDCCH to PDCCH DMRS         |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDSCH DMRS to SSS           |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of PDSCH to PDSCH              |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |                  |                        |                    |                                       |       |                             |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                  |                        |                    |                                       |       |                             |       |
| $N_{oc}$ <sup>Note2</sup>                 |                  | dBm/15 kHz<br>Note5    |                    |                                       |       |                             |       |
| $N_{oc}$ <sup>Note2</sup>                 |                  | dBm/S CS<br>Note4      | Config 1           | -95.7                                 |       | -95.7                       |       |
| SS-RSRP <sup>Note 3</sup>                 |                  | dBm/S CS<br>Note5      | Config 1           | -92.7                                 | -92.7 | -Infinity                   | -85.7 |
| PRS-RSRP <sup>Note 3</sup>                |                  | dBm/S CS<br>Note5      | Config 1           | -Infinity                             | -92.7 | -Infinity                   | -85.7 |
| PRS $\hat{E}_s/I_{ot}$                    |                  | dB                     | Config 1           | -Infinity                             | -3    | -Infinity                   | -10   |
| PRS $\hat{E}_s/N_{oc}$                    |                  | dB                     | Config 1           | -Infinity                             | -3    | -Infinity                   | -10   |
| $I_0$ <sup>Note3</sup>                    |                  | dBm/95.04 MHz<br>Note5 | Config 1           | -59.7                                 | -59.7 | -66.7                       | -57.2 |

| Propagation Condition | Config 1   | AWGN |
|-----------------------|--|------|
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |
| Note 3:               | SS-RSRP/PRS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |      |
| Note 4:               | PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |      |
| Note 5:               | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |      |
| Note 6:               | As observed with 0 dBi gain antenna at the centre of the quiet zone  |      |
| Note 7:               | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |      |

### A.7.6.10.2.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 9.9.3.5. The UE shall perform and report the PRS RSRP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 9.9.3.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRP measurement for each correct event shall be within the PRS RSRP reporting range specified in Clause 10.1.24.3, i.e., between PRS RSRP\_0 and PRS RSRP\_126.

## A.7.6.11 UE Rx-Tx time difference measurements

### A.7.6.11.1 UE Rx-Tx time difference measurements for single positioning frequency layer in FR2 SA

#### A.7.6.11.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are listed in Table A.7.6.11.1.1-1.

**Table A.7.6.11.1.1-1: Supported test configurations**

| Config | Description   |
|--------|---|
| 1      | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on the same RF channel in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of T2, where  $\Delta T = 50$  ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #13 or ID #24 before T2.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.1.1-2 and Table A.7.6.11.1.1-3 respectively.

Table A.7.6.11.1.1-2: General test parameters

| Parameter  | Unit | Test configuration | Value                            | Comment   |
|--|------|--------------------|----------------------------------|---|
| Active cell  |      | 1                  | Cell 1                           | Cell 1 is the PCell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34].        |
| Neighbour cell   |      | 1                  | Cell 2                           | Cell 2 is a neighbour cell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34]. |
| RF Channel Number  |      | 1                  | 1                                | For both Cell 1 and Cell 2  |
| BW <sub>channel</sub>  | MHz  | 1                  | 100: N <sub>RB,c</sub> = 66      |   |
| SSB configuration  |      | 1                  | SSB.2 FR2                        |   |
| SMTc configuration   |      | 1                  | SMTc.1                           |   |
| Measurement gap  |      | 1                  | GP#24 or GP#13 <sup>Note 1</sup> |   |
| CP length  |      | 1                  | Normal                           |   |
| DRX  |      | 1                  | OFF                              |   |
| Time offset between serving and neighbour cells                                  | μs   | 1                  | 3                                | Synchronous cells   |
| T1   | s    | 1                  | 5                                |   |
| T2   | s    | 1                  | 20                               |   |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. |      |                    |                                  |   |

Table A.7.6.11.1.1-3: Cell specific test parameters

| Parameter                           | Unit   | Test configuration | Cell 1                                |        | Cell 2      |        |
|-------------------------------------|--|--------------------|---------------------------------------|--------|-------------|--------|
|                                     |  |                    | T1                                    | T2     | T1          | T2     |
| AoA setup                           |  | 1                  | Setup 1 as specified in clause A.3.15 |        |             |        |
| Beam Assumption <sup>Note 7</sup>   |  | 1                  | Rough                                 |        | Rough       |        |
| TDD configuration                   |  | 1                  | TDDConf.3.1                           |        | TDDConf.3.1 |        |
| PDSCH RMC configuration             |  | 1                  | SR.3.1 TDD                            |        | N/A         |        |
| RMSI CORESET RMC configuration      |  | 1                  | CR.3.1 TDD                            |        | N/A         |        |
| Dedicated CORESET RMC configuration |  | 1                  | CCR.3.1 TDD                           |        | N/A         |        |
| OCNG Patterns                       |  | 1                  | OP.1                                  |        | OP.1        |        |
| TRS Configuration                   |  | 1                  | TRS.2.1 TDD                           |        | N/A         |        |
| Initial BWP configuration           |  | 1                  | DLBWP.0.1<br>ULBWP.0.1                |        | N/A         |        |
| Active DL BWP configuration         |  | 1                  | DLBWP.1.1                             |        | N/A         |        |
| Active UL BWP configuration         |  | 1                  | ULBWP.1.1                             |        | N/A         |        |
| PRS configuration                   |  | 1                  | PRS.1.1 FR2                           |        | PRS.1.1 FR2 |        |
| PRS muting info                     |  | 1                  | '10'                                  |        | '01'        |        |
| SRS configuration                   |  | 1                  | POS-SRS.3                             |        | N/A         |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/SCS  | 1                  | -89                                   |        |             |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/15 kHz   | 1                  | -98                                   |        |             |        |
| PRS $\hat{E}_s/I_{ot}$              | dB   | 1                  | -Infinity                             | -2.41  | -Infinity   | -12.12 |
| PRS $\hat{E}_s/N_{oc}$              | dB   | 1                  | -Infinity                             | -2     | -Infinity   | -10    |
| PRS-RSRP <sup>Note 3</sup>          | dBm/SCS kHz  | 1                  | -Infinity                             | -91    | -Infinity   | -99    |
| $I_o$                               | dBm/95.04 MHz  | 1                  | N/A                                   | -57.63 | N/A         | -57.63 |
| Propagation Condition               |  | 1                  | AWGN                                  |        |             |        |
| Note 1:                             | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |                    |                                       |        |             |        |
| Note 2:                             | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |                                       |        |             |        |
| Note 3:                             | PRS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                    |                                       |        |             |        |
| Note 4:                             | PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |                    |                                       |        |             |        |
| Note 5:                             | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                    |                                       |        |             |        |
| Note 6:                             | As observed with 0 dBi gain antenna at the centre of the quiet zone  |                    |                                       |        |             |        |
| Note 7:                             | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                    |                                       |        |             |        |

Table A.7.6.11.1.1-4: Void

### A.7.6.11.1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

## A.7.6.11.2 UE Rx-Tx time difference measurement period for dual positioning frequency layers in FR2 SA

### A.7.6.11.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR2 in standalone scenario when dual positioning frequency layers are configured.

The supported test configurations are listed in Table A.7.6.11.2.1-1.

**Table A.7.6.11.2.1-1: Supported test configurations**

| Config | Description   |
|--------|---|
| 1      | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on different RF channels in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE  $\Delta T$  ms before the start of T2, where  $\Delta T = 50$  ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #13 or ID #24 before T2.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.2.1-2 and Table A.7.6.11.2.1-3 respectively.

**Table A.7.6.11.2.1-2: General test parameters**

| Parameter  | Unit | Test configuration | Value                       | Comment   |
|--|------|--------------------|-----------------------------|---|
| Active cell  |      | 1                  | Cell 1                      | Cell 1 is the PCell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34].        |
| Neighbour cell   |      | 1                  | Cell 2                      | Cell 2 is a neighbour cell in <i>NR-Multi-RTT-ProvideAssistanceData</i> [34]. |
| RF Channel Number  |      | 1                  | 1                           | For Cell 1  |
| RF Channel Number  |      | 1                  | 2                           | For Cell 2  |
| BW <sub>channel</sub>  | MHz  | 1                  | 100: N <sub>RB,c</sub> = 66 |   |
| SSB configuration  |      | 1                  | SSB.2 FR2                   |   |
| SMTC configuration   |      | 1                  | SMTC.1                      |   |
| Measurement gap  |      | 1                  | GP#24 or GP#13<br>Note 1    |   |
| CP length  |      | 1                  | Normal                      |   |
| DRX  |      | 1                  | OFF                         |   |
| Time offset between serving and neighbour cells                                  | μs   | 1                  | 3                           | Synchronous cells   |
| T1   | s    | 1                  | 5                           |   |
| T2   | s    | 1                  | 20                          |   |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. |      |                    |                             |   |

Table A.7.6.11.2.1-3: Cell specific test parameters

| Parameter                           | Unit   | Test configuration | Cell 1                                |        | Cell 2      |        |
|-------------------------------------|--|--------------------|---------------------------------------|--------|-------------|--------|
|                                     |  |                    | T1                                    | T2     | T1          | T2     |
| AoA setup                           |  | 1                  | Setup 1 as specified in clause A.3.15 |        |             |        |
| Beam Assumption <sup>Note 7</sup>   |  | 1                  | Rough                                 |        | Rough       |        |
| TDD configuration                   |  | 1                  | TDDConf.3.1                           |        | TDDConf.3.1 |        |
| PDSCH RMC configuration             |  | 1                  | SR.3.1 TDD                            |        | N/A         |        |
| RMSI CORESET RMC configuration      |  | 1                  | CR.3.1 TDD                            |        | N/A         |        |
| Dedicated CORESET RMC configuration |  | 1                  | CCR.3.1 TDD                           |        | N/A         |        |
| OCNG Patterns                       |  | 1                  | OP.1                                  |        | OP.1        |        |
| TRS Configuration                   |  | 1                  | TRS.2.1 TDD                           |        | N/A         |        |
| Initial BWP configuration           |  | 1                  | DLBWP.0.1<br>ULBWP.0.1                |        | N/A         |        |
| Active DL BWP configuration         |  | 1                  | DLBWP.1.1                             |        | N/A         |        |
| Active UL BWP configuration         |  | 1                  | ULBWP.1.1                             |        | N/A         |        |
| PRS configuration                   |  | 1                  | PRS.1.1 FR2                           |        | PRS.1.1 FR2 |        |
| PRS muting info                     |  | 1                  | '10'                                  |        | '01'        |        |
| SRS configuration                   |  | 1                  | POS-SRS.3                             |        | N/A         |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/SCS  | 1                  | -89                                   |        |             |        |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/15 kHz   | 1                  | -98                                   |        |             |        |
| PRS $\hat{E}_s/I_{ot}$              | dB   | 1                  | -Infinity                             | -2.41  | -Infinity   | -12.12 |
| PRS $\hat{E}_s/N_{oc}$              | dB   | 1                  | -Infinity                             | -2     | -Infinity   | -10    |
| PRS-RSRP <sup>Note 3</sup>          | dBm/SCS kHz  | 1                  | -Infinity                             | -91    | -Infinity   | -99    |
| $I_o$                               | dBm/95.04 MHz  | 1                  | N/A                                   | -57.89 | N/A         | -59.60 |
| Propagation Condition               |  | 1                  | AWGN                                  |        |             |        |
| Note 1:                             | The resources for uplink transmission are assigned to the UE prior to the start of time period T2.   |                    |                                       |        |             |        |
| Note 2:                             | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |                                       |        |             |        |
| Note 3:                             | PRS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                    |                                       |        |             |        |
| Note 4:                             | PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |                    |                                       |        |             |        |
| Note 5:                             | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                    |                                       |        |             |        |
| Note 6:                             | As observed with 0 dBi gain antenna at the centre of the quiet zone  |                    |                                       |        |             |        |
| Note 7:                             | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                    |                                       |        |             |        |

Table A.7.6.11.1.1-4: Void

### A.7.6.11.2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

## A.7.7 Measurement Performance requirements

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in Clause 10 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in Clause 10 for at least 90% of the reported cases.
- Measurements are performed in RRC\_CONNECTED state.
- The reference channels assume transmission of PDSCH with a maximum number of 5 HARQ transmissions unless otherwise specified.

### A.7.7.1 SS-RSRP

#### A.7.7.1.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

##### A.7.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.3.1.1 and 10.1.3.1.2 for intra-frequency measurements.

##### A.7.7.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.7.7.1.1.2-2 and A.7.7.1.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1. The test consists of two time phases T1 and T2.

**Table A.7.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |



**Table A.7.7.1.1.2-2: SS-RSRP Intra frequency general test parameters**

| Parameter   | Unit | T1                          |              | T2                          |              |
|---|------|-----------------------------|--------------|-----------------------------|--------------|
|   |      | Cell 1                      | Cell 2       | Cell 1                      | Cell 2       |
| Cell ID   |      | 489                         | 0            | 489                         | 0            |
| SSB ARFCN   |      | freq1                       |              | freq1                       |              |
| Duplex mode                                       |      | TDD                         |              | TDD                         |              |
| TDD configuration                                 |      | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>                             | MHz  | 100: N <sub>RB,C</sub> = 66 |              | 100: N <sub>RB,C</sub> = 66 |              |
| Data RBs allocated                                |      | 24                          |              | 24                          |              |
| Downlink initial BWP configuration                |      | DLB<br>WP.0.<br>1           | -            | DLB<br>WP.0.<br>1           | -            |
| Downlink dedicated BWP configuration              |      | DLB<br>WP.1.<br>1           | -            | DLB<br>WP.1.<br>1           | -            |
| Uplink initial BWP configuration                  |      | ULB<br>WP.0.<br>1           | -            | ULB<br>WP.0.<br>1           | -            |
| Uplink dedicated BWP configuration                |      | ULB<br>WP.1.<br>1           | -            | ULB<br>WP.1.<br>1           | -            |
| DRX cycle configuration                           |      | Not<br>applic<br>able       | -            | Not<br>applic<br>able       | -            |
| TRS configuration                                 |      | TRS.2<br>.1<br>TDD          | -            | TRS.2<br>.1<br>TDD          | -            |
| TCI state   |      | TCI.St<br>ate.0             | -            | TCI.St<br>ate.0             | -            |
| PDSCH Reference measurement channel               |      | SR.3.<br>2<br>TDD           | -            | SR.3.<br>2<br>TDD           | -            |
| RMSI CORESET Reference Channel                    |      | CR.3.<br>1<br>TDD           | -            | CR.3.<br>1<br>TDD           | -            |
| Dedicated CORESET Reference channel               |      | CCR.<br>3.1<br>TDD          | -            | CCR.<br>3.1<br>TDD          | -            |
| OCNG Patterns                                     |      | OP.3                        | OP.3         | OP.3                        | OP.3         |
| SSB configuration                                 |      | SSB.3<br>FR2                | SSB.3<br>FR2 | SSB.3<br>FR2                | SSB.3<br>FR2 |
| SMTC configuration                                |      | SMTC<br>.1                  | SMTC<br>.1   | SMTC<br>.1                  | SMTC<br>.1   |
| Time offset with Cell 1                           | μs   | -                           | 3            | -                           | 3            |
| PDSCH/PDCCH subcarrier spacing                    | kHz  | 120                         | 120          | 120                         | 120          |
| EPRE ratio of PSS to SSS                          | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS                    |      |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS                   |      |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS                   |      |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS                 |      |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS                   |      |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS                 |      |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |      |                             |              |                             |              |
| Propagation conditions                            |      | AWG<br>N                    | AWG<br>N     | AWG<br>N                    | AWG<br>N     |
| Antenna configuration                             |      | 1x2                         | 1x2          | 1x2                         | 1x2          |

|         |   |
|---------|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Void  |
| Note 3: | Void  |
| Note 4: | Void  |
| Note 5: | Void  |

**Table A.7.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters**

| Parameter                                 | Unit  | T1                                   |        | T2                                    |                                     |
|---|---|--------------------------------------|--------|---------------------------------------|-------------------------------------|
|   |   | Cell 1                               | Cell 2 | Cell 1                                | Cell 2                              |
| Angle of arrival configuration            |   | Setup 1 according to clause A.3.15.1 |        |                                       |                                     |
| Assumption for UE beams <sup>Note 7</sup> |   | Rough                                |        | Rough                                 |                                     |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz<br>$z$ <sup>Note4</sup>   | -91.6                                |        | N/A                                   |                                     |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS<br><sup>Note4</sup>   | -82.6                                |        | N/A                                   |                                     |
| $\hat{E}_s / N_{oc}$                      | dB  | 6.0                                  | 1.0    | N/A                                   | N/A                                 |
| $E_s$                                     | dBm/SCS<br><sup>Note4</sup>   |                                      |        | (Table B.2.2-2 Rx Beam Peak +2.1dB)   | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| SSB_RP <sup>Note2</sup>                   | dBm/SCS   | -76.6                                | -81.6  | (Table B.2.2-2 Rx Beam Peak +2.1dB)   | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| $\hat{E}_s / I_{ot\_BB}$ <sup>Note6</sup> | dB  | 2.44                                 | -5.98  | -5.98                                 | -5.98                               |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz<br><sup>Note4</sup>   | -50.05                               |        | (Table B.2.2-2 Rx Beam Peak +29.70dB) |                                     |
| Note 1:                                   | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |                                      |        |                                       |                                     |
| Note 2:                                   | SSB_RP, $E_s/I_{ot}$ and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |        |                                       |                                     |
| Note 3:                                   | Void  |                                      |        |                                       |                                     |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |                                      |        |                                       |                                     |
| Note 5:                                   | Void  |                                      |        |                                       |                                     |
| Note 6:                                   | Calculation of $E_s/I_{ot\_BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                                      |        |                                       |                                     |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |                                      |        |                                       |                                     |

### A.7.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2. The following requirements are to be verified:

During T1:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.7.7.1.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.7.7.1.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T1 and T2:

Relative accuracy of Cell 1 during T2 compared with Cell 1 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

**Table A.7.7.1.1.3-1: SS-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <sup>Notes1,2,3</sup>   |
|---------|---|
| Cell 1  | $SSB\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP1 + \delta + G_{max}$   |
| Cell 2  | $SSB\_RP2 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP2 + \delta + G_{max}$   |
| Note 1: | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.3.1.1-1, selected according to the $\delta$ used in the test                                 |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                             |

## A.7.7.1.2 SA inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

### A.7.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.5.1.1 and 10.1.5.1.2 for intrer-frequency measurements with the testing configurations for NR cells in Table A.7.7.1.2.1-1.

**Table A.7.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test**

| <b>Configuration</b> | <b>Description</b>                                  |
|----------------------|---|
| 1                    | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2                    | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

### A.7.7.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.7.7.1.2.2-1: SS-RSRP inter-frequency test parameters**

| Parameter  | Config | Unit | Test 1                         |        | Test 2                         |        |
|--|--------|------|--------------------------------|--------|--------------------------------|--------|
|  |        |      | Cell 1                         | Cell 2 | Cell 1                         | Cell 2 |
| SSB ARFCN  | 1~2    |      | freq1                          | freq2  | freq1                          | freq2  |
| BW <sub>channel</sub>  | 1~2    |      | 100:<br>N <sub>RB,c</sub> = 66 |        | 100:<br>N <sub>RB,c</sub> = 66 |        |
| Data RBs allocated   | 1      |      | 24                             |        | 24                             |        |
|  | 2      |      | 48                             |        | 48                             |        |
| Gap pattern ID   |        |      | 0                              |        | 0                              |        |
| Duplex mode  | 1~2    |      | TDD                            |        | TDD                            |        |
| TDD configuration  | 1~2    |      | TDDConf.3.1                    |        | TDDConf.3.1                    |        |
| PDSCH Reference measurement channel  | 1      |      | SR.3.2 TDD                     | -      | SR.3.2 TDD                     | -      |
|  | 2      |      | SR.3.3 TDD                     |        | SR.3.3 TDD                     |        |
| RMSI CORESET Reference Channel   | 1      |      | CR.3.1 TDD                     | -      | CR.3.1 TDD                     | -      |
|  | 2      |      | CR.3.2 TDD                     |        | CR.3.2 TDD                     |        |
| Dedicated CORESET Reference Channel  | 1      |      | CCR.3.1 TDD                    | -      | CCR.3.1 TDD                    | -      |
|  | 2      |      | CCR.3.7 TDD                    |        | CCR.3.7 TDD                    |        |
| SSB configuration  | 1      |      | SSB.3 FR2                      |        | SSB.3 FR2                      |        |
|  | 2      |      | SSB.4 FR2                      |        | SSB.4 FR2                      |        |
| PDSCH/PDCCH subcarrier spacing   | 1~2    | kHz  | 120                            |        | 120                            |        |
| OCNG Patterns  | 1~2    |      | OP.3                           |        | OP.3                           |        |
| Initial BWP Configuration  | 1~2    |      | DLBWP.0.1                      |        | DLBWP.0.1                      |        |
|  |        |      | ULBWP.0.1                      |        | ULBWP.0.1                      |        |
| Dedicated BWP configuration  | 1~2    |      | DLBWP.1.3                      |        | DLBWP.1.3                      |        |
|  |        |      | ULBWP.1.3                      |        | ULBWP.1.3                      |        |
| TRS Configuration  | 1~2    |      | TRS.2.1 TDD                    |        | TRS.2.1 TDD                    |        |
| PDCCH/PDSCH TCI Configuration  | 1~2    |      | TCI.State.2                    |        | TCI.State.2                    |        |
| SMTc configuration   | 1~2    |      | SMTc.1                         |        | SMTc.1                         |        |
| Time offset between Cell 2 and Cell 1  | 1~2    | µs   | 3                              |        | 3                              |        |
| EPRE ratio of PSS to SSS   | 1~2    | dB   | 0                              | 0      | 0                              | 0      |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                                |        |                                |        |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                                |        |                                |        |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                                |        |                                |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                                |        |                                |        |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                                |        |                                |        |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                                |        |                                |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                                |        |                                |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                                |        |                                |        |
| Propagation condition  |        |      |                                |        |                                |        |
| Antenna configuration  | 1~2    | -    | 1x2                            | 1x2    | 1x2                            | AWGN   |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                                |        |                                |        |
| Note 2: Void.  |        |      |                                |        |                                |        |

**Table A.7.7.1.2.2-2: SS-RSRP inter frequency OTA related test parameters**

| Parameter  | Config | Unit                              | Test 1                                  |                   | Test 2  |   |
|--|--------|-----------------------------------|---|-------------------|---|---|
|  |        |                                   | Cell 1                                  | Cell 2            | Cell 1  | Cell 2  |
| Angle of arrival configuration                         | 1~2    |                                   | Setup 4b according to clause A.3.15.4.2 |                   | Setup 4b according to clause A.3.15.4.2                 |   |
|  |        |                                   | AoA1 Spherical coverage                 | AoA2 Rx Beam Peak | AoA1 Spherical coverage                                 | AoA2 Rx Beam Peak                                       |
| Assumption for UE beams <sup>Note 7</sup>              | 1~2    |                                   | Rough                                   |                   | Rough   |   |
| $N_{oc}$ <sup>Note1</sup>                              | 1      | dBm/15kHz<br>$z$ <sup>Note4</sup> | -90.6                                   | -90.6             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +1.97dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> -3.03dB)  |
|  | 2      |                                   | -93.7                                   | -93.7             |   |   |
| $N_{oc}$ <sup>Note1</sup>                              | 1      | dBm/SCS<br><sup>Note4</sup>       | -81.6                                   | -81.6             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +11.0dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +6.0dB)   |
|  | 2      |                                   | -81.7                                   | -81.7             |   |   |
| $\hat{E}_s/N_{oc}$                                     | 1~2    | dB                                | 6.0                                     | 6.0               | 17.0  | -1.0  |
| SSB_RP <sup>Note2</sup>                                | 1      | dBm/SCS                           | -75.6                                   | -75.6             | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +28.0dB)  | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +5.0dB)   |
|  | 2      |                                   | -75.7                                   | -75.7             |   |   |
| (SSB_RP <sub>Cell 1</sub> – SSB_RP <sub>Cell 2</sub> ) | 1~2    | dB                                | 0                                       |                   | 23.00   |   |
| $\hat{E}_s/I_{ot\ BB}$ <sup>Note6</sup>                | 1      | dB                                | 5.26                                    | 5.96              | 9.53  | -3.46   |
|  | 2      |                                   | 4.61                                    | 5.91              |   |   |
| $I_o$ <sup>Note2</sup>                                 | 1      | dBm/95.04 MHz<br><sup>Note4</sup> | -50.00                                  | -50.00            | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +52.68dB) | (Table B.2.3-2 Rx Beam Peak <sup>Note 8</sup> +33.13dB) |
|  | 2      |                                   | -50.09                                  | -50.09            |   |   |
| ( $I_{ofreq\ 1} - I_{ofreq\ 2}$ )                      | 1~2    | dB                                | 0                                       |                   | 19.55   |   |

|         |  |
|---------|--|
| Note 1: | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |
| Note 2: | SSB_RP, Es/lot, Io, (SSB_RP <sub>Cell 2</sub> – SSB_RP <sub>Cell 1</sub> ) and (Iofreq 2 – Iofreq 1) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 3: | Void   |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |
| Note 5: | Void   |
| Note 6: | Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB <sub>P</sub> or ΔMB <sub>S</sub> from TS 38.101-2 [19] Table 6.2.1.3-4. |
| Note 7: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |
| Note 8: | The value in Table B.2.3-2 is the Minimum SSB_RP for SCS <sub>SSB</sub> = 120 kHz, selected according to the operating band of Cell 2 and UE power class, without ΔMB <sub>P,n</sub> adjustment.   |

**A.7.7.1.2.3 Test Requirements**

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirements in clause 10.1.5.1.1 and the relative requirements in clause 10.1.5.1.2.

Test 1:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.7.7.1.2.3-2.

Test 2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.7.7.1.2.3-2.

**Table A.7.7.1.2.3-1: SS-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <small>Notes1,2,3,4</small>  |
|---------|--|
| Cell 1  | $SSB\_RP1 - \delta + G_{min} + X \leq \text{Reported RSRP(dBm)} \leq SSB\_RP1 + \delta + G_{max}$  |
| Cell 2  | $SSB\_RP2 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP2 + \delta + G_{max}$  |
| Note 1: | SSB_RP <sub>n</sub> is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2: | δ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the Io used in the test   |
| Note 3: | G <sub>min</sub> and G <sub>max</sub> are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  |
| Note 4: | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |



**Table A.7.7.1.2.3-2: SS-RSRP relative accuracy test requirement**

| <b>Test requirement</b> <small>Notes 1,2,3,4, 5, 6</small> |  |
|--|--|
| Cell 2 – Cell 1  | $SSB\_RP2 - SSB\_RP1 - \delta - D - G_{inter} \leq \text{Reported RSRP (dB)} \leq SSB\_RP2 - SSB\_RP1 + \delta + G_{inter} - (X)$  |
| Note 1:  | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2:  | $\delta$ is the RSRP relative accuracy requirement from Table 10.1.5.1.2-1   |
| Note 3:  | Void   |
| Note 4:  | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |
| Note 5:  | D = [5.5dB]. D is the <a href="#">margin due to mis-alignment between fine beam and rough beam</a> .   |
| Note 6:  | $G_{inter}$ = [3dB]. $G_{inter}$ is the <a href="#">margin due to different antenna gain caused by frequency separation</a> .  |

**A.7.7.1.3 SA inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell**

**A.7.7.1.3.1 Test Purpose and Environment**

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.7.7.1.3.1-1.

**Table A.7.7.1.3.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test**

| Config | Description of serving cell                          | Description of target cell                          |
|--------|--|---|
| 1      | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2      | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |   |
| 3      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |   |

**A.7.7.1.3.2 Test parameters**

In this set of test cases there are two cells in the test, PCell (Cell 1) in FR1 and Cell 2 in FR2 . The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2 below. Absolute accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2. The inter-frequency measurements are supported by a measurement gap.

**Table A.7.7.1.3.2-1: SS-RSRP inter-frequency test parameters**

| Parameter  | Config | Unit | Test 1                         |                                | Test 2                         |                                |
|--|--------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|  |        |      | Cell 1                         | Cell 2                         | Cell 1                         | Cell 2                         |
| SSB ARFCN  | 1~3    |      | freq1                          | freq2                          | freq1                          | freq2                          |
| BW <sub>channel</sub>                            | 1      | MHz  | 10:<br>N <sub>RB,c</sub> = 52  | 100:<br>N <sub>RB,c</sub> = 66 | 10:<br>N <sub>RB,c</sub> = 52  | 100:<br>N <sub>RB,c</sub> = 66 |
|  | 2      |      | 10:<br>N <sub>RB,c</sub> = 52  |                                | 10:<br>N <sub>RB,c</sub> = 52  |                                |
|  | 3      |      | 40:<br>N <sub>RB,c</sub> = 106 |                                | 40:<br>N <sub>RB,c</sub> = 106 |                                |
| Data RBs allocated                               | 1,2    |      | 52                             | 24                             | 52                             | 66                             |
|  | 3      |      | 106                            |                                | 106                            |                                |
| Duplex mode                                      | 1      |      | FDD                            | TDD                            | FDD                            | TDD                            |
|  | 2      |      | TDD                            |                                | TDD                            |                                |
|  | 3      |      | TDD                            |                                | TDD                            |                                |
| TDD configuration                                | 1      |      | N/A                            | TDDConf.<br>3.1                | N/A                            | TDDConf.<br>3.1                |
|  | 2      |      | TDDConf.<br>1.1                |                                | TDDConf.<br>1.1                |                                |
|  | 3      |      | TDDConf.<br>2.1                |                                | TDDConf.<br>2.1                |                                |
| PDSCH Reference measurement channel              | 1      |      | SR.1.1 FDD                     | -                              | SR.1.1 FDD                     | -                              |
|  | 2      |      | SR.1.1 TDD                     |                                | SR.1.1 TDD                     |                                |
|  | 3      |      | SR.2.1 FDD                     |                                | SR.2.1 FDD                     |                                |
| RMSI CORESET Reference Channel                   | 1      |      | CR.1.1 FDD                     | -                              | CR.1.1 FDD                     | -                              |
|  | 2      |      | CR.1.1 TDD                     |                                | CR.1.1 TDD                     |                                |
|  | 3      |      | CR.2.1 FDD                     |                                | CR.2.1 FDD                     |                                |
| Dedicated CORESET Reference Channel              | 1      |      | CCR.1.1 FDD                    | -                              | CCR.1.1 FDD                    | -                              |
|  | 2      |      | CCR.1.1 TDD                    |                                | CCR.1.1 TDD                    |                                |
|  | 3      |      | CCR.2.1 TDD                    |                                | CCR.2.1 TDD                    |                                |
| SSB configuration                                | 1      |      | SSB.1<br>FR1                   | SSB.3<br>FR2                   | SSB.1<br>FR1                   | SSB.3<br>FR2                   |
|  | 2      |      | SSB.1<br>FR1                   |                                | SSB.1<br>FR1                   |                                |
|  | 3      |      | SSB.2<br>FR1                   |                                | SSB.2<br>FR1                   |                                |
| OCNG Patterns                                    | 1~3    |      | OP.1                           | OP.3                           | OP.1                           | OP.1                           |
| Initial BWP Configuration                        | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1         |                                | DLBWP.0.1<br>ULBWP.0.1         |                                |
| Dedicated BWP configuration                      | 1~3    |      | DLBWP.1.3<br>ULBWP.1.3         |                                | DLBWP.1.3<br>ULBWP.1.3         |                                |
| TRS Configuration                                | 1~3    |      | TRS.2.1 TDD                    |                                | TRS.2.1 TDD                    |                                |
| PDCCH/PDSCH TCI Configuration                    | 1~3    |      | TCI.State.2                    |                                | TCI.State.2                    |                                |
| SMTC configuration                               | 1~3    |      | SMTC.1                         |                                | SMTC.1                         |                                |
| Time offset between Cell 2 and Cell 1            | 1~3    | µs   | 3                              |                                | 3                              |                                |
| EPRE ratio of PSS to SSS                         | 1~3    | dB   | 0                              | 0                              | 0                              | 0                              |
| EPRE ratio of PBCH DMRS to SSS                   |        |      |                                |                                |                                |                                |
| EPRE ratio of PBCH to PBCH DMRS                  |        |      |                                |                                |                                |                                |
| EPRE ratio of PDCCH DMRS to SSS                  |        |      |                                |                                |                                |                                |
| EPRE ratio of PDCCH to PDCCH DMRS                |        |      |                                |                                |                                |                                |
| EPRE ratio of PDSCH DMRS to SSS                  |        |      |                                |                                |                                |                                |
| EPRE ratio of PDSCH to PDSCH DMRS                |        |      |                                |                                |                                |                                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> |        |      |                                |                                |                                |                                |

|   |     |   |  |      |  |      |
|---|-----|---|--|------|--|------|
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |     |   |  |      |  |      |
| Propagation condition   | 1~3 | - | NA<br>Link only,<br>see clause<br>A.3.7A | AWGN | NA<br>Link only,<br>see clause<br>A.3.7A | AWGN |
| Antenna configuration   | 1~3 | - |  | 1x2  |  | 1x2  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |     |   |  |      |  |      |
| Note 2: Void  |     |   |  |      |  |      |

**Table A.7.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters**

| Parameter   | Config | Unit          | Test 1                             |          | Test 2 <sup>NOTE 3</sup>           |   |
|---|--------|---------------|------------------------------------|----------|------------------------------------|---|
|   |        |               | Cell 1                             | Cell 2   | Cell 1                             | Cell 2                                  |
| Angle of arrival configuration according to clause A.3.15   |        |               | NA                                 | Setup 2b | NA                                 | Setup 2b                                |
| Assumption for UE beams <sup>Note 4</sup>   |        |               | N/A                                | Rough    | N/A                                | Rough                                   |
| $N_{oc}$  | 1~3    | dBm/15 kHz    | Link only,<br>see clause<br>A.3.7A | -90      | Link only,<br>see clause<br>A.3.7A | NA                                      |
| $N_{oc}$  | 1~3    | dBm/SS B SCS  |                                    | -80.97   |                                    | NA                                      |
| $\hat{E}_s / N_{oc}$  | 1~3    | dB            |                                    | 5        |                                    | NA                                      |
| $E_s$   | 1~3    | dBm/SC S      |                                    |          |                                    | (Table B.2.3-2 Spherical coverage +1dB) |
| SSB_RP <sup>Note1</sup>   | 1~3    | dBm/SC S      |                                    | -76.0    |                                    | Table B.2.3-2 Spherical coverage +1dB)  |
| $\hat{E}_s / I_{otBB}$ <sup>Note6</sup>   | 1~3    | dB            |                                    | 4.35     |                                    | -3.81                                   |
| $I_o$ <sup>Note1</sup>  | 1~3    | dBm/95.04M Hz |                                    | 50.18    |                                    | SSB_RP +28.98                           |
| <p>Note 1: <math>E_s/I_{ot}</math>, SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: Void</p> <p>Note 3: No additional noise is added by the test system in Test 2.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 6: Calculation of <math>E_s/I_{otBB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_s</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |        |               |                                    |          |                                    |   |

**A.7.7.1.3.3 Test Requirements**

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the Absolute requirement in clause 10.1.5.1.1.

Test 1:

Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.3.3.

Test 2:

Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.3.3.

**Table A.7.7.1.3.3: SS-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <small>Notes1,2,3,4</small>  |
|---------|--|
| Cell 2  | $SSB\_RP1 - \delta + G_{min} + X \leq \text{Reported RSRP(dBm)} \leq SSB\_RP1 + \delta + G_{max}$  |
| Note 1: | SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the $I_0$ used in the test   |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  |
| Note 4: | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |

## A.7.7.2 SS-RSRQ

### A.7.7.2.1 SA intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.8.1.1.

#### A.7.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.7.7.2.1.2-2 and Table A.7.7.2.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell.

**Table A.7.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| <b>Configuration</b> | <b>Description</b>                                  |
|----------------------|---|
| 1                    | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.7.2.1.2-2: SS-RSRQ Intra frequency test parameters**

| Parameter   |                  | Unit | Test 1                      |              | Test 2                      |              |
|---|------------------|------|-----------------------------|--------------|-----------------------------|--------------|
|   |                  |      | Cell 1                      | Cell 2       | Cell 1                      | Cell 2       |
| SSB ARFCN   |                  |      | Freq1                       |              | Freq1                       |              |
| Duplex mode   |                  |      | TDD                         |              | TDD                         |              |
| TDD configuration   |                  |      | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>   |                  | MHz  | 100: N <sub>RB,c</sub> = 66 |              | 100: N <sub>RB,c</sub> = 66 |              |
| Data RBs allocated  |                  |      | 66                          |              | 66                          |              |
| BWP configuration   | Initial DL BWP   |      | DLBWP.0.1                   |              |                             |              |
|   | Dedicated DL BWP |      | DLBWP.1.1                   |              |                             |              |
|   | Initial UL BWP   |      | ULBWP.0.1                   |              |                             |              |
|   | Dedicated UL BWP |      | ULBWP.1.1                   |              |                             |              |
| TRS configuration   |                  |      | TRS.2.1<br>TDD              |              | TRS.2.1<br>TDD              |              |
| TCI state   |                  |      | TCI.State<br>.0             |              | TCI.State<br>.0             |              |
| PDSCH Reference measurement channel   |                  |      | SR.3.1<br>TDD               |              | SR.3.1<br>TDD               |              |
| RMSI CORESET Reference Channel  |                  |      | CR.3.1<br>TDD               | -            | CR.3.1<br>TDD               |              |
| Control channel RMC   |                  |      | CCR.3.1<br>TDD              | -            | CCR.3.1<br>TDD              | -            |
| OCNG Patterns   |                  |      | OP.1                        | OP.1         | OP.1                        | OP.1         |
| SMTC configuration  |                  |      | SMTC.1                      |              |                             |              |
| SSB configuration   |                  |      | SSB.1<br>FR2                | SSB.1<br>FR2 | SSB.1<br>FR2                | SSB.1<br>FR2 |
| PDSCH/PDCCH subcarrier spacing  |                  | kHz  | 120                         | 120          | 120                         | 120          |
| SS-RSSI-Measurement   |                  |      | Not Applicable              |              |                             |              |
| EPRE ratio of PSS to SSS  |                  | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS  |                  |      |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |                  |      |                             |              |                             |              |
| Propagation condition   |                  |      |                             | AWGN         |                             | AWGN         |
| Antenna configuration   |                  |      | 1x2                         | 1x2          | 1x2                         | 1x2          |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: Void |                  |      |                             |              |                             |              |

**Table A.7.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters**

|  | Unit                           | Test 1                               |        | Test 2                               |        |
|--|--------------------------------|--------------------------------------|--------|--------------------------------------|--------|
|  |                                | Cell 1                               | Cell 2 | Cell 1                               | Cell 2 |
| Angle of arrival configuration   |                                | Setup 1 according to clause A.3.15.1 |        | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 9</sup>  |                                | Rough                                |        |                                      |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -95                                  |        | -95                                  |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -86                                  |        | -86                                  |        |
| $\hat{E}_s / N_{oc}$   | dB                             | 3                                    | 3      | -3                                   | -3     |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -83                                  | -83    | -89                                  | -89    |
| SS-RSRQ <sup>Note2</sup>   | dB                             | -14.77                               | -14.77 | -16.81                               | -16.81 |
| $\hat{E}_s / I_{ot}$   | dB                             | -1.76                                | -1.76  | -4.76                                | -4.76  |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -50                                  |        | -54                                  |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRQ, SSB_RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |                                      |        |

### A.7.7.2.1.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ-2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal RSRQ+3.5dB to Nominal RSRQ-3.5dB according to the requirements in clause 10.1.8.1.1. Nominal RSRQ is the value shown in table A.7.7.2.1.2-3.

### A.7.7.2.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.7.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter-frequency measurement.

#### A.7.7.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.7.7.2.2.2-2 and Table A.7.7.2.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A. 7.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.7.2.2-2: SS-RSRQ Inter frequency general test parameters**

| Parameter   |                  | Unit | Test 1                      |                | Test 2                      |                |
|---|------------------|------|-----------------------------|----------------|-----------------------------|----------------|
|   |                  |      | Cell 1                      | Cell 2         | Cell 1                      | Cell 2         |
| SSB ARFCN   |                  |      | Freq1                       | freq2          | freq1                       | Freq2          |
| SSB Configuration   |                  |      | SSB.1<br>FR2                | SSB.1<br>FR2   | SSB.1<br>FR2                | SSB.1<br>FR2   |
| CSI-RS for tracking   |                  |      | TRS.2.<br>1 TDD             | -              | TRS.2.<br>1 TDD             | -              |
| Duplex mode   |                  |      | TDD                         |                | TDD                         |                |
| TDD configuration   |                  |      | TDDConf.3.1                 |                | TDDConf.3.1                 |                |
| BW <sub>channel</sub>   |                  | MHz  | 100: N <sub>RB,c</sub> = 66 |                | 100: N <sub>RB,c</sub> = 66 |                |
| Data RBs allocated  |                  |      | 66                          |                | 66                          |                |
| BWP configuration   | Initial DL BWP   |      | DLBWP.0.1                   |                |                             |                |
|   | Dedicated DL BWP |      | DLBWP.1.1                   |                |                             |                |
|   | Initial UL BWP   |      | ULBWP.0.1                   |                |                             |                |
|   | Dedicated UL BWP |      | ULBWP.1.1                   |                |                             |                |
| TRS configuration   |                  |      | TRS.2.<br>1 TDD             | -              | TRS.2.<br>1 TDD             | -              |
| TCI state   |                  |      | TCI.Sta<br>te.0             | -              | TCI.Sta<br>te.0             | -              |
| PDSCH Reference measurement channel   |                  |      | SR.3.1<br>TDD               | -              | SR.3.1<br>TDD               | -              |
| RMSI CORESET Reference Channel  |                  |      | CR.3.1<br>TDD               | -              | CR.3.1<br>TDD               | -              |
| OCNG Patterns   |                  |      | OP.1                        | OP.1           | OP.1                        | OP.1           |
| SMTC configuration  |                  |      | SMTC.<br>1 FR2              | SMTC.<br>1 FR2 | SMTC.<br>1 FR2              | SMTC.<br>1 FR2 |
| PDSCH/PDCCH subcarrier spacing  |                  | kHz  | 120                         | 120            | 120                         | 120            |
| EPRE ratio of PSS to SSS  |                  | dB   | 0                           | 0              | 0                           | 0              |
| EPRE ratio of PBCH_DMRS to SSS  |                  |      |                             |                |                             |                |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |      |                             |                |                             |                |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |      |                             |                |                             |                |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |      |                             |                |                             |                |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |      |                             |                |                             |                |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |      |                             |                |                             |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                  |      |                             |                |                             |                |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |                  |      |                             |                |                             |                |
| Propagation conditions  |                  |      |                             |                |                             |                |
| Antenna configuration   |                  |      | 1x2                         | 1x2            | 1x2                         | 1x2            |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void |                  |      |                             |                |                             |                |



**Table A.7.7.2.2-3: SS-RSRQ Inter frequency OTA related test parameters**

| Parameter  | Unit                           | Test 1                    |        | Test 2                    |        |
|--|--------------------------------|---------------------------|--------|---------------------------|--------|
|  |                                | Cell 1                    | Cell 2 | Cell 1                    | Cell 2 |
| AoA setup  |                                | Setup 1 in clause A.3.15. |        | Setup 1 in clause A.3.15. |        |
| Assumption for UE beams <sup>Note 8</sup>  |                                | Rough                     |        | Rough                     |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -94.03                    | -94.03 | -94.03                    | -94.03 |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -85.0                     | -85.0  | -85.0                     | -85.0  |
| $\hat{E}_s / N_{oc}$   | dB                             | -1.75                     | -1.75  | -3                        | -1.75  |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -86.75                    | -86.75 | -88                       | -88    |
| SS-RSRQ <sup>Note2</sup>   | dB                             | -14.75                    | -14.75 | -15.56                    | -15.56 |
| $\hat{E}_s / I_{ot}$   | dB                             | -1.75                     | -1.75  | -3                        | -3     |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -53.8                     | -53.8  | -54.25                    | -54.25 |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-RSRQ, SSB_RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                           |        |                           |        |

### A.7.7.2.2.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ -2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ +3.5dB to Nominal SS-RSRQ -3.5dB according to the requirements in clause 10.1.10.1.1.

The SS-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.1.2.

## A.7.7.3 SS-SINR

### A.7.7.3.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.13.1.1.

#### A.7.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.3.1.2-1. . The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.7.7.3.1.2-2 and Table A.7.7.3.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.3.1.2-2: SS-SINR Intra frequency test parameters

| Parameter   | Unit  | Test 1                      |              | Test 2                      |              |
|---|---|-----------------------------|--------------|-----------------------------|--------------|
|   |   | Cell 1                      | Cell 2       | Cell 1                      | Cell 2       |
| SSB ARFCN   |   | Freq2                       |              | Freq2                       |              |
| Duplex mode                                       |   | TDD                         |              | TDD                         |              |
| TDD configuration                                 |   | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>                             | MHz   | 100: N <sub>RB,c</sub> = 66 |              | 100: N <sub>RB,c</sub> = 66 |              |
| Data RBs allocated                                |   | 66                          |              | 66                          |              |
| Downlink initial BWP configuration                |   | DLBWP.0.1                   |              |                             |              |
| Downlink dedicated BWP configuration              |   | DLBWP.1.1                   |              |                             |              |
| Uplink initial BWP configuration                  |   | ULBWP.0.1                   |              |                             |              |
| Uplink dedicated BWP configuration                |   | ULBWP.1.1                   |              |                             |              |
| DRX cycle configuration                           | ms  | Not applicable              |              |                             |              |
| TRS configuration                                 |   | TRS.2.1 TDD                 |              |                             |              |
| TCI state   |   | TCI.State.0                 |              |                             |              |
| PDSCH Reference measurement channel               |   | SR.3.1<br>TDD               |              | SR.3.1<br>TDD               |              |
| RMSI CORESET Reference Channel                    |   | CR.3.1<br>TDD               | -            | CR.3.1<br>TDD               |              |
| Dedicated RMSI CORESET Reference Channel          |   | CCR.3<br>.1 TDD             | -            | CCR.3.<br>1 TDD             | -            |
| OCNG Patterns                                     |   | OP.1                        | OP.1         | OP.1                        | OP.1         |
| SMTc configuration                                |   | SMTc.1                      |              |                             |              |
| SSB configuration                                 |   | SSB.1<br>FR2                | SSB.1<br>FR2 | SSB.1<br>FR2                | SSB.1<br>FR2 |
| PDSCH/PDCCH subcarrier spacing                    | kHz   | 120                         | 120          | 120                         | 120          |
| SS-RSSI-Measurement                               |   | Not Applicable              |              |                             |              |
| EPRE ratio of PSS to SSS                          | dB  | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS                    |   |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS                   |   |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS                   |   |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS                 |   |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS                   |   |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS                 |   |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |                             |              |                             |              |
| Propagation conditions                            |   | AWGN                        |              |                             |              |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                             |              |                             |              |
| Note 2:   | Void  |                             |              |                             |              |
| Note 3:   | Void.   |                             |              |                             |              |
| Note 4:   | Void  |                             |              |                             |              |

Table A.7.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

| Parameter  | Unit                           | Test 1                               |        | Test 3                               |        |
|--|--------------------------------|--------------------------------------|--------|--------------------------------------|--------|
|  |                                | Cell 1                               | Cell 2 | Cell 1                               | Cell 2 |
| Angle of arrival configuration   |                                | Setup 1 according to clause A.3.15.1 |        | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 9</sup>  |                                | Rough                                |        | Rough                                |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -105                                 |        | -105                                 |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -96                                  |        | -96                                  |        |
| $\hat{E}_s / N_{oc}$   | dB                             | 4.54                                 | 2.66   | -3                                   | -3     |
| SSB_RP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -91.46                               | -93.34 | -99                                  | -99    |
| SS-SINR <sup>Note2</sup>   | dB                             | 0                                    | -3.2   | -4.76                                | -4.76  |
| $\hat{E}_s / I_{ot}$   | dB                             | 0                                    | -3.2   | -4.76                                | -4.76  |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -59.2                                |        | -64                                  |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-SINR, SSB_RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |                                      |        |

### A.7.7.3.1.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3dB to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.10.13.1.

### A.7.7.3.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.7.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

#### A.7.7.3.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.7.7.3.2.2-2 and Table A.7.7.3.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.3.2.2-2: SS-SINR Inter frequency general test parameters

| Parameter   | Unit  | Test 1                      |                | Test 2                      |                | Test 3                      |                |
|---|---|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
|   |   | Cell 1                      | Cell 2         | Cell 1                      | Cell 2         | Cell 1                      | Cell 2         |
| SSB ARFCN   |   | freq1                       | freq2          | freq1                       | freq2          | freq1                       | freq2          |
| Duplex mode                                       |   | TDD                         |                | TDD                         |                | TDD                         |                |
| TDD configuration                                 |   | TDDConf.3.1                 |                | TDDConf.3.1                 |                | TDDConf.3.1                 |                |
| BW <sub>channel</sub>                             | MHz   | 100: N <sub>RB,c</sub> = 66 |                | 100: N <sub>RB,c</sub> = 66 |                | 100: N <sub>RB,c</sub> = 66 |                |
| Data RBs allocated                                |   | 66                          |                | 66                          |                | 66                          |                |
| Downlink initial BWP configuration                |   | DLBWP.0.1                   |                |                             |                |                             |                |
| Downlink dedicated BWP configuration              |   | DLBWP.1.1                   |                |                             |                |                             |                |
| Uplink initial BWP configuration                  |   | ULBWP.0.1                   |                |                             |                |                             |                |
| Uplink dedicated BWP configuration                |   | ULBWP.1.1                   |                |                             |                |                             |                |
| DRX cycle configuration                           | ms  | Not applicable              |                |                             |                |                             |                |
| TRS configuration                                 |   | TRS.2.1 TDD                 |                |                             |                |                             |                |
| TCI state   |   | TCI.State.0                 |                |                             |                |                             |                |
| PDSCH Reference measurement channel               |   | SR.3.1<br>TDD               | -              | SR.3.1<br>TDD               | -              | SR.3.1<br>TDD               | -              |
| RMSI CORESET Reference Channel                    |   | CR.3.1<br>TDD               | -              | CR.3.1<br>TDD               | -              | CR.3.1<br>TDD               | -              |
| OCNG Patterns                                     |   | OP.1                        | OP.1           | OP.1                        | OP.1           | OP.1                        | OP.1           |
| SMTC configuration                                |   | SMTC.<br>1 FR2              | SMTC.<br>1 FR2 | SMTC.<br>1 FR2              | SMTC.<br>1 FR2 | SMTC.<br>1 FR2              | SMTC.<br>1 FR2 |
| SSB configuration                                 |   | SSB.3<br>FR2                | SSB.3<br>FR2   | SSB.3<br>FR2                | SSB.3<br>FR2   | SSB.3<br>FR2                | SSB.3<br>FR2   |
| PDSCH/PDCCH subcarrier spacing                    | kHz   | 120                         | 120            | 120                         | 120            | 120                         | 120            |
| EPRE ratio of PSS to SSS                          | dB  | 0                           | 0              | 0                           | 0              | 0                           | 0              |
| EPRE ratio of PBCH_DMRS to SSS                    |   |                             |                |                             |                |                             |                |
| EPRE ratio of PBCH to PBCH_DMRS                   |   |                             |                |                             |                |                             |                |
| EPRE ratio of PDCCH_DMRS to SSS                   |   |                             |                |                             |                |                             |                |
| EPRE ratio of PDCCH to PDCCH_DMRS                 |   |                             |                |                             |                |                             |                |
| EPRE ratio of PDSCH_DMRS to SSS                   |   |                             |                |                             |                |                             |                |
| EPRE ratio of PDSCH to PDSCH_DMRS                 |   |                             |                |                             |                |                             |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |                             |                |                             |                |                             |                |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |                             |                |                             |                |                             |                |
| Propagation conditions                            |   | AWGN                        | AWGN           | AWGN                        | AWGN           | AWGN                        | AWGN           |
| Antenna configuration                             |   | 1x2                         | 1x2            | 1x2                         | 1x2            | 1x2                         | 1x2            |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |                             |                |                             |                |                             |                |
| Note 2:   | Void  |                             |                |                             |                |                             |                |
| Note 3:   | Void  |                             |                |                             |                |                             |                |
| Note 4:   | Void  |                             |                |                             |                |                             |                |

**Table A.7.7.3.2.2-3: SS-SINR Inter frequency OTA related test parameters**

| Parameter   | Unit                           | Test 1                        |        | Test 2                        |        | Test 3                        |        |
|---|--------------------------------|-------------------------------|--------|-------------------------------|--------|-------------------------------|--------|
|   |                                | Cell 1                        | Cell 2 | Cell 1                        | Cell 2 | Cell 1                        | Cell 2 |
| Angle of arrival configuration  | degrees                        | Setup 1 according to A.3.15.1 |        | Setup 1 according to A.3.15.1 |        | Setup 1 according to A.3.15.1 |        |
| Assumption for UE beams <sup>Note 10</sup>  |                                | Rough                         |        | Rough                         |        | Rough                         |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -105                          | -105   | -105                          | -105   | -105                          | -105   |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -96                           | -96    | -96                           | -96    | -96                           | -96    |
| $\hat{E}_s / N_{oc}$  | dB                             | -0.5                          | -0.5   | 11.0                          | 11.0   | -3.0                          | -3.0   |
| SSB_RP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -96.5                         | -96.5  | -85                           | -85    | -99                           | -99    |
| SS-SINR <sup>Note2</sup>  | dB                             | -0.5                          | -0.5   | 11                            | 11     | -3.0                          | -3.0   |
| $\hat{E}_s / I_{ot}$  | dB                             | -0.5                          | -0.5   | 11                            | 11     | -3.0                          | -3.0   |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -69.3                         | -69.3  | -55.4                         | -55.4  | -65.24                        | -65.24 |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SS-SINR, SSB_RP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Void</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Void</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                               |        |                               |        |                               |        |

### A.7.7.3.2.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR +3dB to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.15.1.1.

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.1.2.

## A.7.7.4 L1-RSRP measurement for beam reporting

### A.7.7.4.1 SSB based L1-RSRP measurement

#### A.7.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.7.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.7.7.4.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  |
| 2      | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.7.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2.

Here is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.7.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters

| Parameter   | Config | Unit | Test 1                      | Test 2                      |
|---|--------|------|-----------------------------|-----------------------------|
| SSB GSCN  | 1~2    |      | freq1                       | freq1                       |
| Duplex mode   | 1~2    |      | TDD                         | TDD                         |
| TDD Configuration   | 1~2    |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| Data RBs allocated  | 1~2    |      | 66                          | 66                          |
| PDSCH Reference measurement channel   | 1      |      | SR.3.2 TDD                  | SR.3.2 TDD                  |
|   | 2      |      | SR.3.3 TDD                  | SR.3.3 TDD                  |
| RMSI CORESET Reference Channel  | 1      |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
|   | 2      |      | CR.3.2 TDD                  | CR.3.2 TDD                  |
| Dedicated CORESET Reference Channel   | 1      |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
|   | 2      |      | CCR.3.7 TDD                 | CCR.3.7 TDD                 |
| SSB configuration   | 1      |      | SSB.1 FR2                   | SSB.1 FR2                   |
|   | 2      |      | SSB.2 FR2                   | SSB.2 FR2                   |
| OCNG Patterns   | 1~2    |      | OP.1                        | OP.1                        |
| Initial BWP Configuration   | 1~2    |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1~2    |      | DLBWP.1.3<br>ULBWP.1.3      | DLBWP.1.3<br>ULBWP.1.3      |
| TRS Configuration   | 1~2    |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1~2    |      | TCI.State.2                 | TCI.State.2                 |
| SMTc configuration  | 1~2    |      | SMTc.1                      | SMTc.1                      |
| reportConfigType  | 1~2    |      | periodic                    | periodic                    |
| reportQuantity  | 1~2    |      | ssb-Index-RSRP              | ssb-Index-RSRP              |
| Number of reported RS   | 1~2    |      | 2                           | 2                           |
| L1-RSRP reporting period  | 1~2    |      | slot320                     | slot320                     |
| Propagation condition   | 1~2    |      | AWGN                        | AWGN                        |
| Antenna configuration   | 1~2    |      | 1x2                         | 1x2                         |
| EPRE ratio of PSS to SSS  | 1~2    | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |        |      |                             |                             |

**Table A.7.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters**

| Parameter   | Config | Unit          | Test 1                        |      | Test 2 <sup>NOTE 3</sup>      |      |
|---|--------|---------------|-------------------------------|------|-------------------------------|------|
|   |        |               | SSB0                          | SSB1 | SSB0                          | SSB1 |
| Angle of arrival configuration  |        |               | Setup 1 according to A.3.15.1 |      | Setup 1 according to A.3.15.1 |      |
| Assumption for UE beams <sup>Note 4</sup>   |        |               | Rough                         |      | Rough                         |      |
| $N_{oc}$  | 1~2    | dBm/15 kHz    | -100                          |      | n.a.                          |      |
| $N_{oc}$  | 1      | dBm/SS B SCS  | -91                           |      | n.a.                          |      |
|   | 2      |               | -88                           |      | n.a.                          |      |
| $\hat{E}_s/I_{ot}$  | 1~2    | dB            | 10                            | -2   | n.a.                          |      |
| SSB_RP <sup>Note1</sup>   | 1      | dBm/SC S      | -81                           | -93  | As in Table B.2.4-2           |      |
|   | 2      |               | -78                           | -90  | As in Table B.2.4-2           |      |
| $I_o$ <sup>Note1</sup>  | 1~2    | dBm/95.04M Hz | -51.57                        |      | SSB_RP+28.98                  |      |
| $\hat{E}_s/N_{oc}$  | 1~2    | dB            | 10                            | -2   | n.a.                          |      |
| <p>Note 1: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: Void.</p> <p>Note 3: No additional noise is added by the test system in Test 2.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |               |                               |      |                               |      |

#### A.7.7.4.1.3 Test Requirements

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB0 and absolute accuracy of SSB1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

For Test 2:

Absolute accuracy of SSB0 and absolute accuracy of SSB1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

**Table A.7.7.4.1.3-1: L1-RSRP absolute accuracy test requirement**

|   | Test requirement <sup>Notes1,2,3</sup>  |
|---|---|
| SSB0  | $SSB\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP0 + \delta + G_{max}$ |
| SSB1  | $SSB\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq SSB\_RP1 + \delta + G_{max}$ |
| <p>Note 1: SSB_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB n under consideration</p> <p>Note 2: <math>\delta</math> is the RSRP absolute accuracy requirement from Table 10.1.20.1.1-1, selected according to the <math>I_o</math> used in the test</p> <p>Note 3: <math>G_{min}</math> and <math>G_{max}</math> are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class</p> |   |



## A.7.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

### A.7.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.7.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.7.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

### A.7.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.7.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters

| Parameter   | Config | Unit | Test 1                      | Test 2                      |
|---|--------|------|-----------------------------|-----------------------------|
| SSB GSCN  | 1      |      | freq1                       | freq1                       |
| Duplex mode   | 1      |      | TDD                         | TDD                         |
| TDD Configuration   | 1      |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1      | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel   | 1      |      | SR.3.1 TDD                  | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel  | 1      |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1      |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
| SSB configuration   | 1      |      | SSB.1 FR2                   | SSB.1 FR2                   |
| OCNG Patterns   | 1      |      | OP.1                        | OP.1                        |
| Initial BWP Configuration   | 1      |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1      |      | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |
| TRS Configuration   | 1      |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1      |      | TCI.State.2                 | TCI.State.2                 |
| SMTTC configuration   | 1      |      | SMTTC.1                     | SMTTC.1                     |
| CSI-RS  | 1      |      | CSI-RS.3.2 TDD              | CSI-RS.3.2 TDD              |
| reportConfigType  | 1      |      | periodic                    | periodic                    |
| reportQuantity  | 1      |      | cri-RSRP                    | cri-RSRP                    |
| Number of reported RS   | 1      |      | 2                           | 2                           |
| L1-RSRP reporting period  | 1      |      | slot80                      | slot80                      |
| Propagation condition   | 1      |      | AWGN                        | AWGN                        |
| Antenna configuration   | 1      |      | 1x2                         | 1x2                         |
| EPRE ratio of PSS to SSS  | 1      | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |        |      |                             |                             |

Table A.7.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters

| Parameter  | Config | Unit          | Test 1                        |         | Test 2 <sup>NOTE 3</sup>      |         |
|--|--------|---------------|-------------------------------|---------|-------------------------------|---------|
|  |        |               | CSI-RS0                       | CSI-RS1 | CSI-RS0                       | CSI-RS1 |
| Angle of arrival configuration   |        |               | Setup 1 according to A.3.15.1 |         | Setup 1 according to A.3.15.1 |         |
| Assumption for UE beams <sup>Note 4</sup>  |        |               | Rough                         |         | Rough                         |         |
| $N_{oc}$   | 1~2    | dBm/15 kHz    | -100                          |         | n.a.                          |         |
| $N_{oc}$   | 1~2    | dBm/SS B SCS  | -91                           |         | n.a.<br>n.a.                  |         |
| $\hat{E}_s / I_{ot}$   | 1~2    | dB            | 10                            | -2      | n.a.                          |         |
| CSI-RS-RSRP <sup>Note1</sup>   | 1~2    | dBm/SC S      | -81                           | -93     | As in Table B.2.4-2           |         |
| $I_o$ <sup>Note1</sup>   | 1~2    | dBm/95.04M Hz | -59.86                        |         | SS-RSRP+28.98                 |         |
| $\hat{E}_s / N_{oc}$   | 1~2    | dB            | -51.57                        | -2      | n.a.                          |         |
| <p>Note 1: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 3: No additional noise is added by the test system in Test 2.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |               |                               |         |                               |         |

### A.7.7.4.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.20.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

For Test 2:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

**Table A.7.7.4.2.3-1: L1-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <sup>Notes1,2,3</sup>  |
|---------|--|
| CSI-RS0 | $CSI-RS\_RP0 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP0 + \delta + G_{max}$  |
| CSI-RS1 | $CSI-RS\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq CSI-RS\_RP1 + \delta + G_{max}$  |
| Note 1: | CSI-RS_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the $I_o$ used in the test  |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                                  |

## A.7.7.5 CLI measurements

### A.7.7.5.1 SA SRS-RSRP measurement accuracy with FR2 serving cell

#### A.7.7.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.1.1 with the testing configurations for NR cells in Table A.7.7.5.1.1-1.

**Table A.7.7.5.1.1-1: Applicable NR configurations for FR2 SRS-RSRP accuracy test**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode   |
| Note:         | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.7.7.5.1.2 Test parameters

In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.5.1.2-1 and A.7.7.5.1.2-2 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table A.7.7.5.1.2-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table A.7.7.5.1.2-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

Table A.7.7.5.1.2-1: FR2 test parameters for SRS-RSRP accuracy

| Parameter  | Config | Unit | Test 1                      | Test 2                      |
|--|--------|------|-----------------------------|-----------------------------|
| SSB GSCN   | 1      |      | freq1                       | freq1                       |
| Duplex mode  | 1      |      | TDD                         | TDD                         |
| TDD configuration  | 1      |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>  | 1      | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel  | 1      |      | SR.3.1 TDD                  | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | 1      |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
| SSB configuration  | 1      |      | SSB.3 FR2                   | SSB.3 FR2                   |
| OCNG Patterns  | 1      |      | OP.1                        | OP.1                        |
| TRS configuration  | 1      |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| Initial BWP Configuration  | 1      |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1      |      | DLBWP.1.3<br>ULBWP.1.3      | DLBWP.1.3<br>ULBWP.1.3      |
| SMTc configuration   | 1      |      | SMTc.1                      | SMTc.1                      |
| Time offset between DL from serving cell and SRS from test system  | 1      | μs   | 10.76                       | 10.67                       |
| EPRE ratio of PSS to SSS   | 1      | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                             |                             |
| Propagation condition  | 1      |      | AWGN                        | AWGN                        |
| Antenna configuration  | 1      |      | 1x2                         | 1x2                         |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |                             |

**Table A.7.7.5.1.2-2: SRS-RSRP accuracy OTA related test parameters for PCell and Neighbour cell UE in FR2**

| Parameter   | Unit                   | T1                          | T2                                       |
|---|------------------------|-----------------------------|--|
| Angle of arrival configuration  |                        | Setup 1 defined<br>A.3.15.1 | Setup 1 defined<br>A.3.15.1              |
| Beam assumption<br>Note 5   |                        | Fine                        | Fine                                     |
| $N_{oc}$ Note1  | dBm/15kHz<br>$z$ Note3 | -100                        | N/A                                      |
| $N_{oc}$ Note1  | dBm/SCS<br>Note3       | -91                         | N/A                                      |
| $\hat{E}_s / N_{oc}$  | dB                     | 2                           | N/A                                      |
| $E_s$   | dBm/SCS<br>Note3       |                             | (Table B.2.7-2 Rx<br>Beam Peak)          |
| SRS_RP Note2  | dBm/SCS                | -89                         | (Table B.2.7-2 Rx<br>Beam Peak)          |
| $\hat{E}_s / I_{otBB}$ Note4  | dB                     | >1                          | 1  |
| $I_o$ Note2   | dBm/95.04<br>MHz Note3 | -57.89                      | (Table B.2.7-2 Rx<br>Beam Peak +50.79dB) |
| <p>Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SRS_RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 4: Calculation of <math>E_s/I_{otBB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor <math>\sum MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                        |                             |  |

**Table A.7.7.5.1.2-3: SRS configuration parameters for FR2 SRS-RSRP accuracy**

|                 | Field                               | SRSCnf.1 |
|-----------------|-------------------------------------|----------|
| SRS-ResourceSet | srs-ResourceSetId                   | 0        |
|                 | srs-ResourceCidList                 | 0        |
|                 | resourceType                        | Periodic |
|                 | Usage                               | Codebook |
| SRS-Resource    | SRS-ResourceCid                     | 0        |
|                 | nrofSRS-Ports                       | Port1    |
|                 | transmissionComb                    | n2       |
|                 | combOffset-n2                       | 0        |
|                 | cyclicShift-n2                      | 0        |
|                 | resourceMapping<br>startPosition    | 0        |
|                 | resourceMapping<br>nrofSymbols      | n1       |
|                 | resourceMapping<br>repetitionFactor | n1       |
|                 | freqDomainPosition                  | 0        |
|                 | freqDomainShift                     | 0        |
|                 | freqHopping<br>c-SRS                | 12       |
|                 | freqHopping<br>b-SRS                | 0        |
|                 | freqHopping<br>b-hop                | 0        |
|                 | groupOrSequenceHopping              | Neither  |
|                 | resourceType                        | Periodic |
|                 | periodicityAndOffset-p              | s160,25  |
|                 | sequenceCid                         | 0        |

### A.7.7.5.1.3 Test Requirements

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.1.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table A.7.7.5.1.3-1.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table A.7.7.5.1.3-1.

**Table A.7.7.5.1.3-1: SRS-RSRP absolute accuracy test requirement**

| SRS     | Test requirement <sup>Notes1,2,3</sup>  |
|---------|---|
|         | $SRS\_RP - \delta + G_{min} \leq \text{Reported SRS-RSRP(dBm)} \leq SRS\_RP + \delta + G_{max}$                                     |
| Note 1: | SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test         |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the $I_o$ used in the test       |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class |

### A.7.7.5.2 SA CLI-RSSI measurement accuracy with FR2 serving cell

#### A.7.7.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.2.1 with the testing configurations for NR cells in Table A.7.7.5.2.1-1.

**Table A.7.7.5.2.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test**

| Config  | Description   |
|---|---|
| 1   | 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band |   |

### A.7.7.5.2.2 Test parameters

In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.5.2.2-1 and A.7.7.5.2.2-2 below.

Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 2 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.7.7.5.2.2-3.

**Table A.7.7.5.2.2-1: FR2 test parameters for CLI-RSSI accuracy**

| Parameter  | Config | Unit | Test 1                      | Test 2                      |
|--|--------|------|-----------------------------|-----------------------------|
| SSB GSCN   | 1      |      | freq1                       | freq1                       |
| Duplex mode  | 1      |      | TDD                         | TDD                         |
| TDD configuration  | 1      |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>  | 1      | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel  | 1      |      | SR.3.1 TDD                  | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel   | 1      |      | CR.3.1 TDD                  | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel  | 1      |      | CCR.3.1 TDD                 | CCR.3.1 TDD                 |
| SSB configuration  | 1      |      | SSB.3 FR2                   | SSB.3 FR2                   |
| OCNG Patterns <sup>Note2</sup>   | 1      |      | OP.1                        | OP.1                        |
| TRS configuration  | 1      |      | TRS.2.1 TDD                 | TRS.2.1 TDD                 |
| Initial BWP Configuration  | 1      |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration  | 1      |      | DLBWP.1.3<br>ULBWP.1.3      | DLBWP.1.3<br>ULBWP.1.3      |
| SMTc configuration   | 1      |      | SMTc.1                      | SMTc.1                      |
| Time offset between DL from serving cell and OCNG from test system   | 1      | µs   | 10.67                       | 10.67                       |
| EPRE ratio of PSS to SSS   | 1      | dB   | 0                           | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |        |      |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS  |        |      |                             |                             |
| EPRE ratio of PDCCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |        |      |                             |                             |
| EPRE ratio of PDSCH DMRS to SSS  |        |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS  |        |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |        |      |                             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |        |      |                             |                             |
| Propagation condition  | 1      |      | AWGN                        | AWGN                        |
| Antenna configuration  | 1      |      | 1x2                         | 1x2                         |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |        |      |                             |                             |
| Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources.   |        |      |                             |                             |



Table A.7.7.5.2.2-2: CLI-RSSI accuracy OTA related test parameters

| Parameter   | Unit  | T1                       | T2 |
|---|---|--------------------------|----|
| Angle of arrival configuration  |   | Setup 1 defined A.3.15.1 |    |
| Beam assumption <sup>Note 5</sup>   |   | Fine                     |    |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note1</sup>                    | dBm/15kHz<br>$z_{\text{Note3}}$   | -100                     |    |
| $N_{oc}$ on CLI-RSSI measurement resource <sup>Note1</sup>                    | dBm/SCS <sup>N</sup> <sub>ote3</sub>  | -91                      |    |
| $\hat{E}_s/N_{oc}$ on CLI-RSSI measurement resource                           | dB  | -Infinity                |    |
| RSRP on CLI-RSSI measurement resource <sup>Note2</sup>                        | dBm/SCS   | -Infinity                |    |
| $\hat{E}_s/I_{ot\text{BB}}$ on CLI-RSSI measurement resource <sup>Note4</sup> | dB  | -Infinity                |    |
| Io on CLI-RSSI measurement resource <sup>Note2</sup>                          | dBm/95.04 MHz <sup>Note3</sup>  | -62.01                   |    |
| Io on CLI-RSSI measurement resource <sup>Note2</sup>                          | dBm/1.08 MHz  | -81.46                   |    |
| Note 1:   | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |                          |    |
| Note 2:   | SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                          |    |
| Note 3:   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |                          |    |
| Note 4:   | Calculation of Es/Iot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                          |    |
| Note 5:   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.   |                          |    |

Table A.7.7.5.2.2-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy

|                               | Field                    | SRSCConf.1 |
|-------------------------------|--------------------------|------------|
| CLI-RSSI measurement resource | rsi-ResourceId           | 0          |
|                               | rsi-SCS                  | 120kHz     |
|                               | startPRB                 | 0          |
|                               | nrofPRBs                 | 66         |
|                               | startPosition            | 3          |
|                               | nrofSymbols              | 11         |
|                               | rsi-PeriodicityAndOffset | sl160, 25  |

### A.7.7.5.2.3 Test Requirements

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table A.7.7.5.2.3-1.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table A.7.7.5.2.3-1.

**Table A.7.7.5.2.3-1: CLI-RSSI absolute accuracy test requirement**

| <b>Test requirement</b> <sup>Notes1,2,3</sup>   |  |
|---|--|
| $I_o - \delta + G_{min} \leq \text{Reported CLI-RSSI(dBm)} \leq I_o + \delta + G_{max}$ |  |
| Note 1:   | $I_o$ is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz |
| Note 2:   | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the $I_o$ used in the test          |
| Note 3:   | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class    |

## A.7.7.6 L1-SINR measurement for beam reporting

### A.7.7.6.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

#### A.7.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.8.4.1 and clause 10.1.28.1 for L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.7.7.6.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.7.7.6.1.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| Config | Description   |
|--------|---|
| 1      | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

#### A.7.7.6.1.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.6.1.2-1 and Table A.7.7.6.1.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.7.7.6.1.2-1 and Table A.7.7.6.1.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

**Table A.7.7.6.1.2-1: FR2 CSI-RS based L1-SINR general test parameters**

| Parameter   | Config   | Unit | Test 1                      |
|---|--|------|-----------------------------|
| SSB GSCN  | 1  |      | freq1                       |
| Duplex mode                                       | 1  |      | TDD                         |
| TDD Configuration                                 | 1  |      | TDDConf.3.1                 |
| BW <sub>channel</sub>                             | 1  | MHz  | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel               | 1  |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel                    | 1  |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel               | 1  |      | CCR.3.1 TDD                 |
| SSB configuration                                 | 1  |      | SSB.1 FR2                   |
| OCNG Patterns                                     | 1  |      | OP.1                        |
| Initial BWP Configuration                         | 1  |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration                       | 1  |      | DLBWP.1.3<br>ULBWP.1.3      |
| TRS Configuration                                 | 1  |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration                     | 1  |      | TCI.State.2                 |
| SMTc configuration                                | 1  |      | SMTc.1                      |
| CSI-RS  | 1  |      | CSI-RS.3.2 TDD              |
| reportConfigType                                  | 1  |      | periodic                    |
| reportQuantity                                    | 1  |      | cri-SINR-r16                |
| nrofReportedRS                                    | 1  |      | 2                           |
| L1-SINR reporting period                          | 1  |      | slot80                      |
| Propagation condition                             | 1  |      | AWGN                        |
| Antenna configuration                             | 1  |      | 1x2                         |
| EPRE ratio of PSS to SSS                          | 1  | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS                    |  |      |                             |
| EPRE ratio of PBCH to PBCH DMRS                   |  |      |                             |
| EPRE ratio of PDCCH DMRS to SSS                   |  |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                 |  |      |                             |
| EPRE ratio of PDSCH DMRS to SSS                   |  |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |      |                             |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |                             |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |                             |

**Table A.7.7.6.1.2-2: FR2 CSI-RS based L1-SINR OTA related test parameters**

| Parameter   | Config | Unit          | Test 1                        |         |
|---|--------|---------------|-------------------------------|---------|
|   |        |               | CSI-RS0                       | CSI-RS1 |
| Angle of arrival configuration  |        |               | Setup 1 according to A.3.15.1 |         |
| Assumption for UE beams <sup>Note 4</sup>   |        |               | Rough                         |         |
| $N_{oc}$  | 1~2    | dBm/15 kHz    | -100                          |         |
| $N_{oc}$  | 1~2    | dBm/SS B SCS  | -91                           |         |
| $\hat{E}_s / I_{ot}$  | 1~2    | dB            | 10                            | -2      |
| CSI-RS-RSRP <sup>Note1</sup>  | 1~2    | dBm/SC S      | -81                           | -93     |
| $I_o$ <sup>Note1</sup>  | 1~2    | dBm/95.04M Hz | -51.57                        | -59.86  |
| $\hat{E}_s / N_{oc}$  | 1~2    | dB            | 10                            | -2      |
| <p>Note 1: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 3: Void.</p> <p>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |               |                               |         |

### A.7.7.6.1.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clauses 10.1.28.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.7.7.6.1.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.1.2-1.

**Table A.7.7.6.1.3-1: L1-SINR absolute accuracy test requirement**

|         | Test requirement <sup>Notes1,2</sup>  |
|---------|---|
| CSI-RS0 | $L1-SINR0 - \delta \leq \text{Reported SINR (dB)} \leq L1-SINR0 + \delta$   |
| CSI-RS1 | $L1-SINR1 - \delta \leq \text{Reported SINR (dB)} \leq L1-SINR1 + \delta$   |
| Note 1: | L1-SINRn is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration |
| Note 2: | $\delta$ is the SINR absolute accuracy requirement from Table 10.1.28.2.1-1, selected according to the $I_o$ used in the test                                     |

## A.7.7.6.2 L1-SINR measurement with SSB based CMR and dedicated IMR

### A.7.7.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.8.4.2 and clause 10.1.28.2 for L1-SINR measurements with SSB based CMR and CSI-IM based IMR, with the testing configurations for NR cells in Table A.7.7.6.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.7.7.6.2.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| 2             | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode   |
| Note:         | The UE is only required to be tested in one of the supported test configurations in each supported band |

#### A.7.7.6.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.6.2.2-1 and Table A.7.7.6.2.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.7.7.6.2.2-1 and Table A.7.7.6.2.2-2.

Here is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR.

**Table A.7.7.6.2.2-1: FR2 L1-SINR general test parameters with SSB based CMR and CSI-IM based IMR**

| Parameter   | Config | Unit | Test 1                      |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1~2    |      | freq1                       |
| Duplex mode   | 1~2    |      | TDD                         |
| TDD Configuration   | 1~2    |      | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1~2    | MHz  | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel   | 1~2    |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel  | 1~2    |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1~2    |      | CCR.3.1 TDD                 |
| SSB configuration   | 1      |      | SSB.1 FR2                   |
|   | 2      |      | SSB.2 FR2                   |
| CSI-IM configuration  | 1~2    |      | CSI-IM 3.1 TDD              |
| OCNG Patterns   | 1~2    |      | OP.1                        |
| Initial BWP Configuration   | 1~2    |      | DLBWP.0.1                   |
|   |        |      | ULBWP.0.1                   |
| Dedicated BWP configuration   | 1~2    |      | DLBWP.1.3                   |
|   |        |      | ULBWP.1.3                   |
| TRS Configuration   | 1~2    |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1~2    |      | TCI.State.2                 |
| SMTc configuration  | 1~2    |      | SMTc.1                      |
| reportConfigType  | 1~2    |      | periodic                    |
| reportQuantity-r16  | 1~2    |      | ssb-Index-SINR-r16          |
| Number of reported RS   | 1~2    |      | 2                           |
| L1-SINR reporting period  | 1~2    |      | slot640                     |
| Propagation condition   | 1~2    |      | AWGN                        |
| Antenna configuration   | 1~2    |      | 1x2                         |
| EPRE ratio of PSS to SSS  | 1~2    | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |        |      |                             |

Table A.7.7.6.2-2: FR2 L1-SINR SSB specific test parameters

| Parameter  | Config | Unit          | Test 1                        |        |
|--|--------|---------------|-------------------------------|--------|
|  |        |               | SSB0                          | SSB1   |
| Angle of arrival configuration   |        |               | Setup 1 according to A.3.15.1 |        |
| Assumption for UE beams <sup>Note 4</sup>  |        |               | Rough                         |        |
| $N_{oc}$   | 1~2    | dBm/15kHz     | -100                          |        |
| $N_{oc}$   | 1      | dBm/SSB       | -91                           |        |
|  | 2      | SCS           | -88                           |        |
| $\hat{E}_s / I_{ot}$   | 1~2    | dB            | 10                            | -2     |
| SS-RSRP <sup>Note1</sup>   | 1      | dBm/SCS       | -81                           | -93    |
|  | 2      |               | -78                           | -90    |
| $I_o$ <sup>Note1</sup>   | 1~2    | dBm/95.04 MHz | -51.57                        | -59.86 |
| $\hat{E}_s / N_{oc}$   | 1~2    | dB            | 10                            | -2     |
| <p>Note 1: RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |        |               |                               |        |

### A.7.7.6.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 of Cell 1 shall fulfil the requirements in clauses 10.1.28.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB#0+CSI-IM#0 and absolute accuracy of SSB#1+CSI-IM#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.7.7.6.2.3-1.

Relative accuracy of SSB#0+CSI-IM#0 compared with SSB#1+CSI-IM#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.2.2-2.

Table A.7.7.6.2.3-1: L1-SINR absolute accuracy test requirement

|   | Test requirement <sup>Notes1,2</sup>                                       |
|---|--|
| SSB#0+CSI-IM#0  | $L1\_SINR0 - \delta \leq \text{Reported SINR(dB)} \leq L1\_SINR0 + \delta$ |
| SSB#1+CSI-IM#1  | $L1\_SINR1 - \delta \leq \text{Reported SINR(dB)} \leq L1\_SINR1 + \delta$ |
| <p>Note 1: <math>L1\_SINRn</math> is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB#n+CSI-IM#n under consideration</p> <p>Note 2: <math>\delta</math> is the SINR absolute accuracy requirement from Table 10.1.28.2.1-2, selected according to the <math>I_o</math> used in the test</p> |  |

### A.7.7.6.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

#### A.7.7.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8.4.3 and clause 10.1.28.3 for L1-SINR measurements based on CSI-RS as both CMR and IMR with the testing configurations for NR cell in Table A.7.7.6.3.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.7.7.6.3.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based both CMR based IMR

| Config | Description   |
|--------|---|
| 1      | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

## A.7.7.6.3.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.6.3.2-1 and Table A.7.7.6.3.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.7.7.6.3.2-1 and Table A.7.7.6.3.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR.

**Table A.7.7.6.3.2-1: FR2 L1-SINR measurement test with CSI-RS based both CMR and IMR**

| Parameter   | Config | Unit | Test 1                      |
|---|--------|------|-----------------------------|
| SSB GSCN  | 1      |      | freq1                       |
| Duplex mode   | 1      |      | TDD                         |
| TDD Configuration   | 1      |      | TDDConf.3.1                 |
| BW <sub>channel</sub>   | 1      | MHz  | 100: N <sub>RB,c</sub> = 66 |
| PDSCH Reference measurement channel   | 1      |      | SR.3.1 TDD                  |
| RMSI CORESET Reference Channel  | 1      |      | CR.3.1 TDD                  |
| Dedicated CORESET Reference Channel   | 1      |      | CCR.3.1 TDD                 |
| SSB configuration   | 1      |      | SSB.1 FR2                   |
| OCNG Patterns   | 1      |      | OP.1                        |
| Initial BWP Configuration   | 1      |      | DLBWP.0.1<br>ULBWP.0.1      |
| Dedicated BWP configuration   | 1      |      | DLBWP.1.1<br>ULBWP.1.1      |
| TRS Configuration   | 1      |      | TRS.2.1 TDD                 |
| PDCCH/PDSCH TCI Configuration   | 1      |      | TCI.State.2                 |
| SMTC configuration  | 1      |      | SMTC.1                      |
| CSI-RS configuration as CMR   | 1      |      | CSI-RS.3.2 TDD              |
| CSI-RS configuration as IMR   | 1      |      | CSI-RS.3.3A TDD             |
| reportConfigType  | 1      |      | periodic                    |
| reportQuantity-r16  | 1      |      | cri-SINR-r16                |
| nrofReportedRS  | 1      |      | 2                           |
| L1-RSRP reporting period  | 1      |      | slot80                      |
| Propagation condition   | 1      |      | AWGN                        |
| Antenna configuration   | 1      |      | 1x2                         |
| EPRE ratio of PSS to SSS  | 1      | dB   | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |        |      |                             |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |                             |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |                             |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |        |      |                             |



Table A.7.7.6.3.2-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters

| Parameter  | Config | Unit          | Test 1                        |         |
|--|--------|---------------|-------------------------------|---------|
|  |        |               | CSI-RS0                       | CSI-RS1 |
| Angle of arrival configuration   |        |               | Setup 1 according to A.3.15.1 |         |
| Assumption for UE beams <sup>Note 4</sup>  |        |               | Rough                         |         |
| $N_{oc}$   | 1~2    | dBm/15 kHz    | -100                          |         |
| $N_{oc}$   | 1~2    | dBm/SS B SCS  | -91                           |         |
| $\hat{E}_s / I_{ot}$   | 1~2    | dB            | 10                            | 0       |
| CSI-RS-RSRP <sup>Note1</sup>   | 1~2    | dBm/SC S      | -81                           | -91     |
| $I_o$ <sup>Note1</sup>   | 1~2    | dBm/95.04M Hz | -51.57                        | -59.86  |
| $\hat{E}_s / N_{oc}$   | 1~2    | dB            | 10                            | 0       |
| Note 1: RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |        |               |                               |         |

### A.7.7.6.3.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-RS#2 and CSI-RS#1+CSI-RS#3 of Cell 1 shall fulfil the requirements in clause 10.1.28.3. The following requirements are to be verified:

Absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.7.7.6.3.3-1.

Relative accuracy of CSI-RS#0 compared with CSI-RS#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.3.2-1.

Table A.7.7.6.3.3-1: L1-SINR absolute accuracy test requirement

|          | Test requirement <sup>Notes1,2</sup>  |
|----------|---|
| CSI-RS#0 | $L1-SINR_0 - \delta \leq \text{Reported SINR (dBm)} \leq L1-SINR_0 + \delta$  |
| CSI-RS#1 | $L1-SINR_1 - \delta \leq \text{Reported SINR (dBm)} \leq L1-SINR_1 + \delta$  |
| Note 1:  | L1-SINR <sub>n</sub> is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS#n under consideration |
| Note 2:  | $\delta$ is the SINR absolute accuracy requirement from Table 10.1.28.3.1-1.  |

## A.7.7.7 CSI-RSRP

### A.7.7.7.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.3.2.1 and 10.1.3.2.2 for intra-frequency measurements.

#### A.7.7.7.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.7.1.2-1. Both absolute and relative accuracy of CSI-RSRP intra-frequency measurements are tested by using the parameters in Table A.7.7.7.1.2-2 and A.7.7.7.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1. The test consists of two time phases T1 and T2.

**Table A.7.7.1.2-1: CSI-RSRP Intra frequency CSI-RSRP supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.7.1.2-2: CSI-RSRP Intra frequency general test parameters**

| Parameter   | Unit | T1                          |              | T2                          |              |
|---|------|-----------------------------|--------------|-----------------------------|--------------|
|   |      | Cell 1                      | Cell 2       | Cell 1                      | Cell 2       |
| Duplex mode   |      | TDD                         |              | TDD                         |              |
| TDD configuration   |      | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 24 |              | 100: N <sub>RB,c</sub> = 24 |              |
| Downlink initial BWP configuration  |      | DLB<br>WP.0.<br>1           | -            | DLB<br>WP.0.<br>1           | -            |
| Downlink dedicated BWP configuration  |      | DLB<br>WP.1.<br>1           | -            | DLB<br>WP.1.<br>1           | -            |
| Uplink initial BWP configuration  |      | ULB<br>WP.0.<br>1           | -            | ULB<br>WP.0.<br>1           | -            |
| Uplink dedicated BWP configuration  |      | ULB<br>WP.1.<br>1           | -            | ULB<br>WP.1.<br>1           | -            |
| DRX cycle configuration   |      | Not applicable              | -            | Not applicable              | -            |
| TRS configuration   |      | TRS.2<br>.1<br>TDD          | -            | TRS.2<br>.1<br>TDD          | -            |
| TCI state   |      | TCI.St<br>ate.0             | -            | TCI.St<br>ate.0             | -            |
| PDSCH Reference measurement channel   |      | SR.3.<br>1<br>TDD           | -            | SR.3.<br>1<br>TDD           | -            |
| RMSI CORESET Reference Channel  |      | CR.3.<br>1<br>TDD           | -            | CR.3.<br>1<br>TDD           | -            |
| Control channel RMC   |      | CCR.<br>3.1<br>TDD          | -            | CCR.<br>3.1<br>TDD          | -            |
| OCNG Patterns   |      | OP.3                        | OP.3         | OP.3                        | OP.3         |
| SMTc configuration  |      | SMTc.1                      |              | SMTc.1                      |              |
| SSB configuration   |      | SSB.3<br>FR2                | SSB.3<br>FR2 | SSB.3<br>FR2                | SSB.3<br>FR2 |
| CSI-RS configuration for RRM  |      | CSI-RS.RRM.FR2.1 TDD        |              |                             |              |
| Time offset with Cell 1   | μs   | -                           | 0.58         | -                           | 0.58         |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120          | 120                         | 120          |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |              |                             |              |
| Propagation conditions  |      | AWG<br>N                    | AWG<br>N     | AWG<br>N                    | AWG<br>N     |
| Antenna configuration   |      | 1x2                         | 1x2          | 1x2                         | 1x2          |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |              |                             |              |

Table A.7.7.1.2-3: CSI-RSRP Intra frequency OTA related test parameters

| Parameter                                 | Unit   | T1                                   |        | T2  |                                       |
|---|--|--------------------------------------|--------|---|---------------------------------------|
|   |  | Cell 1                               | Cell 2 | Cell 1                                    | Cell 2                                |
| Angle of arrival configuration            |  | Setup 1 according to clause A.3.15.1 |        |   |                                       |
| Assumption for UE beams <sup>Note 7</sup> |  | Rough                                |        | Assumption for UE beams <sup>Note 7</sup> |                                       |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/15kHz <sub>z</sub> <sup>Note4</sup>  | -91.6                                |        | N/A                                       |                                       |
| $N_{oc}$ <sup>Note1</sup>                 | dBm/SCS <sub>Note4</sub>   | -82.6                                |        | N/A                                       |                                       |
| $\hat{E}_s/N_{oc}$                        | dB   | 6.0                                  | 1.0    | N/A                                       | N/A                                   |
| $E_s$                                     | dBm/SCS <sub>Note4</sub>   |                                      |        | (Table B.2.2.2-2 Rx Beam Peak +2.1dB)     | (Table B.2.2.2-2 Rx Beam Peak +2.1dB) |
| CSI-RS_RP <sup>Note2</sup>                | dBm/SCS  | -76.6                                | -81.6  | (Table B.2.2.2-2 Rx Beam Peak +2.1dB)     | (Table B.2.2.2-2 Rx Beam Peak +2.1dB) |
| $\hat{E}_s/I_{ot_{BB}}$ <sup>Note6</sup>  | dB   | 2.44                                 | -5.98  | -5.98                                     | -5.98                                 |
| $I_o$ <sup>Note2</sup>                    | dBm/95.04 MHz <sub>Note4</sub>   | -50.05                               |        | (Table B.2.2.2-2 Rx Beam Peak +29.70dB)   |                                       |
| Note 1:                                   | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |                                      |        |   |                                       |
| Note 2:                                   | CSI-RS_RP, $E_s/I_{ot}$ and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                                      |        |   |                                       |
| Note 3:                                   | Void   |                                      |        |   |                                       |
| Note 4:                                   | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                      |        |   |                                       |
| Note 5:                                   | Void   |                                      |        |   |                                       |
| Note 6:                                   | Calculation of $E_s/I_{ot_{BB}}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                                      |        |   |                                       |
| Note 7:                                   | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                      |        |   |                                       |

### A.7.7.7.1.3 Test Requirements

The CSI-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.2.1 and relative accuracy requirements in clause 10.1.3.2.2. The following requirements are to be verified:

During T1:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in table A.7.7.7.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.2.2-1.

During T2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in table A.7.7.7.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.2.2-1.

During T1 and T2:

Relative accuracy of Cell 1 during T2 compared with Cell 1 during T1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.2.2-1

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 10.1.3.2.2-1.

**Table A.7.7.1.3-1: CSI-RSRP absolute accuracy test requirement**

|         | <b>Test requirement</b> <sup>Notes1,2,3</sup>  |
|---------|--|
| Cell 1  | $\text{CSI-RS\_RP1} - \delta + G_{\min} \leq \text{Reported RSRP(dBm)} \leq \text{CSI-RS\_RP1} + \delta + G_{\max}$  |
| Cell 2  | $\text{CSI-RS\_RP2} - \delta + G_{\min} \leq \text{Reported RSRP(dBm)} \leq \text{CSI-RS\_RP2} + \delta + G_{\max}$  |
| Note 1: | CSI-RS_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.3.2.1-1, selected according to the $\delta$ used in the test                                    |
| Note 3: | $G_{\min}$ and $G_{\max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class                              |

## A.7.7.7.2 SA inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

### A.7.7.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.5.2.1 and 10.1.5.2.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.7.7.7.2.1-1.

**Table A.7.7.7.2.1-1: Applicable NR configurations for FR2 inter-frequency CSI-RSRP accuracy test**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

### A.7.7.7.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.7.2.2-1 and Table A.7.7.7.2.2-2 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.7.7.7.2.2-1 and Table A.7.7.7.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.7.7.2.2-1: CSI-RSRP inter-frequency test parameters**

| Parameter   | Unit | Test 1                         |        | Test 2                         |        |  |
|---|------|--------------------------------|--------|--------------------------------|--------|--|
|   |      | Cell 1                         | Cell 2 | Cell 1                         | Cell 2 |  |
| BW <sub>channel</sub>   |      | 100:<br>N <sub>RB,c</sub> = 24 |        | 100:<br>N <sub>RB,c</sub> = 24 |        |  |
| Gap pattern ID  |      | 0                              |        | 0                              |        |  |
| Duplex mode   |      | TDD                            | TDD    | TDD                            | TDD    |  |
| TDD configuration   |      | TDDConf.3.1                    |        | TDDConf.3.1                    |        |  |
| PDSCH Reference measurement channel   |      | SR.3.1<br>TDD                  | -      | SR.3.1<br>TDD                  | -      |  |
| RMSI CORESET Reference Channel  |      | CR.3.1<br>TDD                  | -      | CR.3.1<br>TDD                  | -      |  |
| Dedicated CORESET Reference Channel   |      | CCR.3.1<br>TDD                 | -      | CCR.3.1<br>TDD                 | -      |  |
| SSB configuration   |      | SSB.3 FR2                      |        | SSB.3 FR2                      |        |  |
| SMTc configuration  |      | SMTc.1                         |        | SMTc.1                         |        |  |
| OCNG Patterns   |      | OP.3                           |        | OP.3                           |        |  |
| Initial BWP Configuration   |      | DLBWP.0.1<br>ULBWP.0.1         |        | DLBWP.0.1<br>ULBWP.0.1         |        |  |
| Dedicated BWP configuration   |      | DLBWP.1.3<br>ULBWP.1.3         |        | DLBWP.1.3<br>ULBWP.1.3         |        |  |
| TRS Configuration   |      | TRS.2.1 TDD                    |        | TRS.2.1 TDD                    |        |  |
| PDCCH/PDSCH TCI Configuration   |      | TCI.State.2                    |        | TCI.State.2                    |        |  |
| CSI-RS configuration for RRM  |      | CSI-RS.RRM.FR2.1<br>TDD        |        | CSI-RS.RRM.FR2.1<br>TDD        |        |  |
| Time offset between Cell 2 and Cell 3   | µs   | 0.58                           |        | 0.58                           |        |  |
| EPRE ratio of PSS to SSS  | dB   | 0                              | 0      | 0                              | 0      |  |
| EPRE ratio of PBCH DMRS to SSS  |      |                                |        |                                |        |  |
| EPRE ratio of PBCH to PBCH DMRS   |      |                                |        |                                |        |  |
| EPRE ratio of PDCCH DMRS to SSS   |      |                                |        |                                |        |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |      |                                |        |                                |        |  |
| EPRE ratio of PDSCH DMRS to SSS   |      |                                |        |                                |        |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |      |                                |        |                                |        |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                                |        |                                |        |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                                |        |                                |        |  |
| Propagation condition   | -    | AWGN                           | AWGN   | AWGN                           | AWGN   |  |
| Antenna configuration   | -    | 1x2                            | 1x2    | 1x2                            | 1x2    |  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                |        |                                |        |  |

Table A.7.7.7.2.2-2: SS-RSRP inter frequency OTA related test parameters

| Parameter  | Unit  | Test 1                                  |                   | Test 2                                  |   |
|--|---|---|-------------------|---|---|
|  |   | Cell 1                                  | Cell 2            | Cell 1                                  | Cell 2                                  |
| Angle of arrival configuration                               |   | Setup 4b according to clause A.3.15.4.2 |                   | Setup 4b according to clause A.3.15.4.2 |   |
|  |   | AoA1 Spherical coverage                 | AoA2 Rx Beam Peak | AoA1 Spherical coverage                 | AoA2 Rx Beam Peak                       |
| $N_{oc}$ <sup>Note1</sup>                                    | $\text{dBm}/15\text{kHz}$ <sub><math>z</math> <sup>Note4</sup></sub>  | -90.6                                   | -90.6             | (Table B.2.3.2-2 Rx Beam Peak +1.97dB)  | (Table B.2.3.2-2 Rx Beam Peak -3.03dB)  |
| Assumption for UE beams <sup>Note 7</sup>                    |   | Rough                                   |                   | Rough                                   |   |
| $N_{oc}$ <sup>Note1</sup>                                    | $\text{dBm}/\text{SCS}$ <sub><math>N</math> <sup>Note4</sup></sub>  | -81.6                                   | -81.6             | (Table B.2.3.2-2 Rx Beam Peak +11.0dB)  | (Table B.2.3.2-2 Rx Beam Peak +6.0dB)   |
| $\hat{E}_s/N_{oc}$   | dB  | 6.0                                     | 6.0               | 17.0                                    | -1.0                                    |
| CSI-RS_RP <sup>Note2</sup>                                   | $\text{dBm}/\text{SCS}$   | -75.60                                  | -75.60            | (Table B.2.3.2-2 Rx Beam Peak +28.0dB)  | (Table B.2.3.2-2 Rx Beam Peak +5.0dB)   |
| (CSI-RS_RP <sub>Cell 1</sub> – CSI-RS_RP <sub>Cell 2</sub> ) | dB  | 0                                       |                   | 23.00                                   |   |
| $\hat{E}_s/I_{ot\text{BB}}$ <sup>Note6</sup>                 | dB  | 5.29                                    | 5.96              | 8.86                                    | -3.92                                   |
| $I_o$ <sup>Note2</sup>                                       | $\text{dBm}/95.04\text{MHz}$ <sub><math>N</math> <sup>Note4</sup></sub>   | -50.03                                  | -50.03            | (Table B.2.3.2-2 Rx Beam Peak +52.68dB) | (Table B.2.3.2-2 Rx Beam Peak +33.13dB) |
| ( $I_{ofreq\ 1} - I_{ofreq\ 2}$ )                            | dB  | 0                                       |                   | 19.55                                   |   |
| Note 1:  | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |   |                   |   |   |
| Note 2:  | CSI-RS_RP, $E_s/I_{ot}$ , $I_o$ , (CSI-RS_RP <sub>Cell 2</sub> – CSI-RS_RP <sub>Cell 1</sub> ) and ( $I_{ofreq\ 2} - I_{ofreq\ 1}$ ) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |                   |   |   |
| Note 3:  | Void  |   |                   |   |   |
| Note 4:  | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone   |   |                   |   |   |
| Note 5:  | Void  |   |                   |   |   |
| Note 6:  | Calculation of $E_s/I_{ot\text{BB}}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta\text{MB}_P$ or $\Delta\text{MB}_S$ from TS 36.101-2 [19] Table 6.2.1.3-4. |   |                   |   |   |
| Note 7:  | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  |   |                   |   |   |

### A.7.7.7.2.3 Test Requirements

The CSI-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirements in clause 10.1.5.2.1 and the relative requirements in clause 10.1.5.2.2.

Test 1:



Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table A.7.7.7.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in A.7.7.7.2.3-2.

Test 2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table A.7.7.7.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in A.7.7.7.2.3-2.

**Table A.7.7.7.2.3-1: CSI-RSRP absolute accuracy test requirement**

|         | Test requirement <sup>Notes1,2,3,4</sup>   |
|---------|--|
| Cell 1  | $\text{CSI-RS\_RP1} - \delta + G_{\min} + X \leq \text{Reported RSRP(dBm)} \leq \text{CSI-RS\_RP1} + \delta + G_{\max}$  |
| Cell 2  | $\text{CSI-RS\_RP2} - \delta + G_{\min} \leq \text{Reported RSRP(dBm)} \leq \text{CSI-RS\_RP2} + \delta + G_{\max}$  |
| Note 1: | CSI-RS_RP <sub>n</sub> is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration   |
| Note 2: | $\delta$ is the RSRP absolute accuracy requirement from Table 10.1.5.2.1-1, selected according to the $I_0$ used in the test   |
| Note 3: | $G_{\min}$ and $G_{\max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  |
| Note 4: | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |

**Table A.7.7.7.2.3-2: CSI-RSRP relative accuracy test requirement**

|                 | Test requirement <sup>Notes1,2,3,4</sup>   |
|-----------------|--|
| Cell 2 – Cell 1 | $\text{CSI-RS\_RP2} - \text{CSI-RS\_RP1} - \delta \leq \text{Reported RSRP(dB)} \leq \text{CSI-RS\_RP2} - \text{CSI-RS\_RP1} + \delta - (X)$   |
| Note 1:         | CSI-RS_RP <sub>n</sub> is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration   |
| Note 2:         | $\delta$ is the RSRP relative accuracy requirement from Table 10.1.5.2.2-1   |
| Note 3:         | Void   |
| Note 4:         | X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. |

## A.7.7.8 CSI-RSRQ

### A.7.7.8.1 SA intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.8.2.1.

#### A.7.7.8.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.8.1.2-1. The absolute accuracy of CSI-RSRQ intra-frequency measurement is tested by using the parameters in Table A.7.7.8.1.2-2 and Table A.7.7.8.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell.

**Table A.7.7.8.1.2-1: CSI-RSRQ Intra frequency CSI-RSRQ supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.7.8.1.2-2: CSI-RSRQ Intra frequency test parameters**

| Parameter   |                  | Unit | Test 1                      |              | Test 2                      |              |
|---|------------------|------|-----------------------------|--------------|-----------------------------|--------------|
|   |                  |      | Cell 1                      | Cell 2       | Cell 1                      | Cell 2       |
| SSB ARFCN   |                  |      | Freq1                       |              | Freq1                       |              |
| Duplex mode   |                  |      | TDD                         |              | TDD                         |              |
| TDD configuration   |                  |      | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>   |                  | MHz  | 100: N <sub>RB,c</sub> = 66 |              | 100: N <sub>RB,c</sub> = 66 |              |
| BWP configuration   | Initial DL BWP   |      | DLBWP.0.1                   |              |                             |              |
|   | Dedicated DL BWP |      | DLBWP.1.1                   |              |                             |              |
|   | Initial UL BWP   |      | ULBWP.0.1                   |              |                             |              |
|   | Dedicated UL BWP |      | ULBWP.1.1                   |              |                             |              |
| TRS configuration   |                  |      | TRS.2.1<br>TDD              |              | TRS.2.<br>1 TDD             |              |
| TCI state   |                  |      | TCI.State<br>.0             |              | TCI.Sta<br>te.0             |              |
| PDSCH Reference measurement channel   |                  |      | SR.3.1<br>TDD               |              | SR.3.1<br>TDD               |              |
| RMSI CORESET Reference Channel  |                  |      | CR.3.1<br>TDD               | -            | CR.3.1<br>TDD               |              |
| Control channel RMC   |                  |      | CCR.3.1<br>TDD              | -            | CCR.3.<br>1 TDD             | -            |
| OCNG Patterns   |                  |      | OP.1                        | OP.1         | OP.1                        | OP.1         |
| Time offset with Cell 1   |                  | µs   | -                           | 0.58         | -                           | 0.58         |
| SMTC configuration  |                  |      | SMTC.1                      |              |                             |              |
| SSB configuration   |                  |      | SSB.1<br>FR2                | SSB.1<br>FR2 | SSB.1<br>FR2                | SSB.1<br>FR2 |
| PDSCH/PDCCH subcarrier spacing  |                  | kHz  | 120                         | 120          | 120                         | 120          |
| CSI-RS configuration for RRM  |                  |      | CSI-RS.RRM.FR2.1 TDD        |              |                             |              |
| EPRE ratio of CSI-RS to SSS   |                  | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PSS to SSS  |                  |      |                             |              |                             |              |
| EPRE ratio of PBCH_DMRS to SSS  |                  |      |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |      |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                  |      |                             |              |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |                  |      |                             |              |                             |              |
| $\hat{E}_s / N_{oc}$  |                  | dB   | 3                           | 3            | -3                          | -3           |
| Propagation condition   |                  |      | AWGN                        |              | AWGN                        |              |
| Antenna configuration   |                  |      | 1x2                         |              | 1x2                         |              |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |                  |      |                             |              |                             |              |

**Table A.7.7.8.1.2-3: CSI-RSRQ Intra frequency OTA related test parameters**

|   | Unit                           | Test 1                               |        | Test 2                               |        |
|---|--------------------------------|--------------------------------------|--------|--------------------------------------|--------|
|   |                                | Cell 1                               | Cell 2 | Cell 1                               | Cell 2 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |        | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 9</sup>   |                                | Rough                                |        |                                      |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -95                                  |        | -95                                  |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -86                                  |        | -86                                  |        |
| CSI-RSRP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -83                                  | -83    | -89                                  | -89    |
| CSI-RSRQ <sup>Note2</sup>   | dB                             | -14.77                               | -14.77 | -16.81                               | -16.81 |
| $\hat{E}_s/I_{ot}$  | dB                             | -1.76                                | -1.76  | -4.76                                | -4.76  |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -50                                  |        | -54                                  | -54    |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RSRQ, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |                                      |        |

### A.7.7.8.1.3 Test Requirements

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ+2.5 dB to Nominal CSI-RSRQ-3.5 dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ+3.5 dB to Nominal CSI-RSRQ-4.5 dB according to the requirements in clause 10.1.8.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal RSRQ is the value shown in table A.7.7.8.1.2-3.

### A.7.7.8.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.7.7.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.10.2.1 and 10.1.10.2.2 for inter-frequency measurement.

#### A.7.7.8.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.8.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test parameters in Table A.7.7.8.2.2-2 and Table A.7.7.8.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

**Table A. 7.7.2.2.2-1: CSI-RSRQ Inter frequency supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.7.8.2.2-2: CSI-RSRQ Inter frequency general test parameters**

| Parameter   | Unit | Test 1                      |                | Test 2                      |                |
|---|------|-----------------------------|----------------|-----------------------------|----------------|
|   |      | Cell 1                      | Cell 2         | Cell 1                      | Cell 2         |
| SSB ARFCN   |      | Freq1                       | freq2          | freq1                       | Freq2          |
| Duplex mode   |      | TDD                         |                | TDD                         |                |
| TDD configuration   |      | TDDConf.3.1                 |                | TDDConf.3.1                 |                |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |                | 100: N <sub>RB,c</sub> = 66 |                |
| PDSCH Reference measurement channel   |      | SR.3.1<br>TDD               | -              | SR.3.1<br>TDD               | -              |
| RMSI CORESET Reference Channel  |      | CR.3.1<br>TDD               | -              | CR.3.1<br>TDD               | -              |
| OCNG Patterns   |      | OP.1                        | OP.1           | OP.1                        | OP.1           |
| Time offset with Cell 1   | μs   | -                           | 0.58           | -                           | 0.58           |
| SMTC configuration  |      | SMTC.<br>1 FR2              | SMTC.<br>1 FR2 | SMTC.<br>1 FR2              | SMTC.<br>1 FR2 |
| CSI-RS configuration for RRM  |      | CSI-RS.RRM.FR2.1 TDD        |                |                             |                |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120            | 120                         | 120            |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0              | 0                           | 0              |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |                |                             |                |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |                |                             |                |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |                |                             |                |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |                |                             |                |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |                |                             |                |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |                |                             |                |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |                |                             |                |
| EPRE ratio of CSI-RS to SSS   |      |                             |                |                             |                |
| $\hat{E}_s / N_{oc}$  | dB   | -1.75                       | -1.75          | -3                          | -1.75          |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> |      |                             |                |                             |                |

Table A.7.7.8.2.2-3: CSI-RSRQ Inter frequency OTA related test parameters

| Parameter   | Unit                           | Test 1                    |        | Test 2                    |        |
|---|--------------------------------|---------------------------|--------|---------------------------|--------|
|   |                                | Cell 1                    | Cell 2 | Cell 1                    | Cell 2 |
| AoA setup   |                                | Setup 1 in clause A.3.15. |        | Setup 1 in clause A.3.15. |        |
| Assumption for UE beams <sup>Note 8</sup>   |                                | Rough                     |        | Rough                     |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -94.03                    |        | -94.03                    |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -85.0                     |        | -85.0                     |        |
| CSI-RSRP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -86.75                    | -86.75 | -88                       | -88    |
| CSI-RSRQ <sup>Note2</sup>   | dB                             | -14.75                    | -14.75 | -15.56                    | -15.56 |
| $\hat{E}_s / I_{ot}$  | dB                             | -1.75                     | -1.75  | -3                        | -3     |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -53.8                     | -53.8  | -54.25                    | -54.25 |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-RSRQ, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                           |        |                           |        |

### A.7.7.8.2.3 Test Requirements

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ+2.5dB to Nominal CSI-RSRQ -3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ -4.5dB according to the requirements in clause 10.1.10.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.

The CSI-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.2.2.

## A.7.7.9 CSI-SINR

### A.7.7.9.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.13.2.1.

#### A.7.7.9.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.9.1.2-1. . The absolute accuracy of CSI-SINR intra-frequency measurement is test by using the parameters in Table A.7.7.9.1.2-2 and Table A.7.7.9.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.9.1.2-1: CSI-SINR Intra frequency CSI-SINR supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.7.9.1.2-2: CSI-SINR Intra frequency test parameters**

| Parameter                                   | Unit   | Test 1                      |              | Test 2                      |              |
|---|--|-----------------------------|--------------|-----------------------------|--------------|
|   |  | Cell 1                      | Cell 2       | Cell 1                      | Cell 2       |
| SSB ARFCN                                   |  | Freq2                       |              | Freq2                       |              |
| Duplex mode                                 |  | TDD                         |              | TDD                         |              |
| TDD configuration                           |  | TDDConf.3.1                 |              | TDDConf.3.1                 |              |
| BW <sub>channel</sub>                       | MHz  | 100: N <sub>RB,c</sub> = 66 |              | 100: N <sub>RB,c</sub> = 66 |              |
| Downlink initial BWP configuration          |  | DLBWP.0.1                   |              |                             |              |
| Downlink dedicated BWP configuration        |  | DLBWP.1.1                   |              |                             |              |
| Uplink initial BWP configuration            |  | ULBWP.0.1                   |              |                             |              |
| Uplink dedicated BWP configuration          |  | ULBWP.1.1                   |              |                             |              |
| DRX cycle configuration                     | ms   | Not applicable              |              |                             |              |
| TRS configuration                           |  | TRS.2.1 TDD                 |              |                             |              |
| TCI state                                   |  | TCI.State.0                 |              |                             |              |
| PDSCH Reference measurement channel         |  | SR.3.1<br>TDD               |              | SR.3.1<br>TDD               |              |
| RMSI CORESET Reference Channel              |  | CR.3.1<br>TDD               | -            | CR.3.1<br>TDD               |              |
| Dedicated RMSI CORESET Reference Channel    |  | CCR.3<br>.1 TDD             | -            | CCR.3.<br>1 TDD             | -            |
| Time offset with Cell 1                     | µs   | -                           | 0.29         | -                           | 0.29         |
| OCNG Patterns                               |  | OP.1                        | OP.1         | OP.1                        | OP.1         |
| SMTc configuration                          |  | SMTc.1                      |              |                             |              |
| SSB configuration                           |  | SSB.1<br>FR2                | SSB.1<br>FR2 | SSB.1<br>FR2                | SSB.1<br>FR2 |
| CSI-RS configuration for RRM                |  | CSI-RS.RRM.FR2.1 TDD        |              |                             |              |
| PDSCH/PDCCH subcarrier spacing              | kHz  | 120                         | 120          | 120                         | 120          |
| SS-RSSI-Measurement                         |  | Not Applicable              |              |                             |              |
| EPRE ratio of PSS to SSS                    | dB   | 0                           | 0            | 0                           | 0            |
| EPRE ratio of PBCH_DMRS to SSS              |  |                             |              |                             |              |
| EPRE ratio of PBCH to PBCH_DMRS             |  |                             |              |                             |              |
| EPRE ratio of PDCCH_DMRS to SSS             |  |                             |              |                             |              |
| EPRE ratio of PDCCH to PDCCH_DMRS           |  |                             |              |                             |              |
| EPRE ratio of PDSCH_DMRS to SSS             |  |                             |              |                             |              |
| EPRE ratio of PDSCH to PDSCH_DMRS           |  |                             |              |                             |              |
| EPRE ratio of CSI-RS to SSS                 |  |                             |              |                             |              |
| EPRE ratio of OCNG to SSS <sup>Note 1</sup> |  |                             |              |                             |              |
| $\hat{E}_s / N_{oc}$                        | dB   | 4.54                        | 2.66         | -3                          | -3           |
| Propagation conditions                      |  | AWGN                        |              |                             |              |
| Antenna configuration                       |  | 1x2                         |              |                             |              |
| Note 1:                                     | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                             |              |                             |              |
| Note 2:                                     | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                             |              |                             |              |
| Note 3:                                     | CSI-SINR, CSI-RSRP, and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                             |              |                             |              |
| Note 4:                                     | CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                             |              |                             |              |

**Table A.7.7.9.1.2-3: CSI-SINR Intra frequency OTA related test parameters**

| Parameter   | Unit                           | Test 1                               |        | Test 3                               |        |
|---|--------------------------------|--------------------------------------|--------|--------------------------------------|--------|
|   |                                | Cell 1                               | Cell 2 | Cell 1                               | Cell 2 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |        | Setup 1 according to clause A.3.15.1 |        |
| Assumption for UE beams <sup>Note 9</sup>   |                                | Rough                                |        | Rough                                |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -105                                 |        | -105                                 |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -96                                  |        | -96                                  |        |
| CSI-RSRP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -91.46                               | -93.34 | -99                                  | -99    |
| CSI-SINR <sup>Note2</sup>   | dB                             | 0                                    | -3.2   | -4.76                                | -4.76  |
| $\hat{E}_s / I_{ot}$  | dB                             | 0                                    | -3.2   | -4.76                                | -4.76  |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -59.2                                |        | -64                                  |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-SINR, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |                                      |        |

### A.7.7.9.1.3 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+XdB to Nominal CSI-SINR –X-1dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR +YdB to Nominal CSI-SINR –Y-1dB according to the requirements in clause 10.1.13.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. The relative CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.13.2.1.

Editor's note: The values of X and Y are pending on the accuracy requirement discussion

### A.7.7.9.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.7.7.9.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.15.2.1 and 10.1.15.2.2 for inter-frequency measurement.

#### A.7.7.9.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.9.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test parameters in Table A.7.7.9.2.2-2 and Table A.7.7.9.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.9.2.2-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |



Table A.7.7.9.2.2-2: CSI-SINR Inter frequency general test parameters

| Parameter                                   | Unit   | Test 1               |                 | Test 2               |                 | Test 3               |                 |
|---|--|----------------------|-----------------|----------------------|-----------------|----------------------|-----------------|
|   |  | Cell 1               | Cell 2          | Cell 1               | Cell 2          | Cell 1               | Cell 2          |
| SSB ARFCN                                   |  | freq1                | freq2           | freq1                | freq2           | freq1                | freq2           |
| Duplex mode                                 |  | TDD                  |                 | TDD                  |                 | TDD                  |                 |
| TDD configuration                           |  | TDDConf.3.1          |                 | TDDConf.3.1          |                 | TDDConf.3.1          |                 |
| $BW_{channel}$                              | MHz  | 100: $N_{RB,c} = 66$ |                 | 100: $N_{RB,c} = 66$ |                 | 100: $N_{RB,c} = 66$ |                 |
| Downlink initial BWP configuration          |  | DLBWP.0.1            |                 |                      |                 |                      |                 |
| Downlink dedicated BWP configuration        |  | DLBWP.1.1            |                 |                      |                 |                      |                 |
| Uplink initial BWP configuration            |  | ULBWP.0.1            |                 |                      |                 |                      |                 |
| Uplink dedicated BWP configuration          |  | ULBWP.1.1            |                 |                      |                 |                      |                 |
| DRX cycle configuration                     | ms   | Not applicable       |                 |                      |                 |                      |                 |
| TRS configuration                           |  | TRS.2.1 TDD          |                 |                      |                 |                      |                 |
| TCI state                                   |  | TCI.State.0          |                 |                      |                 |                      |                 |
| PDSCH Reference measurement channel         |  | SR.3.1<br>TDD        | -               | SR.3.1<br>TDD        | -               | SR.3.1<br>TDD        | -               |
| RMSI CORESET Reference Channel              |  | CR.3.1<br>TDD        | -               | CR.3.1<br>TDD        | -               | CR.3.1<br>TDD        | -               |
| Time offset with Cell 1                     | $\mu s$  | -                    | 0.29            | -                    | 0.29            | -                    | 0.29            |
| OCNG Patterns                               |  | OP.1                 | OP.1            | OP.1                 | OP.1            | OP.1                 | OP.1            |
| SMTTC configuration                         |  | SMTTC.<br>1 FR2      | SMTTC.<br>1 FR2 | SMTTC.<br>1 FR2      | SMTTC.<br>1 FR2 | SMTTC.<br>1 FR2      | SMTTC.<br>1 FR2 |
| CSI-RS configuration for RRM                |  | CSI-RS.RRM.FR2.1 TDD |                 |                      |                 |                      |                 |
| PDSCH/PDCCH subcarrier spacing              | kHz  | 120                  | 120             | 120                  | 120             | 120                  | 120             |
| EPRE ratio of PSS to SSS                    | dB   | 0                    | 0               | 0                    | 0               | 0                    | 0               |
| EPRE ratio of PBCH_DMRS to SSS              |  |                      |                 |                      |                 |                      |                 |
| EPRE ratio of PBCH to PBCH_DMRS             |  |                      |                 |                      |                 |                      |                 |
| EPRE ratio of PDCCH_DMRS to SSS             |  |                      |                 |                      |                 |                      |                 |
| EPRE ratio of PDCCH to PDCCH_DMRS           |  |                      |                 |                      |                 |                      |                 |
| EPRE ratio of PDSCH_DMRS to SSS             |  |                      |                 |                      |                 |                      |                 |
| EPRE ratio of PDSCH to PDSCH_DMRS           |  |                      |                 |                      |                 |                      |                 |
| EPRE ratio of OCNG to SSS <sup>Note 1</sup> |  |                      |                 |                      |                 |                      |                 |
| $\hat{E}_s / N_{oc}$                        | dB   | -0.5                 | -0.5            | 11.0                 | 11.0            | -3.0                 | -3.0            |
| Propagation conditions                      |  | AWGN                 |                 |                      |                 |                      |                 |
| Antenna configuration                       |  | 1x2                  |                 |                      |                 |                      |                 |
| Note 1:                                     | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                      |                 |                      |                 |                      |                 |
| Note 2:                                     | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                      |                 |                      |                 |                      |                 |
| Note 3:                                     | CSI-SINR, CSI-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                      |                 |                      |                 |                      |                 |
| Note 4:                                     | CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                      |                 |                      |                 |                      |                 |

Table A.7.7.9.2.2-3: CSI-SINR Inter frequency OTA related test parameters

| Parameter  | Unit                           | Test 1                        |        | Test 2                        |        | Test 3                        |        |
|--|--------------------------------|-------------------------------|--------|-------------------------------|--------|-------------------------------|--------|
|  |                                | Cell 1                        | Cell 2 | Cell 1                        | Cell 2 | Cell 1                        | Cell 2 |
| Angle of arrival configuration   | degrees                        | Setup 1 according to A.3.15.1 |        | Setup 1 according to A.3.15.1 |        | Setup 1 according to A.3.15.1 |        |
| Assumption for UE beams <sup>Note 10</sup>   |                                | Rough                         |        | Rough                         |        | Rough                         |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/15kHz <sup>Note4</sup>     | -105                          |        | -105                          |        | -105                          |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/SCS <sup>Note3</sup>       | -96                           |        | -96                           |        | -96                           |        |
| CSI-RSRP <sup>Note2</sup>  | dBm/SCS <sup>Note4</sup>       | -96.5                         | -96.5  | -85                           | -85    | -99                           | -99    |
| CSI-SINR <sup>Note2</sup>  | dB                             | -0.5                          | -0.5   | 11                            | 11     | -3.0                          | -3.0   |
| $\hat{E}_s / I_{ot}$   | dB                             | -0.5                          | -0.5   | 11                            | 11     | -3.0                          | -3.0   |
| $I_o$ <sup>Note2</sup>   | dBm/95.04 MHz <sup>Note4</sup> | -69.3                         |        | -55.4                         |        | -65.24                        |        |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: CSI-SINR, CSI-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</p> <p>Note 6: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 7: Void</p> <p>Note 8: Void</p> <p>Note 9: Void</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                               |        |                               |        |                               |        |

### A.7.7.9.2.3 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR +XdB to Nominal CSI-SINR –X-1dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR +YdB to Nominal CSI-SINR –Y-1dB according to the requirements in clause 10.1.15.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.

The CSI-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.2.2.

## A.7.7.10 RSTD measurements

### A.7.7.10.1 RSTD measurement accuracy test case for single positioning frequency layer

#### A.7.7.10.1.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.7.7.10.1.1-1.

Table A.7.7.10.1.1-1: Supported test configurations

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR2. GP#24 is configured if UE supports GP#24, otherwise, GP#13 is configured for the test. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

Table A.7.7.10.1.1-2: RSTD accuracy test parameters

| Parameter   | Unit | T1                          |             | T2                          |             |
|---|------|-----------------------------|-------------|-----------------------------|-------------|
|   |      | Cell 1                      | Cell 2      | Cell 1                      | Cell 2      |
| PRS ARFCN   |      | freq1                       |             | freq1                       |             |
| Duplex mode   |      | TDD                         |             | TDD                         |             |
| TDD configuration   |      | TDDConf.3.1                 |             | TDDConf.3.1                 |             |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |             | 100: N <sub>RB,c</sub> = 66 |             |
| Downlink initial BWP configuration  |      | DLBWP.0.1                   | -           | DLBWP.0.1                   | -           |
| Downlink dedicated BWP configuration  |      | DLBWP.1.1                   | -           | DLBWP.1.1                   | -           |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   | -           | ULBWP.0.1                   | -           |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   | -           | ULBWP.1.1                   | -           |
| DRX cycle configuration   |      | Not applicable              | -           | Not applicable              | -           |
| TRS configuration   |      | TRS.2.1 TDD                 | -           | TRS.2.1 TDD                 | -           |
| TCI state   |      | TCI.State.0                 | -           | TCI.State.0                 | -           |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  | -           | SR.3.1 TDD                  | -           |
| RMSI CORESET Reference Channel  |      | CR.3.1 TDD                  | -           | CR.3.1 TDD                  | -           |
| Control channel RMC   |      | CCR.3.1 TDD                 | -           | CCR.3.1 TDD                 | -           |
| OCNG Patterns   |      | OP.3                        | OP.3        | OP.3                        | OP.3        |
| SSB configuration   |      | SSB.3 FR2                   | SSB.3 FR2   | SSB.3 FR2                   | SSB.3 FR2   |
| SMTC configuration  |      | SMTC.1                      | SMTC.1      | SMTC.1                      | SMTC.1      |
| PRS configuration   |      | PRS.1.2 FR2                 | PRS.1.2 FR2 | PRS.1.2 FR2                 | PRS.1.2 FR2 |
| PRS Resource slot offset  | slot | 0                           | 4           | 0                           | 4           |
| Expected RSTD   | μs   | N/A                         | 3           | N/A                         | 3           |
| Expected RSTD uncertainty   | μs   | N/A                         | 5           | N/A                         | 5           |
| Time offset with Cell 1   | μs   | -                           | 3           | -                           | 3           |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120         | 120                         | 120         |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0           | 0                           | 0           |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |             |                             |             |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |             |                             |             |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |             |                             |             |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |             |                             |             |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |             |                             |             |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |             |                             |             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |             |                             |             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |             |                             |             |
| Propagation conditions  |      |                             |             |                             |             |
| Antenna configuration   |      | 1x2                         | 1x2         | 1x2                         | 1x2         |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |             |                             |             |

Table A.7.7.10.1.1-3: RSTD accuracy OTA related test parameters

| Parameter   | Unit                           | Test 1                               |        | Test 2 |        |
|---|--------------------------------|--------------------------------------|--------|--------|--------|
|   |                                | Cell 1                               | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |        |        |        |
| Assumption for UE beams <sup>Note 5</sup>   |                                | Rough                                |        | Rough  |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note3</sup>       | -98                                  |        | -98    |        |
| $\hat{E}_s/N_{oc}$  | dB                             | -6                                   | -13    | -6     | -13    |
| PRS-RSRP <sup>Note2</sup>   | dBm/SCS                        | -104                                 | -111   | -104   | -111   |
| $\hat{E}_s/I_{ot_{BB}}$ <sup>Note4</sup>  | dB                             | -6                                   | -13    | -6     | -13    |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note3</sup> | -68.04                               | -68.80 | -68.04 | -68.80 |
| <p>Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 4: Calculation of <math>E_s/I_{ot_{BB}}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |        |        |

#### A.7.7.10.1.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

#### A.7.7.10.2 RSTD measurement accuracy test case for dual positioning frequency layer

##### A.7.7.10.2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

The supported test configurations are specified in Table A.7.7.10.2.1-1.

**Table A.7.7.10.2.1-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell on NR RF channel #1 in FR2. Cell 2 is a neighbour cell on a different NR RF channel #2 in FR2. GP#24 is configured if UE supports GP#24, otherwise, GP#13 is configured for the test.

Table A.7.7.10.2.1-2: RSTD accuracy test parameters

| Parameter   | Unit | Test 1                      |             | Test 2                      |             |
|---|------|-----------------------------|-------------|-----------------------------|-------------|
|   |      | Cell 1                      | Cell 2      | Cell 1                      | Cell 2      |
| PRS ARFCN   |      | freq1                       | freq2       | freq1                       | freq2       |
| Duplex mode   |      | TDD                         |             | TDD                         |             |
| TDD configuration   |      | TDDConf.3.1                 |             | TDDConf.3.1                 |             |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 |             | 100: N <sub>RB,c</sub> = 66 |             |
| Downlink initial BWP configuration  |      | DLBWP.0.1                   | -           | DLBWP.0.1                   | -           |
| Downlink dedicated BWP configuration  |      | DLBWP.1.1                   | -           | DLBWP.1.1                   | -           |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   | -           | ULBWP.0.1                   | -           |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                   | -           | ULBWP.1.1                   | -           |
| DRX cycle configuration   |      | Not applicable              | -           | Not applicable              | -           |
| TRS configuration   |      | TRS.2.1 TDD                 | -           | TRS.2.1 TDD                 | -           |
| TCI state   |      | TCI.State.0                 | -           | TCI.State.0                 | -           |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                  | -           | SR.3.1 TDD                  | -           |
| RMSI CORESET Reference Channel  |      | CR.3.1 TDD                  | -           | CR.3.1 TDD                  | -           |
| Control channel RMC   |      | CCR.3.1 TDD                 | -           | CCR.3.1 TDD                 | -           |
| OCNG Patterns   |      | OP.3                        | OP.3        | OP.3                        | OP.3        |
| SSB configuration   |      | SSB.3 FR2                   | SSB.3 FR2   | SSB.3 FR2                   | SSB.3 FR2   |
| SMTTC configuration   |      | SMTTC.1                     | SMTTC.1     | SMTTC.1                     | SMTTC.1     |
| PRS configuration   |      | PRS.1.1 FR2                 | PRS.1.1 FR2 | PRS.1.2 FR2                 | PRS.1.2 FR2 |
| PRS Resource slot offset  | slot | 0                           | 4           | 0                           | 4           |
| Expected RSTD   | μs   | N/A                         | 3           | N/A                         | 3           |
| Expected RSTD uncertainty   | μs   | N/A                         | 5           | N/A                         | 5           |
| Time offset with Cell 1   | μs   | -                           | 3           | -                           | 3           |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120         | 120                         | 120         |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0           | 0                           | 0           |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |             |                             |             |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |             |                             |             |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |             |                             |             |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |             |                             |             |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |             |                             |             |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |             |                             |             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |             |                             |             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                             |             |                             |             |
| Propagation conditions  |      |                             |             |                             |             |
| Antenna configuration   |      | 1x2                         | 1x2         | 1x2                         | 1x2         |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |             |                             |             |

**Table A.7.7.10.2.1-3: RSTD accuracy OTA related test parameters**

| Parameter                                  | Unit   | Test 1                               |        | Test 2 |        |
|--|--|--------------------------------------|--------|--------|--------|
|  |  | Cell 1                               | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration             |  | Setup 1 according to clause A.3.15.1 |        |        |        |
| Assumption for UE beams <sup>Note 5</sup>  |  | Rough                                |        | Rough  |        |
| $N_{oc}$ <sup>Note1</sup>                  | dBm/SCS <sup>Note3</sup>   | -98                                  |        | -98    |        |
| $\hat{E}_s / N_{oc}$                       | dB   | -6                                   | -13    | -6     | -13    |
| PRS-RSRP <sup>Note2</sup>                  | dBm/SCS  | -104                                 | -111   | -104   | -111   |
| $\hat{E}_s / I_{ot_{BB}}$ <sup>Note4</sup> | dB   | -6                                   | -13    | -6     | -13    |
| $I_o$ <sup>Note2</sup>                     | dBm/95.04 MHz <sup>Note3</sup>   | -68.04                               | -68.80 | -68.04 | -68.80 |
| Note 1:                                    | Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |                                      |        |        |        |
| Note 2:                                    | SSB_RP, $E_s/I_{ot}$ and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                                      |        |        |        |
| Note 3:                                    | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |                                      |        |        |        |
| Note 4:                                    | Calculation of $E_s/I_{ot_{BB}}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |                                      |        |        |        |
| Note 5:                                    | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |                                      |        |        |        |

### A.7.7.10.2.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

## A.7.7.11 PRS-RSRP measurements

### A.7.7.11.1 SA measurement accuracy with PRS in FR2

#### A.7.7.11.1.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.24.2.1 and 10.1.24.2.2.

#### A.7.7.11.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.11.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in Table A.7.7.11.1.2-2 and A.7.7.11.1.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.11.1.2-1: PRS-RSRP supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.7.11.1.2-2: PRS-RSRP general test parameters

| Parameter   | Unit | Test 1                          |             | Test 2                      |             |
|---|------|---------------------------------|-------------|-----------------------------|-------------|
|   |      | Cell 1                          | Cell 2      | Cell 1                      | Cell 2      |
| Cell ID   |      | 489                             | 0           | 489                         | 0           |
| SSB ARFCN   |      | freq1                           |             | freq1                       |             |
| Duplex mode   |      | TDD                             |             | TDD                         |             |
| TDD configuration   |      | TDDConf.3.1                     |             | TDDConf.3.1                 |             |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,C</sub> = 24     |             | 100: N <sub>RB,C</sub> = 24 |             |
| Downlink initial BWP configuration  |      | DLBWP.0.1                       | -           | DLBWP.0.1                   | -           |
| Downlink dedicated BWP configuration  |      | DLBWP.1.1                       | -           | DLBWP.1.1                   | -           |
| Uplink initial BWP configuration  |      | ULBWP.0.1                       | -           | ULBWP.0.1                   | -           |
| Uplink dedicated BWP configuration  |      | ULBWP.1.1                       | -           | ULBWP.1.1                   | -           |
| DRX cycle configuration   |      | Not applicable                  | -           | Not applicable              | -           |
| Measurement gap   |      | GP#13 or GP#24 <sup>Note2</sup> |             |                             |             |
| TRS configuration   |      | TRS.2.1 TDD                     | -           | TRS.2.1 TDD                 | -           |
| TCI state   |      | TCI.State.0                     | -           | TCI.State.0                 | -           |
| PDSCH Reference measurement channel   |      | SR.3.1 TDD                      | -           | SR.3.1 TDD                  | -           |
| RMSI CORESET Reference Channel  |      | CR.3.1 TDD                      | -           | CR.3.1 TDD                  | -           |
| Control channel RMC   |      | CCR.3.1 TDD                     | -           | CCR.3.1 TDD                 | -           |
| OCNG Patterns   |      | OP.3                            | OP.3        | OP.3                        | OP.3        |
| SSB configuration   |      | SSB.3 FR2                       | SSB.3 FR2   | SSB.3 FR2                   | SSB.3 FR2   |
| SMTC configuration  |      | SMTC.1                          | SMTC.1      | SMTC.1                      | SMTC.1      |
| Time offset with Cell 1   | μs   | -                               | 3           | -                           | 3           |
| PRS configuration   |      | PRS.1.3 FR2                     | PRS.1.3 FR2 | PRS.1.4 FR2                 | PRS.1.4 FR2 |
| PRS Resource slot offset  | slot | 0                               | 4           | 0                           | 4           |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                             | 120         | 120                         | 120         |
| EPRE ratio of PSS to SSS  | dB   | 0                               | 0           | 0                           | 0           |
| EPRE ratio of PBCH_DMRS to SSS  |      |                                 |             |                             |             |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                                 |             |                             |             |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                                 |             |                             |             |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                                 |             |                             |             |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                                 |             |                             |             |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                                 |             |                             |             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                                 |             |                             |             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |      |                                 |             |                             |             |
| Propagation conditions  |      |                                 |             |                             |             |
| Antenna configuration   |      | 1x2                             | 1x2         | 1x2                         | 1x2         |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                                 |             |                             |             |
| Note 2: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured.  |      |                                 |             |                             |             |



**Table A.7.7.11.1.2-3: PRS-RSRP OTA related test parameters**

| Parameter   | Unit                           | Test 1                               |        | Test 2 |        |
|---|--------------------------------|--------------------------------------|--------|--------|--------|
|   |                                | Cell 1                               | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration  |                                | Setup 1 according to clause A.3.15.1 |        |        |        |
| Assumption for UE beams <sup>Note 7</sup>   |                                | Rough                                |        | Rough  |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -91.6                                |        | -91.6  |        |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note4</sup>       | -82.6                                |        | -82.6  |        |
| $\hat{E}_s / N_{oc}$  | dB                             | 6.0                                  | 1.0    | 6.0    | 1.0    |
| $E_s$   | dBm/SCS <sup>Note4</sup>       | -                                    | -      | -      | -      |
| PRS_RP <sup>Note2</sup>   | dBm/SCS                        | -76.6                                | -81.6  | -76.6  | -81.6  |
| $\hat{E}_s / I_{ot_{BB}}$ <sup>Note6</sup>  | dB                             | 2.44                                 | -5.98  | 2.44   | -5.98  |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -50.05                               |        | -50.05 |        |
| <p>Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: PRS_RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</p> <p>Note 5: Void</p> <p>Note 6: Calculation of <math>E_s/I_{ot_{BB}}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> <p>Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |                                |                                      |        |        |        |

**A.7.7.11.1.3 Test Requirements**

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.2.1 if the reported PRS-RSRP is in the range shown in table A.7.7.11.1.3-1. **The relative PRS-RSRP measurement between the two PRS resources within the same cell** shall fulfil the relative accuracy requirement in clause 10.1.24.2.2.

**Table A.7.7.11.1.3-1: PRS-RSRP absolute accuracy test requirement**

|  | Test requirement <sup>Notes1,2,3</sup>  |
|--|---|
| Cell 1   | $PRS\_RP1 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq PRS\_RP1 + \delta + G_{max}$ |
| Cell 2   | $PRS\_RP2 - \delta + G_{min} \leq \text{Reported RSRP(dBm)} \leq PRS\_RP2 + \delta + G_{max}$ |
| <p>Note 1: PRS_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration.</p> <p>Note 2: <math>\delta</math> is the RSRP absolute accuracy requirement from Table 10.1.24.2.1-2, selected according to the <math>I_o</math> used in the test.</p> <p>Note 3: <math>G_{min}</math> and <math>G_{max}</math> are the minimum and maximum UE gain values from Table B.2.1.6.1-1, selected according to the UE power class</p> |   |

## A.7.7.12 UE Rx-Tx time difference measurements

### A.7.7.12.1 UE Rx-Tx time difference measurement period for single positioning frequency layer in FR2 SA

#### A.7.7.12.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx time difference measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.25.2. The test is conducted in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configuration is listed in Table A.7.7.12.1.1-1.

**Table A.7.7.12.1.1-1: Supported test configurations**

| Config | Description   |
|--------|---|
| 1      | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on the same RF channel in FR2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE before the start of the test.

The UE is configured with measurement gap pattern ID #13 or ID #24 before the test.

The UE is configured to transmit SRS on Cell 1 during the test.

The test equipment measures the transmit timing of the UE using the transmitted SRS and measures the receive timing using the PRS. The test equipment then compares the difference of these two timings to the UE Rx-Tx measurement reported by the UE for each cell.

#### A.7.7.12.1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.7.7.12.1.2-1.

**Table A.7.7.12.1.2-1: UE Rx-Tx time difference measurement accuracy test parameters**

| Parameter                           | Unit           | Test configuration | Test 1                                |             | Test 2                                |             |
|-------------------------------------|----------------|--------------------|---------------------------------------|-------------|---------------------------------------|-------------|
|                                     |                |                    | Cell 1                                | Cell 2      | Cell 1                                | Cell 2      |
| AoA setup                           |                | 1                  | Setup 1 as specified in clause A.3.15 |             | Setup 1 as specified in clause A.3.15 |             |
| Beam Assumption <sup>Note 7</sup>   |                | 1                  | Rough                                 | Rough       | Rough                                 | Rough       |
| Measurement gap                     |                | 1                  | GP#24 or GP#13 <sup>Note 8</sup>      |             | GP#24 or GP#13 <sup>Note 8</sup>      |             |
| DRX                                 |                | 1                  | OFF                                   |             | OFF                                   |             |
| Time offset with Cell 1             | μs             | 1                  | N/A                                   | 3           | N/A                                   | 3           |
| TDD configuration                   |                | 1                  | TDDConf.3.1                           | TDDConf.3.1 | TDDConf.3.1                           | TDDConf.3.1 |
| PDSCH RMC configuration             |                | 1                  | SR.3.1 TDD                            | N/A         | SR.3.1 TDD                            | N/A         |
| RMSI CORESET RMC configuration      |                | 1                  | CR.3.1 TDD                            | N/A         | CR.3.1 TDD                            | N/A         |
| Dedicated CORESET RMC configuration |                | 1                  | CCR.3.1 TDD                           | N/A         | CCR.3.1 TDD                           | N/A         |
| OCNG Patterns                       |                | 1                  | OP.1                                  | OP.1        | OP.1                                  | OP.1        |
| TRS Configuration                   |                | 1                  | TRS.2.1 TDD                           | N/A         | TRS.2.1 TDD                           | N/A         |
| Initial BWP configuration           |                | 1                  | DLBWP.0.1<br>ULBWP.0.1                | N/A         | DLBWP.0.1<br>ULBWP.0.1                | N/A         |
| Active DL BWP configuration         |                | 1                  | DLBWP.1.1                             | N/A         | DLBWP.1.1                             | N/A         |
| Active UL BWP configuration         |                | 1                  | ULBWP.1.1                             | N/A         | ULBWP.1.1                             | N/A         |
| PRS configuration                   |                | 1                  | PRS.1.1 FR2                           | PRS.1.1 FR2 | PRS.1.2 FR2                           | PRS.1.2 FR2 |
| PRS Resource slot offset            | slot           | 1                  | 0                                     | 4           | 0                                     | 4           |
| SRS configuration                   |                | 1                  | POS-SRS.3                             | N/A         | POS-SRS.3                             | N/A         |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/SCS        | 1                  | -89                                   |             | -89                                   |             |
| $N_{oc}$ <sup>Note 2</sup>          | dBm/15 kHz     | 1                  | -98                                   |             | -98                                   |             |
| PRS $\hat{E}_s/I_{ot}$              | dB             | 1                  | -2.41                                 | -12.12      | -2.41                                 | -12.12      |
| PRS $\hat{E}_s/N_{oc}$              | dB             | 1                  | -2                                    | -10         | -2                                    | -10         |
| PRS-RSRP <sup>Note 3</sup>          | dBm/SCS<br>kHz | 1                  | -91                                   | -99         | -91                                   | -99         |
| $I_o$                               | dBm/95.04 MHz  | 1                  | -57.63                                | -57.63      | -57.63                                | -57.63      |
| Propagation Condition               |                | 1                  | AWGN                                  |             | AWGN                                  |             |

|         |  |
|---------|--|
| Note 1: | Void.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | PRS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone  |
| Note 7: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation   |
| Note 8: | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured.   |

**Table A.7.7.12.1.2-2: Void**

### A.7.7.12.1.3 Test requirements

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.2 for both Cell 1 and Cell 2.

## A.8 E-UTRA standalone tests for NR RRM

*Editor notes: All NR RRM tests under E-UTRA standalone operations are included in this Annex. All EN-DC related NR RRM tests are in A.4 and A.5.*

### A.8.1 Void

### A.8.2 RRC\_IDLE state mobility

#### A.8.2.1 Inter-RAT NR Cell re-selection

##### A.8.2.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

###### A.8.2.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in clause 4.2.2.5.6 in TS 36.133 [15].

The test scenario comprises of 1 E-UTRA cell and 1 NR cell as given in tables A.8.2.1.1.1-1, A.8.2.1.1.1-2, A.8.2.1.1.1-3 and A.8.2.1.1.1-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

**Table A.8.2.1.1.1-1: Supported test configurations**

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

Table A.8.2.1.1.1-2: General test parameters for E-UTRA cell re-selection FR1 NR cell test case

| Parameter                    |                | Unit | Test configuration | Value     | Comment  |
|------------------------------|----------------|------|--------------------|-----------|--|
| Initial condition            | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell2     | The UE camps on cell 2 in the initial phase  |
|                              | Neighbour cell |      | 1, 2, 3, 4, 5, 6   | Cell1     |  |
| T1 end condition             | Active cell    |      |                    | Cell1     | During T1 period the UE reselects to cell 1  |
|                              | Neighbour cell |      |                    | Cell2     |  |
| T3 end condition             | Active cell    |      | 1, 2, 3, 4, 5, 6   | Cell2     | The UE shall perform reselection to cell 2 during T3   |
|                              | Neighbour cell |      | 1, 2, 3, 4, 5, 6   | Cell1     |  |
| RF Channel Number            |                |      | 1, 2, 3, 4, 5, 6   | 1, 2      | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test  |
| Time offset between cells    |                |      | 1, 4               | 3 ms      | Asynchronous cells   |
|                              |                |      | 2, 5               | 3 $\mu$ s | Synchronous cells  |
|                              |                |      | 3, 6               | 3 $\mu$ s | Synchronous cells  |
| Access Barring Information   |                | -    | 1, 2, 3, 4, 5, 6   | Not Sent  | No additional delays in random access procedure.   |
| DRX cycle length             |                | s    | 1, 2, 3, 4, 5, 6   | 1.28      | The value shall be used for all cells in the test.   |
| NR PRACH configuration index |                |      | 1, 2, 3, 4, 5, 6   | 102       | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| T1                           |                | s    | 1, 2, 3, 4, 5, 6   | 15        | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2                           |                | s    | 1, 2, 3, 4, 5, 6   | >7        | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3                           |                | s    | 1, 2, 3, 4, 5, 6   | 75        | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

**Table A.8.2.1.1.1-3: Cell specific test parameters for NR cell 2**

| Parameter  | Unit          | Test configuration | Cell 2      |           |        |
|--|---------------|--------------------|-------------|-----------|--------|
|  |               |                    | T1          | T2        | T3     |
| TDD configuration                                  |               | 1, 4               | N/A         |           |        |
|  |               | 2, 5               | TDDConf.1.1 |           |        |
|  |               | 3, 6               | TDDConf.2.1 |           |        |
| PDSCH Reference measurement channel                |               | 1, 4               | SR.1.1 FDD  |           |        |
|  |               | 2, 5               | SR.1.1 TDD  |           |        |
|  |               | 3, 6               | SR.2.1 TDD  |           |        |
| RMSI CORESET Reference Channel                     |               | 1, 4               | CR.1.1 FDD  |           |        |
|  |               | 2, 5               | CR.1.1 TDD  |           |        |
|  |               | 3, 6               | CR.2.1 TDD  |           |        |
| RMC CORESET Reference Channel                      |               | 1, 4               | CCR.1.1 FDD |           |        |
|  |               | 2, 5               | CCR.1.1 TDD |           |        |
|  |               | 3, 6               | CCR.2.1 TDD |           |        |
| OCNG Patterns                                      |               | 1, 2, 3, 4, 5, 6   | OP.1        |           |        |
| SMTC configuration                                 |               | 1, 2, 3, 4, 5, 6   | SMTC.1      |           |        |
| SSB configuration                                  |               | 1, 4               | SSB.1 FR1   |           |        |
|  |               | 2, 5               | SSB.1 FR1   |           |        |
|  |               | 3, 6               | SSB.2 FR1   |           |        |
| Initial DL BWP configuration                       |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1   |           |        |
| Initial UL BWP configuration                       |               | 1, 2, 3, 4, 5, 6   | ULBWP.0.1   |           |        |
| RLM-RS   |               | 1, 2, 3, 4, 5, 6   | SSB         |           |        |
| Qrxlevmin  | dBm/SCS       | 1, 2, 4, 5         | -140        |           |        |
|  |               | 3, 6               | -137        |           |        |
| Pcompensation                                      | dB            | 1, 2, 3, 4, 5, 6   | 0           |           |        |
| Qhysts   | dB            | 1, 2, 3, 4, 5, 6   | 0           |           |        |
| Qoffset <sub>s, n</sub>                            | dB            | 1, 2, 3, 4, 5, 6   | 0           |           |        |
| Cell_selection_and_reselection_quality_measurement |               | 1, 2, 3, 4, 5, 6   | SS-RSRP     |           |        |
| $\hat{E}_s / I_{ot}$                               | dB            | 1, 4               | -4          | -infinity | 12     |
|  |               | 2, 5               |             |           |        |
|  |               | 3, 6               |             |           |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/SCS       | 1, 4               | -98         |           |        |
|  |               | 2, 5               | -98         |           |        |
|  |               | 3, 6               | -95         |           |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/15 kHz    | 1, 4               | -98         |           |        |
|  |               | 2, 5               |             |           |        |
|  |               | 3, 6               |             |           |        |
| $\hat{E}_s / N_{oc}$                               | dB            | 1, 4               | -4          | -infinity | 12     |
|  |               | 2, 5               |             |           |        |
|  |               | 3, 6               |             |           |        |
| SS-RSRP <sup>Note3</sup>                           | dBm/SCS       | 1, 4               | -102        | -infinity | -86    |
|  |               | 2, 5               | -102        | -infinity | -86    |
|  |               | 3, 6               | -99         | -infinity | -83    |
| I <sub>o</sub>                                     | dBm/9.36 MHz  | 1, 4               | -68.60      | -70.05    | -57.78 |
|  | dBm/9.36 MHz  | 2, 5               | -68.60      | -70.05    | -57.78 |
|  | dBm/38.16 MHz | 3, 6               | -62.50      | -63.95    | -51.69 |
| Treselection                                       | s             | 1, 2, 3, 4, 5, 6   | 0           | 0         | 0      |
| SnonintrasearchP                                   | dB            | 1, 2, 3, 4, 5, 6   | 50          |           |        |
| Thresh <sub>x, highP</sub>                         | dB            | 1, 2, 3, 4, 5, 6   | 48          |           |        |
| Thresh <sub>serv<sub>ing</sub>, lowP</sub>         | dB            | 1, 2, 3, 4, 5, 6   | 44          |           |        |
| Thresh <sub>x, lowP</sub>                          | dB            | 1, 2, 3, 4, 5, 6   | 50          |           |        |
| Propagation Condition                              |               | 1, 2, 3, 4, 5, 6   | AWGN        |           |        |



- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.8.2.1.1-4: Cell specific test parameters for E-UTRA cell 1

| Parameter  | Unit       | Cell 1  |     |     |
|--|------------|---|-----|-----|
|  |            | T1  | T2  | T3  |
| E-UTRA RF Channel number   |            | 1   |     |     |
| $BW_{channel}$   | MHz        | 10  |     |     |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2   |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |     |
| PBCH_RA  | dB         | 0   |     |     |
| PBCH_RB  | dB         |   |     |     |
| PSS_RA   | dB         |   |     |     |
| SSS_RA   | dB         |   |     |     |
| PCFICH_RB  | dB         |   |     |     |
| PHICH_RA   | dB         |   |     |     |
| PHICH_RB   | dB         |   |     |     |
| PDCCH_RA   | dB         |   |     |     |
| PDCCH_RB   | dB         |   |     |     |
| PDSCH_RA   | dB         |   |     |     |
| PDSCH_RB   | dB         |   |     |     |
| OCNG_RA <sup>Note 1</sup>  | dB         |   |     |     |
| OCNG_RB <sup>Note 1</sup>  | dB         |   |     |     |
| Qrxlevmin  | dBm        | -140  |     |     |
| $N_{oc}$ <sup>Note 2</sup>   | dBm/15 kHz | -98   |     |     |
| RSRP <sup>Note 3</sup>   | dBm/15 KHz | -84   | -84 | -84 |
| $\hat{E}_s/I_{ot}$   | dB         | 14  | 14  | 14  |
| $\hat{E}_s/N_{oc}$   | dB         | 14  | 14  | 14  |
| Treselection <sub>EUTRAN</sub>   | S          | 0   |     |     |
| SnonintrasearchP   | dB         | 50  |     |     |
| Thresh <sub>x, highP</sub>   | dB         | 48  |     |     |
| Thresh <sub>serv, lowP</sub>   | dB         | 44  |     |     |
| Thresh <sub>x, lowP</sub>  | dB         | 50  |     |     |
| Propagation Condition  |            | AWGN  |     |     |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |            |   |     |     |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |            |   |     |     |
| Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |            |   |     |     |

### A.8.2.1.1.2 Test Requirements

The cell reselection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR} + T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR} + T_{SI-NR}$ ,

Where:

$T_{higher\_priority\_search}$  See clause 4.2.2 in TS 36.133 [15]

$T_{evaluate, NR}$  See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

$T_{SI-NR}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

### A.8.2.1.2 E-UTRA Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16

#### A.8.2.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in clause 4.2.2.5.6 in 36.133 [15].

The test scenario comprises of 1 E-UTRA cell and 1 NR cell as given in tables A.8.2.1.2.1-1, A.8.2.1.2.1-2, A.8.2.1.2.1-3 and A.8.2.1.2.1-4. In SIB of the E-UTRA cell, highSpeedInterRAT-NR-r16 is configured and the carrier of NR cell is configured with highSpeedCarrierNR-r16. The test consists of two time periods, with time duration of T1 and T2 respectively. Both E-UTRA cell 1 and NR cell 2 are already identified by the UE prior to the start of the test. NR cell 2 is of lower priority than E-UTRA cell 1.

**Table A.8.2.1.2.1-1: Supported test configurations for UE configured with highSpeedInterRAT-NR-r16**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 2             | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 3             | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  |
| 4             | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 5             | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6             | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.8.2.1.2.1-2: General test parameters in E-UTRA cell re-selection FR1 NR cell test case for UE configured with highSpeedInterRAT-NR-r16**

| Parameter                    |                 | Unit | Test configuration | Value     | Comment   |
|------------------------------|-----------------|------|--------------------|-----------|---|
| Initial condition            | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell1     | The UE camps on cell 1 in the initial phase   |
| T1 end condition             | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell2     | The UE shall perform reselection to cell 2 during T1                                  |
|                              | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell1     |   |
| T2 end condition             | Active cell     |      | 1, 2, 3, 4, 5, 6   | Cell1     | The UE shall perform reselection to cell 1 during T2 for iteration of the tests.      |
|                              | Neighbour cells |      | 1, 2, 3, 4, 5, 6   | Cell2     |   |
| RF Channel Number            |                 |      | 1, 2, 3, 4, 5, 6   | 1, 2      | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test             |
| Time offset between cells    |                 |      | 1, 4               | 3 ms      | Asynchronous cells  |
|                              |                 |      | 2, 5               | 3 $\mu$ s | Synchronous cells   |
|                              |                 |      | 3, 6               | 3 $\mu$ s | Synchronous cells   |
| Access Barring Information   |                 | -    | 1, 2, 3, 4, 5, 6   | Not Sent  | No additional delays in random access procedure.                                      |
| DRX cycle length             |                 | s    | 1, 2, 3, 4, 5, 6   | 0.32      | The value shall be used for all cells in the test.                                    |
| NR PRACH configuration index |                 |      | 1, 2, 3, 4, 5, 6   | 102       | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                   |
| T1                           |                 | s    | 1, 2, 3, 4, 5, 6   | 15        | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2                           |                 | s    | 1, 2, 3, 4, 5, 6   | 75        | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

**Table A.8.2.1.2.1-3: Cell specific test parameters for NR cell 2 in E-UTRA cell re-selection FR1 NR cell test case for UE configured with highSpeedInterRAT-NR-r16**

| Parameter  | Unit          | Test configuration | Cell 2                      |        |
|--|---------------|--------------------|-----------------------------|--------|
|  |               |                    | T1                          | T2     |
| TDD configuration                                  |               | 1, 4               | N/A                         |        |
|  |               | 2, 5               | TDDConf.1.1                 |        |
|  |               | 3, 6               | TDDConf.2.1                 |        |
| PDSCH Reference measurement channel                |               | 1, 4               | SR.1.1 FDD                  |        |
|  |               | 2, 5               | SR.1.1 TDD                  |        |
|  |               | 3, 6               | SR.2.1 TDD                  |        |
| RMSI CORESET Reference Channel                     |               | 1, 4               | CR.1.1 FDD                  |        |
|  |               | 2, 5               | CR.1.1 TDD                  |        |
|  |               | 3, 6               | CR.2.1 TDD                  |        |
| RMC CORESET Reference Channel                      |               | 1, 4               | CCR.1.1 FDD                 |        |
|  |               | 2, 5               | CCR.1.1 TDD                 |        |
|  |               | 3, 6               | CCR.2.1 TDD                 |        |
| OCNG Patterns                                      |               | 1, 2, 3, 4, 5, 6   | OP.1                        |        |
| SMTC configuration                                 |               | 1, 2, 3, 4, 5, 6   | SMTC.1                      |        |
| SSB configuration                                  |               | 1, 4               | SSB.1 FR1                   |        |
|  |               | 2, 5               | SSB.1 FR1                   |        |
|  |               | 3, 6               | SSB.2 FR1                   |        |
| Initial DL BWP configuration                       |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1                   |        |
| Initial UL BWP configuration                       |               | 1, 2, 3, 4, 5, 6   | ULBWP.0.1                   |        |
| RLM-RS   |               | 1, 2, 3, 4, 5, 6   | SSB                         |        |
| Qrxlevmin  | dBm/SCS       | 1, 2, 4, 5         | -140                        |        |
|  |               | 3, 6               | -137                        |        |
| Pcompensation                                      | dB            | 1, 2, 3, 4, 5, 6   | 0                           |        |
| Qhyst <sub>s</sub>                                 | dB            | 1, 2, 3, 4, 5, 6   | 0                           |        |
| Qoffset <sub>s,n</sub>                             | dB            | 1, 2, 3, 4, 5, 6   | 0                           |        |
| Cell_selection_and_reselection_quality_measurement |               | 1, 2, 3, 4, 5, 6   | SS-RSRP                     |        |
| $\hat{E}_s/I_{ot}$                                 | dB            | 1, 4               | 14                          | 14     |
|  |               | 2, 5               |                             |        |
|  |               | 3, 6               |                             |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/SCS       | 1, 4               | -98                         |        |
|  |               | 2, 5               | -98                         |        |
|  |               | 3, 6               | -95                         |        |
| $N_{oc}$ <sup>Note2</sup>                          | dBm/15 kHz    | 1, 4               | -98                         |        |
|  |               | 2, 5               |                             |        |
|  |               | 3, 6               |                             |        |
| $\hat{E}_s/N_{oc}$                                 | dB            | 1, 4               | 14                          | 14     |
|  |               | 2, 5               |                             |        |
|  |               | 3, 6               |                             |        |
| SS-RSRP <sup>Note3</sup>                           | dBm/SCS       | 1, 4               | -84                         | -84    |
|  |               | 2, 5               | -84                         | -84    |
|  |               | 3, 6               | -81                         | -81    |
| I <sub>o</sub>                                     | dBm/9.36 MHz  | 1, 4               | -55.88                      | -55.88 |
|  | dBm/9.36 MHz  | 2, 5               | -55.88                      | -55.88 |
|  | dBm/38.16 MHz | 3, 6               | -47.79                      | -47.79 |
| Treselection                                       | s             | 1, 2, 3, 4, 5, 6   | 0                           |        |
| Snonintrasearch                                    | dB            | 1, 2, 3, 4, 5, 6   | Not sent                    |        |
| Thresh <sub>x,high</sub>                           | dB            | 1, 2, 3, 4, 5, 6   | 48                          |        |
| Thresh <sub>-serving,low</sub>                     | dB            | 1, 2, 3, 4, 5, 6   | 44                          |        |
| Thresh <sub>x,low</sub>                            | dB            | 1, 2, 3, 4, 5, 6   | 50                          |        |
| Propagation Condition                              |               | 1, 2, 3, 4, 5, 6   | AWGN 3334 <sup>Note 4</sup> |        |

|         |   |
|---------|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as<br>AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.   |

**Table A.8.2.1.2.1-4: Cell specific test parameters for E-UTRA cell 1 in E-UTRA cell re-selection FR1 NR cell test case for UE configured with highSpeedInterRAT-NR-r16**

| Parameter                                       | Unit  | Cell 1  |     |
|---|---|---|-----|
|   |   | T1  | T2  |
| E-UTRA RF Channel number                        |   | 1   |     |
| $BW_{channel}$                                  | MHz   | 10  |     |
| OCNG Patterns defined in TS 36.133 clause A.3.2 |   | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |
| PBCH_RA   | dB  | 0   |     |
| PBCH_RB   | dB  |   |     |
| PSS_RA  | dB  |   |     |
| SSS_RA  | dB  |   |     |
| PCFICH_RB                                       | dB  |   |     |
| PHICH_RA  | dB  |   |     |
| PHICH_RB  | dB  |   |     |
| PDCCH_RA  | dB  |   |     |
| PDCCH_RB  | dB  |   |     |
| PDSCH_RA  | dB  |   |     |
| PDSCH_RB  | dB  |   |     |
| OCNG_RA <sup>Note 1</sup>                       | dB  |   |     |
| OCNG_RB <sup>Note 1</sup>                       | dB  |   |     |
| Qrxlevmin                                       | dBm   | -140  |     |
| $N_{oc}$ <sup>Note 2</sup>                      | dBm/15 kHz  | -98   |     |
| RSRP <sup>Note 3</sup>                          | dBm/15 KHz  | -102  | -86 |
| $\hat{E}_s / I_{ot}$                            | dB  | -4  | 12  |
| $\hat{E}_s / N_{oc}$                            | dB  | -4  | 12  |
| Treselection <sub>EUTRAN</sub>                  | S   | 0   |     |
| Snonintrasearch                                 | dB  | 50  |     |
| Thresh <sub>x, high</sub>                       | dB  | 48  |     |
| Thresh <sub>rserving, low</sub>                 | dB  | 44  |     |
| Thresh <sub>x, low</sub>                        | dB  | 50  |     |
| Propagation Condition                           |   | AWGN 1944 Hz <sup>Note 4</sup>  |     |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |   |     |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as<br>AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |     |
| Note 3:   | RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |     |
| Note 4:   | The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.   |   |     |

#### A.8.2.1.2.2 Test Requirements

The cell reselection delay to a lower priority NR cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as:  $T_{\text{evaluate, NR}} + T_{\text{SI-NR}}$ ,

Where:

$T_{\text{evaluate, NR}}$  See Table 4.2.2.5.6-2 in clause 4.2.2.5.6 in [15]

$T_{\text{SI-NR}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority NR cell.

## A.8.2.2 E-UTRA – NR Inter-RAT Early Measurement Reporting

### A.8.2.2.1 E-UTRA – NR Early Measurement Reporting for NR in FR1

#### A.8.2.2.1.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in clause 4.9.2.4 in TS 36.133 [15]. This test is also to verify the accuracy requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in clause 9.11.1A and 9.11.2A in TS 36.133 [15]. Supported test configurations are shown in Table A.8.2.2.1.1-1.

**Table A.8.2.2.1.1-1: Supported test configurations**

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

The test scenario comprises of 1 E-UTRA cell (Cell 1) and 1 NR cell (Cell 2). The the test parameters and applicability for the E-UTRAN cell are defined in Table A.8.2.2.1.1-4. The general test parameters and the cell specific test parameters for the NR cell are specified in Table A.8.2.2.1.1-2 and Table A.8.2.2.1.1-3, respectively.

The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Prior to the start of the time duration T1, the UE shall be connected to Cell 1. During T1, Cell 2 shall be powered off. At the end of T1, the RRC connection to Cell 1 is released and UE is configured Idle mode DC measurement on the carrier frequency of Cell 2. Time duration T2 starts when the RRC connection is released, and during the T2 UE is in Idle mode. Cell 2 shall be powered on from the beginning of T2. At beginning of T3 the UE is paged for connection setup and requested by the network to send idle mode measurements.

**Table A.8.2.2.1.1-2: General test parameters**

| Parameter                             | Unit | Test configuration | Value                  | Comment |
|---------------------------------------|------|--------------------|------------------------|---------|
| Active cell                           |      | 1, 2, 3, 4, 5, 6   | E-UTRAN Cell 1         |         |
| Neighbour cell                        |      | 1, 2, 3, 4, 5, 6   | NR Cell 2              |         |
| RF Channel Number                     |      | 1, 2, 3, 4, 5, 6   | 1: Cell 1<br>2: Cell 2 |         |
| DRX cycle length                      | s    | 1, 2, 3, 4, 5, 6   | 1.28                   |         |
| Time offset between Cell 1 and Cell 2 |      | 1, 2, 3, 4, 5, 6   | 3 $\mu$ s              |         |
| T1                                    | s    | 1, 2, 3, 4, 5, 6   | 0.5                    |         |
| T2                                    | s    | 1, 2, 3, 4, 5, 6   | 71                     |         |
| T3                                    | s    | 1, 2, 3, 4, 5, 6   | 2                      |         |
| T331                                  | s    | 1, 2, 3, 4, 5, 6   | 300                    |         |



Table A.8.2.2.1.1-3: Cell specific test parameters for NR cell 2

| Parameter  | Unit          | Test configuration | Cell 2      |        |        |
|--|---------------|--------------------|-------------|--------|--------|
|  |               |                    | T1          | T2     | T3     |
| TDD configuration  |               | 1, 4               | N/A         |        |        |
|  |               | 2, 5               | TDDConf.1.1 |        |        |
|  |               | 3, 6               | TDDConf.2.1 |        |        |
| PDSCH Reference measurement channel  |               | 1, 4               | SR.1.1 FDD  |        |        |
|  |               | 2, 5               | SR.1.1 TDD  |        |        |
|  |               | 3, 6               | SR.2.1 TDD  |        |        |
| RMSI CORESET Reference Channel   |               | 1, 4               | CR.1.1 FDD  |        |        |
|  |               | 2, 5               | CR.1.1 TDD  |        |        |
|  |               | 3, 6               | CR.2.1 TDD  |        |        |
| RMC CORESET Reference Channel  |               | 1, 4               | CCR.1.1 FDD |        |        |
|  |               | 2, 5               | CCR.1.1 TDD |        |        |
|  |               | 3, 6               | CCR.2.1 TDD |        |        |
| OCNG Patterns  |               | 1, 2, 3, 4, 5, 6   | OP.1        |        |        |
| SMTC configuration   |               | 1, 2, 3, 4, 5, 6   | SMTC.1      |        |        |
| SSB configuration  |               | 1, 4               | SSB.1 FR1   |        |        |
|  |               | 2, 5               | SSB.1 FR1   |        |        |
|  |               | 3, 6               | SSB.2 FR1   |        |        |
| Initial DL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | DLBWP.0.1   |        |        |
| Initial UL BWP configuration   |               | 1, 2, 3, 4, 5, 6   | ULBWP.0.1   |        |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1, 4               | -infinity   | 4      | 4      |
|  |               | 2, 5               |             |        |        |
|  |               | 3, 6               |             |        |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1, 4               | -98         |        |        |
|  |               | 2, 5               | -98         |        |        |
|  |               | 3, 6               | -95         |        |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | 1, 4               | -98         |        |        |
|  |               | 2, 5               |             |        |        |
|  |               | 3, 6               |             |        |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1, 4               | -infinity   | -4     | -4     |
|  |               | 2, 5               |             |        |        |
|  |               | 3, 6               |             |        |        |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1, 4               | -infinity   | -102   | -102   |
|  |               | 2, 5               | -infinity   | -102   | -102   |
|  |               | 3, 6               | -infinity   | -99    | -99    |
| SS-RSRQ <sup>Note3</sup>   | dB            | 1, 4               | -infinity   | -16.25 | -16.25 |
|  |               | 2, 5               | -infinity   | -16.25 | -16.25 |
|  |               | 3, 6               | -infinity   | -16.25 | -16.25 |
| I <sub>o</sub>   | dBm/9.36 MHz  | 1, 4               | -70.05      | -68.60 | -68.60 |
|  | dBm/9.36 MHz  | 2, 5               | -70.05      | -68.60 | -68.60 |
|  | dBm/38.16 MHz | 3, 6               | -63.96      | -62.50 | -62.50 |
| Propagation Condition  |               | 1, 2, 3, 4, 5, 6   | AWGN        |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |             |        |        |

Table A.8.2.2.1.1-4: Cell specific test parameters for E-UTRA cell 1

| Parameter  | Unit   | Cell 1  |        |        |
|--|--|---|--------|--------|
|  |  | T1  | T2     | T3     |
| E-UTRA RF Channel number                             |  | 1   |        |        |
| $BW_{\text{channel}}$                                | MHz  | 10  |        |        |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |        |        |
| PBCH_RA  | dB   | 0   |        |        |
| PBCH_RB  | dB   |   |        |        |
| PSS_RA   | dB   |   |        |        |
| SSS_RA   | dB   |   |        |        |
| PCFICH_RB  | dB   |   |        |        |
| PHICH_RA   | dB   |   |        |        |
| PHICH_RB   | dB   |   |        |        |
| PDCCH_RA   | dB   |   |        |        |
| PDCCH_RB   | dB   |   |        |        |
| PDSCH_RA   | dB   |   |        |        |
| PDSCH_RB   | dB   |   |        |        |
| OCNG_RA <sup>Note 1</sup>                            | dB   |   |        |        |
| OCNG_RB <sup>Note 1</sup>                            | dB   |   |        |        |
| Qrxlevmin  | dBm  | -140  |        |        |
| $N_{oc}$ <sup>Note 2</sup>                           | dBm/15 kHz   | -98   |        |        |
| RSRP <sup>Note 3</sup>                               | dBm/15 KHz   | -84   | -84    | -84    |
| RSRQ <sup>Note 3</sup>                               | dB   | -10.96  | -10.96 | -10.96 |
| $\hat{E}_s/I_{ot}$                                   | dB   | 14  | 14     | 14     |
| $\hat{E}_s/N_{oc}$                                   | dB   | 14  | 14     | 14     |
| Treselection <sub>EUTRAN</sub>                       | S  | 0   |        |        |
| SnonintrasearchP                                     | dB   | 50  |        |        |
| Thresh <sub>x, highP</sub>                           | dB   | 48  |        |        |
| Thresh <sub>serv, lowP</sub>                         | dB   | 44  |        |        |
| Thresh <sub>x, lowP</sub>                            | dB   | 50  |        |        |
| beamMeasConfigIdle                                   |  | True  |        |        |
| Propagation Condition                                |  | AWGN  |        |        |
| Note 1:  | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |   |        |        |
| Note 2:  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |        |        |
| Note 3:  | RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |   |        |        |

### A.8.2.2.1.2 Test Requirements

At the beginning of the time-period T2 the connection is released, and UE enters idle mode. During the time period T2 the UE is in Idle mode and Cell 2 is active. The UE shall not perform reselection. The UE shall perform Idle Mode DC measurement according to clause 4.9.2.4 in TS 36.133 [15]. UE shall be able to detect, acquire the SSB index and measure the SS-RSRP and SS-RSRQ from Cell 2 for Idle mode DC measurement during T2.

NOTE: The Idle mode DC measurement period for the test setup can be expressed as:  $T_{\text{higher\_priority\_search}} + T_{\text{SSB\_index,NR}} + T_{\text{evaluate, NR}}$ .

Where:

$T_{\text{higher\_priority\_search}}$  See clause 4.2.2 in TS 36.133 [15]

$T_{\text{SSB\_index,NR}}$  See Table 4.9.2.4-1 in clause 4.9.2.4 in TS 36.133 [15]

$T_{\text{evaluate, NR}}$  See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

This gives a total of 70.24 s, allow 71 s for the T2.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Section 9.1.2B in TS 36.133 [15] and Section 9.1.3B, respectively and test ends.

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

## A.8.2.2.2 E-UTRA – NR Early Measurement Reporting for NR in FR2

### A.8.2.2.2.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in clause 4.9.2.4 in TS 36.133 [15]. This test is also to verify the accuracy requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in clause 9.11.1A and 9.11.2A in TS 36.133 [15]. Supported test configurations are shown in Table A.8.2.2.2-1.

**Table A.8.2.2.2.1-1: Supported test configurations**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode                  |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

The test scenario comprises of 1 E-UTRA cell (Cell 1) and 1 NR cell (Cell 2). The the test parameters and applicability for the E-UTRAN cell are defined in Table A.8.2.2.2.1-4. The general test parameters and the cell specific test parameters for the NR cell are specified in Table A.8.2.2.2.1-2 and Table A.8.2.2.2.1-3, respectively.

The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Prior to the start of the time duration T1, the UE shall be connected to Cell 1. During T1, Cell 2 shall be powered off. At the end of T1, the RRC connection to Cell 1 is released and UE is configured Idle mode DC measurement on the carrier frequency of Cell 2. Time duration T2 starts when the RRC connection is released, and during the T2 UE is in Idle mode. Cell 2 shall be powered on from the beginning of T2. At beginning of T3 the UE is paged for connection setup and requested by the network to send idle mode measurements.

Table A.8.2.2.1-2: General test parameters

| Parameter                             | Unit | Test configuration | Value                  | Comment |
|---------------------------------------|------|--------------------|------------------------|---------|
| Active cell                           |      | 1, 2               | E-UTRAN Cell 1         |         |
| Neighbour cell                        |      | 1, 2               | NR Cell 2              |         |
| RF Channel Number                     |      | 1, 2               | 1: Cell 1<br>2: Cell 2 |         |
| DRX cycle length                      | s    | 1, 2               | 1.28                   |         |
| Time offset between Cell 1 and Cell 2 |      | 1, 2               | 3 $\mu$ s              |         |
| T1                                    | s    | 1, 2               | 0.5                    |         |
| T2                                    | s    | 1, 2               | 128                    |         |
| T3                                    | s    | 1, 2               | 2                      |         |
| T331                                  | s    | 1, 2               | 300                    |         |

Table A.8.2.2.1-3: Cell specific test parameters for NR cell 2

| Parameter  | Unit         | Test configuration | Cell 2      |        |        |
|--|--------------|--------------------|-------------|--------|--------|
|  |              |                    | T1          | T2     | T3     |
| TDD configuration  |              | 1, 4               | TDDConf.3.1 |        |        |
| PDSCH Reference measurement channel  |              | 1, 4               | SR.3.1 TDD  |        |        |
| RMSI CORESET Reference Channel   |              | 1, 4               | CR.3.1 TDD  |        |        |
| RMC CORESET Reference Channel  |              | 1, 4               | CCR.3.1 TDD |        |        |
| OCNG Patterns  |              | 1, 2               | OP.1        |        |        |
| SMTc configuration   |              | 1, 2               | SMTc.1      |        |        |
| SSB configuration  |              | 1, 4               | SSB.1 FR2   |        |        |
| Initial DL BWP configuration   |              | 1, 2               | DLBWP.0.1   |        |        |
| Initial UL BWP configuration   |              | 1, 2               | ULBWP.0.1   |        |        |
| $\hat{E}_s / I_{ot}$   | dB           | 1, 4               | -infinity   | 4      | 4      |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS      | 1, 4               | -98         |        |        |
| $\hat{E}_s / N_{oc}$   | dB           | 1, 4               | -infinity   | -4     | -4     |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS      | 1, 4               | -infinity   | -102   | -102   |
| SS-RSRQ <sup>Note3</sup>   | dB           | 1, 4               | -infinity   | -16.25 | -16.25 |
| Io   | dBm/95.04MHz | 1, 4               | -69.01      | -67.56 | -67.56 |
| Propagation Condition  |              | 1, 2               | AWGN        |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |                    |             |        |        |

Table A.8.2.2.1-4: Cell specific test parameters for E-UTRA cell 1

| Parameter | Unit | Cell 1 |    |    |
|-----------|------|--------|----|----|
|           |      | T1     | T2 | T3 |

|   |            |   |        |        |
|---|------------|---|--------|--------|
| E-UTRA RF Channel number  |            | 1   |        |        |
| BW <sub>channel</sub>   | MHz        | 10  |        |        |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2  |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |        |        |
| PBCH_RA   | dB         | 0   |        |        |
| PBCH_RB   | dB         |   |        |        |
| PSS_RA  | dB         |   |        |        |
| SSS_RA  | dB         |   |        |        |
| PCFICH_RB   | dB         |   |        |        |
| PHICH_RA  | dB         |   |        |        |
| PHICH_RB  | dB         |   |        |        |
| PDCCH_RA  | dB         |   |        |        |
| PDCCH_RB  | dB         |   |        |        |
| PDSCH_RA  | dB         |   |        |        |
| PDSCH_RB  | dB         |   |        |        |
| OCNG_RA <sup>Note 1</sup>   | dB         |   |        |        |
| OCNG_RB <sup>Note 1</sup>   | dB         |   |        |        |
| Qrxlevmin   | dBm        | -140  |        |        |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 kHz | -98   |        |        |
| RSRP <sup>Note 3</sup>  | dBm/15 KHz | -84   | -84    | -84    |
| RSRQ <sup>Note 3</sup>  | dB         | -10.96  | -10.96 | -10.96 |
| $\hat{E}_s/I_{ot}$  | dB         | 14  | 14     | 14     |
| $\hat{E}_s/N_{oc}$  | dB         | 14  | 14     | 14     |
| Treselection <sub>EUTRAN</sub>  | S          | 0   |        |        |
| SnonintrasearchP  | dB         | N/A   |        |        |
| Thresh <sub>x, highP</sub>  | dB         | 48  |        |        |
| Thresh <sub>serv, lowP</sub>  | dB         | 44  |        |        |
| Thresh <sub>x, lowP</sub>   | dB         | 50  |        |        |
| beamMeasConfigIdle  |            | False   |        |        |
| Propagation Condition   |            | AWGN  |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |            |   |        |        |

#### A.8.2.2.2.2 Test Requirements

At the beginning of the time-period T2 the connection is released, and UE enters idle mode. During the time period T2 the UE is in Idle mode and Cell 2 is active. The UE shall not perform reselection. The UE shall perform Idle Mode DC measurement according to clause 4.9.2.4 in TS 36.133 [15]. UE shall be able to detect, acquire the SSB index and measure the SS-RSRP and SS-RSRQ from Cell 2 for Idle mode DC measurement during T2.

NOTE: The Idle mode DC measurement period for the test setup can be expressed as:  $T_{\text{detect, NR}}$ .

Where:

$T_{\text{detect, NR}}$  See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

This gives a total of 128 s, allow 128 s for the T2.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Section 9.1.2B in TS 36.133 [15] and Section 9.1.3B, respectively and test ends.

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

## A.8.3 RRC\_CONNECTED state mobility

### A.8.3.1 Handover

#### A.8.3.1.1 E-UTRAN - NR handover in FR1

##### A.8.3.1.1.1 Test Purpose and Environment

This test shall verify the E-UTRAN to NR FR1 handover requirements as specified in clause 6.1.2.1 specified in clause 5.3.4 in TS 36.133 [15].

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN and Cell 2 is an inter-RAT NR neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [15] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.8.3.1.1-1. General test parameters are provided in Table A.8.3.1.1-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.8.3.1.1-3 and A.8.3.1.1-4 respectively.

**Table A.8.3.1.1-1: Supported test configurations for E-UTRAN inter-RAT NR handover**

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

Table A.8.3.1.1-2: General test parameters for E-UTRAN inter-RAT NR handover

| Parameter                    |                   | Unit | Value                             | Comment   |
|------------------------------|-------------------|------|-----------------------------------|---|
| NR RF Channel Number         |                   |      | 1                                 | 1 NR carrier frequency is used in the test                    |
| LTE RF Channel Number        |                   |      | 2                                 | 1 E-UTRAN carrier frequency is used in the test               |
| Initial conditions           | Active cell       |      | Cell 1                            | E-UTRAN cell  |
|                              | Neighbouring cell |      | Cell 2                            | NR cell   |
| Final condition              | Active cell       |      | Cell 2                            |   |
| NR measurement quantity      |                   |      | SS-RSRP                           |   |
| E-UTRAN measurement quantity |                   |      | RSRP                              |   |
| b2-Threshold1                |                   | dBm  | -83                               | Absolute E-UTRAN RSRP threshold for event B2                  |
| b2-Threshold2NR              |                   | dBm  | As specified in Table A.8.3.1.1-4 | Absolute NR SS-RSRP threshold for event B2                    |
| Hysteresis                   |                   | dB   | 0                                 |   |
| TimeToTrigger                |                   | s    | 0                                 |   |
| Filter coefficient           |                   |      | 0                                 | L3 filtering is not used                                      |
| DRX                          |                   |      | OFF                               | Non-DRX test  |
| Access Barring Information   |                   | -    | Not sent                          | No additional delays in random access procedure               |
| Time offset between cells    |                   |      | 3 ms                              | Asynchronous cells  |
| Gap pattern configuration Id |                   |      | 0                                 | As specified in Table 8.1.2.1-1 started before T2 starts [15] |
| T1                           |                   | s    | 5                                 |   |
| T2                           |                   | s    | ≤5                                |   |
| T3                           |                   | s    | 1                                 |   |

Table A.8.3.1.1-3: Cell specific test parameters for E-UTRAN inter-RAT NR handover (Cell 1)

| Parameter   | Unit | Configuration    | Cell 1   |    |    |
|---|------|------------------|--|----|----|
|   |      |                  | T1   | T2 | T3 |
| RF channel number   |      | 1, 2, 3, 4, 5, 6 | 2  |    |    |
| Duplex mode   |      | 1, 2, 3          | FDD  |    |    |
|   |      | 4, 5, 6          | TDD  |    |    |
| TDD special subframe configuration <sup>Note1</sup>                                 |      | 4, 5, 6          | 6  |    |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |      | 4, 5, 6          | 1  |    |    |
| BW <sub>channel</sub>   | MHz  | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |    |
| PRACH Configuration <sup>Note2</sup>  |      | 1, 2, 3          | 4  |    |    |
|   |      | 4, 5, 6          | 53   |    |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup>              |      | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |    |
|   |      | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |    |    |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup> |      | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |    |    |
|   |      | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |    |    |
| OCNG Patterns <sup>Note3</sup>  |      | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |    |    |
|   |      | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |    |    |
| PBCH_RA   | dB   | 1, 2, 3, 4, 5, 6 | 0  |    |    |
| PBCH_RB   |      |                  |  |    |    |

|  |           |                  |         |        |        |
|--|-----------|------------------|---------|--------|--------|
| PSS_RA   |           |                  |         |        |        |
| SSS_RA   |           |                  |         |        |        |
| PCFICH_RB  |           |                  |         |        |        |
| PHICH_RA   |           |                  |         |        |        |
| PHICH_RB   |           |                  |         |        |        |
| PDCCH_RA   |           |                  |         |        |        |
| PDCCH_RB   |           |                  |         |        |        |
| PDSCH_RA   |           |                  |         |        |        |
| PDSCH_RB   |           |                  |         |        |        |
| OCNG_RA <sup>Note4</sup>   |           |                  |         |        |        |
| OCNG_RB <sup>Note4</sup>   |           |                  |         |        |        |
| $N_{oc}$ <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98     |        |        |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | 7       | 7      | 7      |
| $\hat{E}_s/I_{ot}$ <sup>Note6</sup>  | dB        | 1, 2, 3, 4, 5, 6 | 7       | 7      | 7      |
| RSRP <sup>Note6</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -91     | -91    | -91    |
| SCH_RP <sup>Note6</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -91     | -91    | -91    |
| $I_o$ <sup>Note6</sup>   | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -62.43  | -62.43 | -62.43 |
| Propagation Condition  |           | 1, 2, 3, 4, 5, 6 | AWGN    |        |        |
| Antenna Configuration and Correlation Matrix <sup>Note7</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low |        |        |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].</p> <p>Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 6: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |         |        |        |



**Table A.8.3.1.1-4: Cell specific test parameters E-UTRAN inter-RAT NR handover (Cell 2)**

| Parameter  |                  | Unit         | Configuration    | Cell 2                            |        |        |
|--|------------------|--------------|------------------|-----------------------------------|--------|--------|
|  |                  |              |                  | T1                                | T2     | T3     |
| RF channel number  |                  |              | 1, 2, 3, 4, 5, 6 | 1                                 |        |        |
| Duplex mode  |                  |              | 1, 4             | FDD                               |        |        |
|  |                  |              | 2, 3, 5, 6       | TDD                               |        |        |
| TDD Configuration  |                  |              | 2, 5             | TDDConf.1.1                       |        |        |
|  |                  |              | 3, 6             | TDDConf.2.1                       |        |        |
| BW <sub>channel</sub>  |                  | MHz          | 1, 4             | 10: N <sub>RB,c</sub> = 52 (FDD)  |        |        |
|  |                  |              | 2, 5             | 10: N <sub>RB,c</sub> = 52 (TDD)  |        |        |
|  |                  |              | 3, 6             | 40: N <sub>RB,c</sub> = 106 (TDD) |        |        |
| PDSCH reference measurement channel  |                  |              | 1, 4             | SR.1.1 FDD                        |        |        |
|  |                  |              | 2, 5             | SR.1.1 TDD                        |        |        |
|  |                  |              | 3, 6             | SR.2.1 TDD                        |        |        |
| CORSET reference channel   |                  |              | 1, 4             | CR.1.1 FDD                        |        |        |
|  |                  |              | 2, 5             | CR.1.1 TDD                        |        |        |
|  |                  |              | 3, 6             | CR.2.1 TDD                        |        |        |
| PRACH configuration  |                  |              |                  | FR1 PRACH configuration 1         |        |        |
| OCNG pattern <sup>Note1</sup>  |                  |              | 1, 2, 3, 4, 5, 6 | OP.1                              |        |        |
| BWP  | Initial DL BWP   |              | 1, 2, 3, 4, 5, 6 | DLBWP.0.1                         |        |        |
|  | Dedicated DL BWP |              |                  | DLBWP.1.1                         |        |        |
|  | Initial UL BWP   |              |                  | ULBWP.0.1                         |        |        |
|  | Dedicated UL BWP |              |                  | ULBWP.1.1                         |        |        |
| SMTC configuration   |                  |              | 1, 2, 3, 4, 5, 6 | SMTC.1                            |        |        |
| SSB configuration  |                  |              | 1, 2, 4, 5       | SSB.1 FR1                         |        |        |
|  |                  |              | 3, 6             | SSB.2 FR1                         |        |        |
| b2-Threshold2NR  |                  | dBm          | 1, 2, 4, 5       | -106                              |        |        |
|  |                  |              | 3, 6             | -103                              |        |        |
| EPRE ratio of PSS to SSS   |                  | dB           | 1, 2, 3, 4, 5, 6 | 0                                 |        |        |
| EPRE ratio of PBCH_DMRS to SSS   |                  |              |                  |                                   |        |        |
| EPRE ratio of PBCH to PBCH_DMRS  |                  |              |                  |                                   |        |        |
| EPRE ratio of PDCCH_DMRS to SSS  |                  |              |                  |                                   |        |        |
| EPRE ratio of PDCCH to PDCCH_DMRS  |                  |              |                  |                                   |        |        |
| EPRE ratio of PDSCH_DMRS to SSS  |                  |              |                  |                                   |        |        |
| EPRE ratio of PDSCH to PDSCH_DMRS  |                  |              |                  |                                   |        |        |
| EPRE ratio of OCNG DMRS to SSS   |                  |              |                  |                                   |        |        |
| EPRE ratio of OCNG to OCNG DMRS  |                  |              |                  |                                   |        |        |
| N <sub>oc</sub> <sup>Note2</sup>   |                  |              |                  |                                   |        |        |
| N <sub>oc</sub> <sup>Note2</sup>   |                  | dBm/SCS      | 1, 2, 4, 5       | -98                               |        |        |
|  |                  |              | 3, 6             | -95                               |        |        |
| Ê <sub>s</sub> /N <sub>oc</sub>  |                  | dB           | 1, 2, 3, 4, 5, 6 | -infinity                         | 0      | 0      |
| Ê <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup>   |                  | dB           | 1, 2, 3, 4, 5, 6 | -infinity                         | 0      | 0      |
| SS-RSRP <sup>Note3</sup>   |                  | dBm/SCS      | 1, 2, 4, 5       | -infinity                         | -98    | -98    |
|  |                  |              | 3, 6             | -infinity                         | -95    | -95    |
| I <sub>o</sub> <sup>Note3</sup>  |                  | dBm/9.36 MHz | 1, 2, 4, 5       | -70.05                            | -67.04 | -67.04 |
|  |                  |              | dBm/38.16 MHz    | 3, 6                              | -63.96 | -60.94 |
| Propagation condition  |                  |              | 1, 2, 3, 4, 5, 6 | AWGN                              |        |        |
| Antenna Configuration and Correlation Matrix   |                  |              | 1, 2, 3, 4, 5, 6 | 1x2 Low                           |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: Ê<sub>s</sub>/I<sub>ot</sub>, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                  |              |                  |                                   |        |        |

### A.8.3.1.1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 112 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

RRC procedure delay = 50 ms and is specified in TS36.133.

$T_{\text{interrupt}}$  = 62 ms in the test;  $T_{\text{interrupt}}$  is defined in TS36.133 clause 5.3.4.3.

This gives a total of 112 ms.

## A.8.4 Measurement procedure

### A.8.4.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay

#### A.8.4.1.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay in non-DRX

##### A.8.4.1.1.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and no DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.1.1-1 below. Test parameters and cell-specific parameters for the NR cell are provided in Tables A.8.4.1.1.1-2 and A.8.4.1.1.1-3 below, respectively. Cell-specific parameters for the E-UTRA cell are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1.

**Table A.8.4.1.1.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.8.4.1.1.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test**

| Parameter   | Unit | Test configuration | Value     |        | Comment   |
|---|------|--------------------|-----------|--------|---|
|   |      |                    | Test 1    | Test 2 |   |
| E-UTRA RF Channel Number                              |      | Config 1,2,3,4,5,6 | 1         |        | One E-UTRAN carrier frequencies is used.                                      |
| NR RF Channel Number                                  |      | Config 1,2,3,4,5,6 | 1         |        | One NR FR1 carrier frequencies is used.                                       |
| Active cell   |      | Config 1,2,3,4,5,6 | Cell 1    |        | Cell 1 is on E-UTRA RF channel number 1.                                      |
| Neighbour cell  |      | Config 1,2,3,4,5,6 | Cell 2    |        | Cell 2 is on NR RF channel number 1.  |
| SSB configuration                                     |      | Config 1,4         | SSB.1 FR1 |        | As specified in clause A.3.10.1   |
|   |      | Config 2,5         | SSB.1 FR1 |        | As specified in clause A.3.10.1   |
|   |      | Config 3,6         | SSB.2 FR1 |        | As specified in clause A.3.10.1   |
| CP length   |      | Config 1,2,3,4,5,6 | Normal    |        | Applicable to both cells.   |
| DRX   |      | Config 1,2,3,4,5,6 | OFF       |        | DRX is not used   |
| Frame time offset between serving and neighbour cells | ms   | Config 1,2,3,4     | 3         | 7      | Asynchronous cells.<br>The timing of Cell 2 relative to the timing of Cell 1. |
|   | μs   | Config 5,6         | 3         |        | Synchronous cells.  |
| SFN offset between serving and neighbour cells        |      | Config 1,2,3,4,5,6 | 0         | 1      | SFN of Cell 2 relative to SFN of Cell 1.                                      |
| T1  | s    | Config 1,2,3,4,5,6 | 1         |        |   |

**Table A.8.4.1.1.1-3: Cell specific test parameters for Cell 2 in inter-RAT SFTD measurement delay test**

| Parameter   | Unit         | Test configuration | Cell 2                      |
|---|--------------|--------------------|-----------------------------|
| NR RF Channel Number  |              | Config 1,2,3,4,5,6 | 1                           |
| Duplex mode   |              | Config 1,4         | FDD                         |
|   |              | Config 2,3,5,6     | TDD                         |
| BW <sub>channel</sub>   | MHz          | Config 1,4         | 10: N <sub>RB,c</sub> = 52  |
|   |              | Config 2,5         | 10: N <sub>RB,c</sub> = 52  |
|   |              | Config 3,6         | 40: N <sub>RB,c</sub> = 106 |
| TDD configuration   |              | Config 2,5         | TDDConf.1.1                 |
|   |              | Config 3,6         | TDDConf.2.1                 |
| OCNG Pattern defined in A.3.2.1.1   |              | Config 1,2,3,4,5,6 | OP.1                        |
| SMTC configuration  |              | Config 1,2,3,4,5,6 | SMTC.1                      |
| PDSCH/PDCCH subcarrier spacing  | kHz          | Config 1,2,4,5     | 15                          |
|   |              | Config 3,6         | 30                          |
| EPRE ratio of PSS to SSS  | dB           | Config 1,2,3,4,5,6 | 0                           |
| EPRE ratio of PBCH DMRS to SSS  | dB           |                    |                             |
| EPRE ratio of PBCH to PBCH DMRS   | dB           |                    |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  | dB           |                    |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   | dB           |                    |                             |
| N <sub>oc</sub> <sup>Note2</sup>  | dBm/15kHz    |                    | -98                         |
| N <sub>oc</sub> <sup>Note2</sup>  | dBm/SCS      | Config 1,2,4,5     | -98                         |
|   |              | Config 3,6         | -95                         |
| SS-RSRP <sup>Note 3, 4</sup>  | dBm/SCS      | Config 1,2,4,5     | -94                         |
|   |              | Config 3,6         | -91                         |
| $\bar{E}_s/I_{ot}$  | dB           | Config 1,2,3,4,5,6 | 4                           |
| $\bar{E}_s/N_{oc}$  | dB           | Config 1,2,3,4,5,6 | 4                           |
| I <sub>o</sub> <sup>Note 3</sup>  | dBm/9.36MHz  | Config 1,2,4,5     | -64.59                      |
|   | dBm/38.16MHz | Config 3,6         | -58.50                      |
| Propagation Condition   |              | Config 1,2,3,4,5,6 | AWGN                        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |                             |

### A.8.4.1.1.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at T<sub>RRC\_procedure\_delay</sub> + T<sub>measure\_SFTD1</sub> after the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2×TTI<sub>DCCH</sub> longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

### A.8.4.1.2 E-UTRA – NR Inter-RAT SFTD Measurement Delay in DRX

#### A.8.4.1.2.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.2.1-1 below. Test parameters are provided in Tables A.8.4.1.2.1-2 below. Cell-specific parameters for the E-UTRA and NR cells are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1, and Table A.8.4.1.1.1-3 in clause A.8.4.1.1.1, respectively.

**Table A.8.4.1.2.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.8.4.1.2.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX**

| Parameter   | Unit | Test configuration | Value     |        | Comment   |
|---|------|--------------------|-----------|--------|---|
|   |      |                    | Test 1    | Test 2 |   |
| E-UTRA RF Channel Number                              |      | Config 1,2,3,4,5,6 | 1         |        | One E-UTRAN carrier frequencies is used.                                      |
| NR RF Channel Number                                  |      | Config 1,2,3,4,5,6 | 1         |        | One NR FR1 carrier frequencies is used.                                       |
| Active cell   |      | Config 1,2,3,4,5,6 | Cell 1    |        | Cell 1 is on E-UTRA RF channel number 1.                                      |
| Neighbour cell  |      | Config 1,2,3,4,5,6 | Cell 2    |        | Cell 2 is on NR RF channel number 1.  |
| SSB configuration                                     |      | Config 1,4         | SSB.1 FR1 |        | As specified in clause A.3.10.1   |
|   |      | Config 2,5         | SSB.1 FR1 |        | As specified in clause A.3.10.1   |
|   |      | Config 3,6         | SSB.2 FR1 |        | As specified in clause A.3.10.1   |
| CP length   |      | Config 1,2,3,4,5,6 | Normal    |        | Applicable to both cells.   |
| DRX   |      | Config 1,2,3,4,5,6 | DRX.4     |        | DRX configuration as specified in clause A.3.3.4                              |
| Frame time offset between serving and neighbour cells | ms   | Config 1,2,4,5     | 3         | 7      | Asynchronous cells.<br>The timing of Cell 2 relative to the timing of Cell 1. |
|   | µs   | Config 3,6         | 3         |        | Synchronous cells.  |
| SFN offset between serving and neighbour cells        |      | Config 1,2,3,4,5,6 | 0         | 1      | SFN of Cell 2 relative to SFN of Cell 1.                                      |
| T1  | s    | Config 1,2,3,4,5,6 | 1         |        |   |

#### A.8.4.1.2.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at the earliest DRX activity time following upon  $T_{\text{RRC\_procedure\_delay}} + T_{\text{measure\_SFTD1}}$  from the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2 E-UTRA – NR Inter-RAT Measurements

### A.8.4.2.1 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

#### A.8.4.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.1.1-1, A.8.4.2.1.1-2, A.8.4.2.1.1-3 and A.8.4.2.1.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.8.4.2.1.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6             | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations.

**Table A.8.4.2.1.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit | Test configuration | Value                 |        | Comment   |
|--|------|--------------------|-----------------------|--------|---|
|  |      |                    | Test 1                | Test 2 |   |
| E-UTRA RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        | One FR1 NR carrier frequency is used.   |
| Active cell  |      | 1, 2, 3, 4, 5, 6   | E-UTRA cell 1 (PCell) |        | E-UTRA cell 1 is on E-UTRA RF channel number 1.                                     |
| Neighbour cell   |      | 1, 2, 3, 4, 5, 6   | NR cell 2             |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id   |      | 1, 2, 3, 4, 5, 6   | 0                     | 4      | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset   |      | 1, 2, 3, 4, 5, 6   | 39                    | 19     | As specified in TS 36.331 [16].   |
| b2-Threshold1  | dBm  | 1, 2, 3, 4, 5, 6   | Note 1                |        | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]       |
| b2-Threshold2NR  | dBm  | 1, 2, 3, 4, 5, 6   | Note 2                |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]               |
| Hysteresis   | dB   | 1, 2, 3, 4, 5, 6   | 0                     |        |   |
| CP length  |      | 1, 2, 3, 4, 5, 6   | Normal                |        |   |
| TimeToTrigger  | s    | 1, 2, 3, 4, 5, 6   | 0                     |        |   |
| Filter coefficient   |      | 1, 2, 3, 4, 5, 6   | 0                     |        | L3 filtering is not used  |
| DRX  |      | 1, 2, 3, 4, 5, 6   | OFF                   |        | DRX is not used   |
| Time offset between serving and neighbour cells                        |      | 1, 4               | 3ms                   |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |      | 2, 3, 5, 6         | 3μs                   |        | Synchronous cells.  |
| T1   | s    | 1, 2, 3, 4, 5, 6   | 5                     |        |   |
| T2   | s    | 1, 2, 3, 4, 5, 6   | 1                     | 1      |   |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.1.1-3   |      |                    |                       |        |   |
| Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.1.1-4 |      |                    |                       |        |   |

**Table A.8.4.2.1.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter   | Unit | Configuration    | Cell 1   |    |
|---|------|------------------|--|----|
|   |      |                  | T1   | T2 |
| RF channel number   |      | 1, 2, 3, 4, 5, 6 | 1  |    |
| Duplex mode   |      | 1, 2, 3          | FDD  |    |
|   |      | 4, 5, 6          | TDD  |    |
| TDD special subframe configuration <sup>Note1</sup>                 |      | 4, 5, 6          | 6  |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                  |      | 4, 5, 6          | 1  |    |
| BW <sub>channel</sub>   | MHz  | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |
| PDSCH parameters: DL Reference Measurement Channel <sup>Note2</sup> |      | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |
|   |      | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |    |



|  |           |                  |  |                                     |
|--|-----------|------------------|--|-------------------------------------|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                                     |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                                     |
| OCNG Patterns <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                                     |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                                     |
| b2-Threshold1  | dBm       | 1, 2, 3, 4, 5, 6 | -77  |                                     |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |                                     |
| PBCH_RB  |           |                  |  |                                     |
| PSS_RA   |           |                  |  |                                     |
| SSS_RA   |           |                  |  |                                     |
| PCFICH_RB  |           |                  |  |                                     |
| PHICH_RA   |           |                  |  |                                     |
| PHICH_RB   |           |                  |  |                                     |
| PDCCH_RA   |           |                  |  |                                     |
| PDCCH_RB   |           |                  |  |                                     |
| PDSCH_RA   |           |                  |  |                                     |
| PDSCH_RB   |           |                  |  |                                     |
| OCNG_RA <sup>Note3</sup>   |           |                  |  |                                     |
| OCNG_RB <sup>Note3</sup>   |           |                  |  |                                     |
| N <sub>oc</sub> <sup>Note4</sup>   |           |                  |  |                                     |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                                  |
| $\bar{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                                  |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                                 |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                                 |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -59.13+10log(N <sub>RB,c</sub> /50)                        | -59.13+10log(N <sub>RB,c</sub> /50) |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2, 3, 4, 5, 6 | ETU70  |                                     |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |                                     |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\bar{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |                                     |

**Table A.8.4.2.1.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit         | Test configuration | Cell 2                      |        |
|--|--------------|--------------------|-----------------------------|--------|
|  |              |                    | T1                          | T2     |
| NR RF Channel Number   |              | 1, 2, 3, 4, 5, 6   | 1                           |        |
| Duplex mode  |              | 1, 4               | FDD                         |        |
|  |              | 2, 3, 5, 6         | TDD                         |        |
| TDD configuration  |              | 2, 5               | TDDConf.1.1                 |        |
|  |              | 3, 6               | TDDConf.2.1                 |        |
| BW <sub>channel</sub>  | MHz          | 1, 2, 4, 5         | 10: N <sub>RB,c</sub> = 52  |        |
|  |              | 3, 6               | 40: N <sub>RB,c</sub> = 106 |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |              | 1, 2, 3, 4, 5, 6   | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2  |              | 1, 4               | SMTC.2                      |        |
|  |              | 2, 3, 5, 6         | SMTC.1                      |        |
| PDSCH/PDCCH subcarrier spacing   | kHz          | 1, 2, 4, 5         | 15                          |        |
|  |              | 3, 6               | 30                          |        |
| b2-Threshold2NR  | dBm/SCS      | 1, 2, 4, 5         | -101                        |        |
|  |              | 3, 6               | -98                         |        |
| EPRE ratio of PSS to SSS   |              | 1, 2, 3, 4, 5, 6   | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH   |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |                    |                             |        |
| Note2<br>$N_{sc}$  | dBm/15kHz    |                    |                             |        |
| Note2<br>$N_{sc}$  | dBm/SCS      | 1, 2, 4, 5         | -98                         |        |
|  |              | 3, 6               | -95                         |        |
| SS-RSRP Note 3   | dBm/SCS      | 1, 2, 4, 5         | -Infinity                   | -91    |
|  |              | 3, 6               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| I <sub>o</sub> Note3   | dBm/9.36MHz  | 1, 2, 4, 5         | -70.05                      | -62.26 |
|  | dBm/38.16MHz | 3, 6               | -63.95                      | -56.16 |
| Propagation Condition  |              | 1, 2, 3, 4, 5, 6   | TDL-C 300ns 100Hz           |        |
| Antenna Configuration and Correlation Matrix   |              | 1, 2, 3, 4, 5, 6   | 1x2 Low                     |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{sc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |                             |        |

#### A.8.4.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement

reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.8.4.2.2 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used

##### A.8.4.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.2.1-1, A.8.4.2.2.1-2, A.8.4.2.2.1-3 and A.8.4.2.2.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.2.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.8.4.2.2.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

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

**Table A.8.4.2.2.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit | Test configuration | Value                 |        |        |        | Comment   |
|--|------|--------------------|-----------------------|--------|--------|--------|---|
|  |      |                    | Test 1                | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        |        |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        |        |        | One FR1 NR carrier frequency is used.   |
| Active cell  |      | 1, 2, 3, 4, 5, 6   | E-UTRA cell 1 (PCell) |        |        |        | E-UTRA cell 1 is on E-UTRA RF channel number 1.                                     |
| Neighbour cell   |      | 1, 2, 3, 4, 5, 6   | NR cell 2             |        |        |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id   |      | 1, 2, 3, 4, 5, 6   | 0                     |        | 4      |        | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset   |      | 1, 2, 3, 4, 5, 6   | 39                    |        | 19     |        | As specified in TS 36.331 [16].   |
| b2-Threshold1  | dBm  | 1, 2, 3, 4, 5, 6   | Note 1                |        |        |        | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]       |
| b2-Threshold2NR  | dBm  | 1, 2, 3, 4, 5, 6   | Note 2                |        |        |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]               |
| Hysteresis   | dB   | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        |   |
| CP length  |      | 1, 2, 3, 4, 5, 6   | Normal                |        |        |        |   |
| TimeToTrigger  | s    | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        |   |
| Filter coefficient   |      | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        | L3 filtering is not used  |
| DRX  |      | 1, 2, 3, 4, 5, 6   | DRX.9                 | DRX.12 | DRX.9  | DRX.12 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells                        |      | 1, 4               | 3ms                   |        |        |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |      | 2, 3, 5, 6         | 3μs                   |        |        |        | Synchronous cells.  |
| T1   | s    | 1, 2, 3, 4, 5, 6   | 5                     |        |        |        |   |
| T2   | s    | 1, 2, 3, 4, 5, 6   | 2                     | 11     | 2      | 11     |   |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.2.1-3   |      |                    |                       |        |        |        |   |
| Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.2.1-4 |      |                    |                       |        |        |        |   |

**Table A.8.4.2.2.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter  | Unit | Configuration    | Cell 1   |    |
|--|------|------------------|--|----|
|  |      |                  | T1   | T2 |
| RF channel number  |      | 1, 2, 3, 4, 5, 6 | 1  |    |
| Duplex mode  |      | 1, 2, 3          | FDD  |    |
|  |      | 4, 5, 6          | TDD  |    |
| TDD special subframe configuration <sup>Note1</sup>                    |      | 4, 5, 6          | 6  |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                     |      | 4, 5, 6          | 1  |    |
| BW <sub>channel</sub>  | MHz  | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |      | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |

|  |           |                  |  |                              |
|--|-----------|------------------|--|------------------------------|
|  |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD       |                              |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                              |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                              |
| OCNG Patterns <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                              |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                              |
| b2-Threshold1  | dBm       | 1, 2, 3, 4, 5, 6 | -77  |                              |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |                              |
| PBCH_RB  |           |                  |  |                              |
| PSS_RA   |           |                  |  |                              |
| SSS_RA   |           |                  |  |                              |
| PCFICH_RB  |           |                  |  |                              |
| PHICH_RA   |           |                  |  |                              |
| PHICH_RB   |           |                  |  |                              |
| PDCCH_RA   |           |                  |  |                              |
| PDCCH_RB   |           |                  |  |                              |
| PDSCH_RA   |           |                  |  |                              |
| PDSCH_RB   |           |                  |  |                              |
| OCNG_RA <sup>Note3</sup>   |           |                  |  |                              |
| OCNG_RB <sup>Note3</sup>   |           |                  |  |                              |
| $N_{oc}$ <sup>Note4</sup>  |           |                  |  |                              |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                           |
| $\bar{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                           |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                          |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                          |
| $I_o$ <sup>Note5</sup>   | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | $-59.13+10\log(N_{RB,c}/50)$                               | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2, 3, 4, 5, 6 | ETU70  |                              |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |                              |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>\bar{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |                              |

**Table A.8.4.2.2.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter   | Unit         | Test configuration | Cell 2                      |        |
|---|--------------|--------------------|-----------------------------|--------|
|   |              |                    | T1                          | T2     |
| NR RF Channel Number  |              | 1, 2, 3, 4, 5, 6   | 1                           |        |
| Duplex mode   |              | 1, 4               | FDD                         |        |
|   |              | 2, 3, 5, 6         | TDD                         |        |
| TDD configuration   |              | 2, 5               | TDDConf.1.1                 |        |
|   |              | 3, 6               | TDDConf.2.1                 |        |
| BW <sub>channel</sub>   | MHz          | 1, 2, 4, 5         | 10: N <sub>RB,c</sub> = 52  |        |
|   |              | 3, 6               | 40: N <sub>RB,c</sub> = 106 |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)   |              | 1, 2, 3, 4, 5, 6   | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2   |              | 1, 4               | SMTC.2                      |        |
|   |              | 2, 3, 5, 6         | SMTC.1                      |        |
| PDSCH/PDCCH subcarrier spacing  | kHz          | 1, 2, 4, 5         | 15                          |        |
|   |              | 3, 6               | 30                          |        |
| b2-Threshold2NR   | dBm/SCS      | 1, 2, 4, 5         | -101                        |        |
|   |              | 3, 6               | -98                         |        |
| EPRE ratio of PSS to SSS  |              | 1, 2, 3, 4, 5, 6   | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS   |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH  |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |                    |                             |        |
| <sup>Note2</sup><br>N <sub>sc</sub>   | dBm/15kHz    |                    |                             |        |
| <sup>Note2</sup><br>N <sub>sc</sub>   | dBm/SCS      | 1, 2, 4, 5         | -98                         |        |
|   |              | 3, 6               | -95                         |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS      | 1, 2, 4, 5         | -Infinity                   | -91    |
|   |              | 3, 6               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$  | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$  | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/9.36MHz  | 1, 2, 4, 5         | -70.05                      | -62.26 |
|   | dBm/38.16MHz | 3, 6               | -63.95                      | -56.16 |
| Propagation Condition   |              | 1, 2, 3, 4, 5, 6   | TDL-C 300ns 100Hz           |        |
| Antenna Configuration and Correlation Matrix  |              | 1, 2, 3, 4, 5, 6   | 1x2 Low                     |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>sc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |                             |        |

#### A.8.4.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement

reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.8.4.2.3 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

#### A.8.4.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.3.1-1, A.8.4.2.3.1-2, A.8.4.2.3.1-3 and A.8.4.2.3.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.3.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.8.4.2.3.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

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

**Table A.8.4.2.3.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit | Test configuration | Value                 |        | Comment  |
|--|------|--------------------|-----------------------|--------|--|
|  |      |                    | Test 1                | Test 2 |  |
| E-UTRA RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        | One E-UTRA carrier frequency is used.  |
| NR RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        | One FR1 NR carrier frequency is used.  |
| Active cell  |      | 1, 2, 3, 4, 5, 6   | E-UTRA cell 1 (PCell) |        | E-UTRA cell 1 is on E-UTRA RF channel number 1.                                      |
| Neighbour cell   |      | 1, 2, 3, 4, 5, 6   | NR cell 2             |        | NR cell 2 is on NR RF channel number 1.  |
| Gap Pattern Id   |      | 1, 2, 3, 4, 5, 6   | 0                     | 4      | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                            |
| Measurement gap offset   |      | 1, 2, 3, 4, 5, 6   | 39                    | 19     | As specified in TS 36.331 [16].  |
| b2-Threshold1  | dBm  | 1, 2, 3, 4, 5, 6   | Note 1                |        | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]        |
| b2-Threshold2NR  | dBm  | 1, 2, 3, 4, 5, 6   | Note 2                |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]                |
| Hysteresis   | dB   | 1, 2, 3, 4, 5, 6   | 0                     |        |  |
| CP length  |      | 1, 2, 3, 4, 5, 6   | Normal                |        |  |
| TimeToTrigger  | s    | 1, 2, 3, 4, 5, 6   | 0                     |        |  |
| Filter coefficient   |      | 1, 2, 3, 4, 5, 6   | 0                     |        | L3 filtering is not used   |
| DRX  |      | 1, 2, 3, 4, 5, 6   | OFF                   |        | DRX is not used  |
| Time offset between serving and neighbour cells                        |      | 1, 4               | 3ms                   |        | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
|  |      | 2, 3, 5, 6         | 3μs                   |        | Synchronous cells.   |
| T1   | s    | 1, 2, 3, 4, 5, 6   | 5                     |        |  |
| T2   | s    | 1, 2, 3, 4, 5, 6   | 2                     | 1      |  |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.3.1-3   |      |                    |                       |        |  |
| Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.3.1-4 |      |                    |                       |        |  |

**Table A.8.4.2.3.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter   | Unit | Configuration    | Cell 1   |    |
|---|------|------------------|--|----|
|   |      |                  | T1   | T2 |
| RF channel number   |      | 1, 2, 3, 4, 5, 6 | 1  |    |
| Duplex mode   |      | 1, 2, 3          | FDD  |    |
|   |      | 4, 5, 6          | TDD  |    |
| TDD special subframe configuration <sup>Note1</sup>                 |      | 4, 5, 6          | 6  |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                  |      | 4, 5, 6          | 1  |    |
| BW <sub>channel</sub>   | MHz  | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |
| PDSCH parameters: DL Reference Measurement Channel <sup>Note2</sup> |      | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |
|   |      | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |    |



|  |           |                  |  |                                     |
|--|-----------|------------------|--|-------------------------------------|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                                     |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                                     |
| OCNG Patterns <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                                     |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                                     |
| b2-Threshold1  | dBm       | 1, 2, 3, 4, 5, 6 | -77  |                                     |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |                                     |
| PBCH_RB  |           |                  |  |                                     |
| PSS_RA   |           |                  |  |                                     |
| SSS_RA   |           |                  |  |                                     |
| PCFICH_RB  |           |                  |  |                                     |
| PHICH_RA   |           |                  |  |                                     |
| PHICH_RB   |           |                  |  |                                     |
| PDCCH_RA   |           |                  |  |                                     |
| PDCCH_RB   |           |                  |  |                                     |
| PDSCH_RA   |           |                  |  |                                     |
| PDSCH_RB   |           |                  |  |                                     |
| OCNG_RA <sup>Note3</sup>   |           |                  |  |                                     |
| OCNG_RB <sup>Note3</sup>   |           |                  |  |                                     |
| N <sub>oc</sub> <sup>Note4</sup>   |           |                  |  |                                     |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                                  |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                                  |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                                 |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                                 |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -59.13+10log(N <sub>RB,c</sub> /50)                        | -59.13+10log(N <sub>RB,c</sub> /50) |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2, 3, 4, 5, 6 | ETU70  |                                     |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |                                     |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |                                     |

**Table A.8.4.2.3.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter   | Unit         | Test configuration | Cell 2                      |        |
|---|--------------|--------------------|-----------------------------|--------|
|   |              |                    | T1                          | T2     |
| NR RF Channel Number  |              | 1, 2, 3, 4, 5, 6   | 1                           |        |
| Duplex mode   |              | 1, 4               | FDD                         |        |
|   |              | 2, 3, 5, 6         | TDD                         |        |
| TDD configuration   |              | 2, 5               | TDDConf.1.1                 |        |
|   |              | 3, 6               | TDDConf.2.1                 |        |
| BW <sub>channel</sub>   | MHz          | 1, 2, 4, 5         | 10: N <sub>RB,c</sub> = 52  |        |
|   |              | 3, 6               | 40: N <sub>RB,c</sub> = 106 |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)   |              | 1, 2, 3, 4, 5, 6   | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2   |              | 1, 4               | SMTC.2                      |        |
|   |              | 2, 3, 5, 6         | SMTC.1                      |        |
| PDSCH/PDCCH subcarrier spacing  | kHz          | 1, 2, 4, 5         | 15                          |        |
|   |              | 3, 6               | 30                          |        |
| b2-Threshold2NR   | dBm/SCS      | 1, 2, 4, 5         | -101                        |        |
|   |              | 3, 6               | -98                         |        |
| EPRE ratio of PSS to SSS  |              | 1, 2, 3, 4, 5, 6   | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS   |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH  |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |                    |                             |        |
| <sup>Note2</sup><br>N <sub>sc</sub>   | dBm/15kHz    | 1, 2, 3, 4, 5, 6   | -98                         |        |
| <sup>Note2</sup><br>N <sub>sc</sub>   | dBm/SCS      | 1, 2, 4, 5         | -98                         |        |
|   |              | 3, 6               | -95                         |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS      | 1, 2, 4, 5         | -Infinity                   | -91    |
|   |              | 3, 6               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$  | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$  | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/9.36MHz  | 1, 2, 4, 5         | -70.05                      | -62.26 |
|   | dBm/38.16MHz | 3, 6               | -63.95                      | -56.16 |
| Propagation Condition   |              | 1, 2, 3, 4, 5, 6   | TDL-C 300ns 100Hz           |        |
| Antenna Configuration and Correlation Matrix  |              | 1, 2, 3, 4, 5, 6   | 1x2 Low                     |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>sc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |                             |        |

### A.8.4.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.8.4.2.4 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

##### A.8.4.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.4.1-1, A.8.4.2.4.1-2, A.8.4.2.4.1-3 and A.8.4.2.4.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.4.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.8.4.2.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

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

**Table A.8.4.2.4.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit | Test configuration | Value                 |        |        |        | Comment   |
|--|------|--------------------|-----------------------|--------|--------|--------|---|
|  |      |                    | Test 1                | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        |        |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     |        |        |        | One FR1 NR carrier frequency is used.   |
| Active cell  |      | 1, 2, 3, 4, 5, 6   | E-UTRA cell 1 (PCell) |        |        |        | E-UTRA cell 1 is on E-UTRA RF channel number 1.                                     |
| Neighbour cell   |      | 1, 2, 3, 4, 5, 6   | NR cell 2             |        |        |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id   |      | 1, 2, 3, 4, 5, 6   | 0                     |        | 4      |        | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset   |      | 1, 2, 3, 4, 5, 6   | 39                    |        | 19     |        | As specified in TS 36.331 [16].   |
| b2-Threshold1  | dBm  | 1, 2, 3, 4, 5, 6   | Note 1                |        |        |        | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]       |
| b2-Threshold2NR  | dBm  | 1, 2, 3, 4, 5, 6   | Note 2                |        |        |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]               |
| Hysteresis   | dB   | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        |   |
| CP length  |      | 1, 2, 3, 4, 5, 6   | Normal                |        |        |        |   |
| TimeToTrigger  | s    | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        |   |
| Filter coefficient   |      | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        | L3 filtering is not used  |
| DRX  |      | 1, 2, 3, 4, 5, 6   | DRX.9                 | DRX.12 | DRX.9  | DRX.12 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells                        |      | 1, 4               | 3ms                   |        |        |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |      | 2, 3, 5, 6         | 3μs                   |        |        |        | Synchronous cells.  |
| T1   | s    | 1, 2, 3, 4, 5, 6   | 5                     |        |        |        |   |
| T2   | s    | 1, 2, 3, 4, 5, 6   | 2                     | 13     | 2      | 13     |   |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.4.1-3   |      |                    |                       |        |        |        |   |
| Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.4.1-4 |      |                    |                       |        |        |        |   |

**Table A.8.4.2.4.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter  | Unit | Configuration    | Cell 1   |    |
|--|------|------------------|--|----|
|  |      |                  | T1   | T2 |
| RF channel number  |      | 1, 2, 3, 4, 5, 6 | 1  |    |
| Duplex mode  |      | 1, 2, 3          | FDD  |    |
|  |      | 4, 5, 6          | TDD  |    |
| TDD special subframe configuration <sup>Note1</sup>                    |      | 4, 5, 6          | 6  |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                     |      | 4, 5, 6          | 1  |    |
| BW <sub>channel</sub>  | MHz  | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |      | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |

|  |           |                  |  |                              |
|--|-----------|------------------|--|------------------------------|
|  |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD       |                              |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                              |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                              |
| OCNG Patterns <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                              |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                              |
| b2-Threshold1  | dBm       | 1, 2, 3, 4, 5, 6 | -77  |                              |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |                              |
| PBCH_RB  |           |                  |  |                              |
| PSS_RA   |           |                  |  |                              |
| SSS_RA   |           |                  |  |                              |
| PCFICH_RB  |           |                  |  |                              |
| PHICH_RA   |           |                  |  |                              |
| PHICH_RB   |           |                  |  |                              |
| PDCCH_RA   |           |                  |  |                              |
| PDCCH_RB   |           |                  |  |                              |
| PDSCH_RA   |           |                  |  |                              |
| PDSCH_RB   |           |                  |  |                              |
| OCNG_RA <sup>Note3</sup>   |           |                  |  |                              |
| OCNG_RB <sup>Note3</sup>   |           |                  |  |                              |
| $N_{oc}$ <sup>Note4</sup>  |           |                  |  |                              |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                           |
| $\bar{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                           |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                          |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                          |
| $I_o$ <sup>Note5</sup>   | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | $-59.13+10\log(N_{RB,c}/50)$                               | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2, 3, 4, 5, 6 | ETU70  |                              |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |                              |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>\bar{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |                              |

**Table A.8.4.2.4.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit         | Test configuration | Cell 2                      |        |
|--|--------------|--------------------|-----------------------------|--------|
|  |              |                    | T1                          | T2     |
| NR RF Channel Number   |              | 1, 2, 3, 4, 5, 6   | 1                           |        |
| Duplex mode  |              | 1, 4               | FDD                         |        |
|  |              | 2, 3, 5, 6         | TDD                         |        |
| TDD configuration  |              | 2, 5               | TDDConf.1.1                 |        |
|  |              | 3, 6               | TDDConf.2.1                 |        |
| BW <sub>channel</sub>  | MHz          | 1, 2, 4, 5         | 10: N <sub>RB,c</sub> = 52  |        |
|  |              | 3, 6               | 40: N <sub>RB,c</sub> = 106 |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |              | 1, 2, 3, 4, 5, 6   | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2  |              | 1, 4               | SMTC.2                      |        |
|  |              | 2, 3, 5, 6         | SMTC.1                      |        |
| PDSCH/PDCCH subcarrier spacing   | kHz          | 1, 2, 4, 5         | 15                          |        |
|  |              | 3, 6               | 30                          |        |
| b2-Threshold2NR  | dBm/SCS      | 1, 2, 4, 5         | -101                        |        |
|  |              | 3, 6               | -98                         |        |
| EPRE ratio of PSS to SSS   |              | 1, 2, 3, 4, 5, 6   | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH   |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |                    |                             |        |
| <sup>Note2</sup><br>$N_{sc}$   | dBm/15kHz    |                    |                             |        |
| <sup>Note2</sup><br>$N_{sc}$   | dBm/SCS      | 1, 2, 4, 5         | -98                         |        |
|  |              | 3, 6               | -95                         |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS      | 1, 2, 4, 5         | -Infinity                   | -91    |
|  |              | 3, 6               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| I <sub>o</sub> <sup>Note3</sup>  | dBm/9.36MHz  | 1, 2, 4, 5         | -70.05                      | -62.26 |
|  | dBm/38.16MHz | 3, 6               | -63.95                      | -56.16 |
| Propagation Condition  |              | 1, 2, 3, 4, 5, 6   | TDL-C 300ns 100Hz           |        |
| Antenna Configuration and Correlation Matrix   |              | 1, 2, 3, 4, 5, 6   | 1x2 Low                     |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{sc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |              |                    |                             |        |

#### A.8.4.2.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.8.4.2.5 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is not used

##### A.8.4.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.5.1-1, A.8.4.2.5.1-2 and A.8.4.2.5.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.5.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2.

**Table A.8.4.2.5.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in non-DRX**

| Configuration   | Description   |
|---|---|
| 1   | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.8.4.2.5.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Parameter   | Unit | Test configuration | Value                 |        | Comment   |
|---|------|--------------------|-----------------------|--------|---|
|   |      |                    | Test 1                | Test 2 |   |
| E-UTRA RF Channel Number  |      | 1, 2               | 1                     |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number  |      | 1, 2               | 1                     |        | One FR2 NR carrier frequency is used.   |
| Active cell   |      | 1, 2               | E-UTRA cell 1 (PCell) |        | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.      |
| Neighbour cell  |      | 1, 2               | NR cell 2             |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id  |      | 1, 2               | 0                     | 4      | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset  |      | 1, 2               | 39                    | 19     | As specified in TS 36.331 [16].   |
| b1-ThresholdNR  | dBm  | 1, 2               | Note 1                |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]               |
| Hysteresis  | dB   | 1, 2               | 0                     |        |   |
| CP length   |      | 1, 2               | Normal                |        |   |
| TimeToTrigger   | s    | 1, 2               | 0                     |        |   |
| Filter coefficient  |      | 1, 2               | 0                     |        | L3 filtering is not used  |
| DRX   |      | 1, 2               | OFF                   |        | DRX is not used   |
| Time offset between serving and neighbour cells                       |      | 1                  | 3ms                   |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3μs                   |        | Synchronous cells.  |
| T1  | s    | 1, 2               | 10                    |        |   |
| T2  | s    | 1, 2               | 6                     | 3      |   |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.5.1-3 |      |                    |                       |        |   |



**Table A.8.4.2.5.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Parameter   | Unit         | Test configuration | Cell 2                      |       |
|---|--------------|--------------------|-----------------------------|-------|
|   |              |                    | T1                          | T2    |
| AoA setup defined in A.3.15.2.1   |              | 1, 2               | Setup 2a                    |       |
| Assumption for UE beams <sup>Note 5</sup>   |              | 1, 2               | Rough                       |       |
| NR RF Channel Number  |              | 1, 2               | 1                           |       |
| Duplex mode   |              | 1, 2               | TDD                         |       |
| TDD configuration   |              | 1, 2               | TDDConf.3.1                 |       |
| BW <sub>channel</sub>   | MHz          | 1, 2               | 100: N <sub>RB,c</sub> = 66 |       |
| OCNG patterns defined in A.3.2.1.1  |              | 1, 2               | OP.3                        |       |
| SMTC configuration defined in A.3.11.1 and A.3.11.2   |              | 1                  | SMTC.2                      |       |
|   |              | 2                  | SMTC.1                      |       |
| PDSCH/PDCCH subcarrier spacing  | kHz          | 1, 2               | 120                         |       |
| b1-ThresholdNR   UE power class 3   | dBm/SCS      | 1, 2               | -112                        |       |
| EPRE ratio of PSS to SSS  |              | 1, 2               | 0                           |       |
| EPRE ratio of PBCH DMRS to SSS  |              |                    |                             |       |
| EPRE ratio of PBCH to PBCH DMRS   |              |                    |                             |       |
| EPRE ratio of PDCCH DMRS to SSS   |              |                    |                             |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |                    |                             |       |
| EPRE ratio of PDSCH DMRS to SSS   |              |                    |                             |       |
| EPRE ratio of PDSCH to PDSCH  |              |                    |                             |       |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |                    |                             |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |                    |                             |       |
| $N_{oc} \bar{E}_s$  | dBm/SCS      |                    |                             |       |
| SSB_RP <sup>Note 3</sup>  | dBm/SCS      | 1, 2               | -Infinity                   | -80.6 |
| $\hat{E}_s/I_{ot, BB}$ <sup>Note 6</sup>  | dB           | 1, 2               | -Infinity                   | 8.3   |
| $I_o$ <sup>Note3</sup>  | dBm/95.04MHz | 1, 2               | -Infinity                   | -56.0 |
| Propagation Condition   |              | 1, 2               | AWGN                        |       |
| <p>Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: SSB_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: Void</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> <p>Note 6: Calculation of <math>\hat{E}_s/I_{ot, BB}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> |              |                    |                             |       |

#### A.8.4.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

**Table A.8.4.2.5.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Test case        | Measurement reporting delay (ms) |               |
|------------------|----------------------------------|---------------|
|                  | Test 1: D1 ms                    | Test 2: D2 ms |
| UE power class 3 | 3200                             | 1600          |

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.8.4.2.6 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is used

##### A.8.4.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.6.1-1, A.8.4.2.6.1-2 and A.8.4.2.6.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.6.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.6.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2.

**Table A.8.4.2.6.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX**

| Configuration   | Description   |
|---|---|
| 1   | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.8.4.2.6.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter   | Unit | Test configuration | Value                 |        |        |        | Comment   |
|---|------|--------------------|-----------------------|--------|--------|--------|---|
|   |      |                    | Test 1                | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number  |      | 1, 2               | 1                     |        |        |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number  |      | 1, 2               | 1                     |        |        |        | One FR2 NR carrier frequency is used.   |
| Active cell   |      | 1, 2, 3, 4, 5, 6   | E-UTRA cell 1 (PCell) |        |        |        | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.      |
| Neighbour cell  |      | 1, 2, 3, 4, 5, 6   | NR cell 2             |        |        |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id  |      | 1, 2, 3, 4, 5, 6   | 0                     | 4      |        |        | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset  |      | 1, 2, 3, 4, 5, 6   | 39                    |        | 19     |        | As specified in TS 36.331 [16].   |
| b1-ThresholdNR  | dBm  | 1, 2               | Note 1                |        |        |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]               |
| Hysteresis  | dB   | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        |   |
| CP length   |      | 1, 2, 3, 4, 5, 6   | Normal                |        |        |        |   |
| TimeToTrigger   | s    | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        |   |
| Filter coefficient  |      | 1, 2, 3, 4, 5, 6   | 0                     |        |        |        | L3 filtering is not used  |
| DRX   |      | 1, 2, 3, 4, 5, 6   | DRX.9                 | DRX.12 | DRX.9  | DRX.12 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells                       |      | 1                  | 3ms                   |        |        |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3μs                   |        |        |        | Synchronous cells.  |
| T1  | s    | 1, 2, 3, 4, 5, 6   | 5                     |        |        |        |   |
| T2  | s    | 1, 2, 3, 4, 5, 6   | 6                     | 83     | 6      | 83     |   |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.6.1-3 |      |                    |                       |        |        |        |   |

**Table A.8.4.2.6.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter   | Unit         | Test configuration | Cell 2                      |       |
|---|--------------|--------------------|-----------------------------|-------|
|   |              |                    | T1                          | T2    |
| AoA setup defined in A.3.15.1   |              | 1, 2               | Setup 1                     |       |
| Assumption for UE beams <sup>Note 5</sup>   |              | 1, 2               | Rough                       |       |
| NR RF Channel Number  |              | 1, 2               | 1                           |       |
| Duplex mode   |              | 1, 2               | TDD                         |       |
| TDD configuration   |              | 1, 2               | TDDConf.3.1                 |       |
| BW <sub>channel</sub>   | MHz          | 1, 2               | 100: N <sub>RB,c</sub> = 66 |       |
| OCNG patterns defined in A.3.2.1.1  |              | 1, 2               | OP.1                        |       |
| SMTC configuration defined in A.3.11.1 and A.3.11.2   |              | 1                  | SMTC.2                      |       |
|   |              | 2                  | SMTC.1                      |       |
| PDSCH/PDCCH subcarrier spacing  | kHz          | 1, 2               | 120                         |       |
| b1-ThresholdNR   UE power class 3   | dBm/SCS      | 1, 2               | -106                        |       |
| EPRE ratio of PSS to SSS  |              | 1, 2               | 0                           |       |
| EPRE ratio of PBCH DMRS to SSS  |              |                    |                             |       |
| EPRE ratio of PBCH to PBCH DMRS   |              |                    |                             |       |
| EPRE ratio of PDCCH DMRS to SSS   |              |                    |                             |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |                    |                             |       |
| EPRE ratio of PDSCH DMRS to SSS   |              |                    |                             |       |
| EPRE ratio of PDSCH to PDSCH  |              |                    |                             |       |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |                    |                             |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |                    |                             |       |
| $N_{oc}$ <sup>Note2</sup>   | dBm/15kHz    |                    |                             |       |
| $N_{oc}$ <sup>Note2</sup>   | dBm/SCS      | 1, 2               | -95.7                       |       |
| SSN_RP <sup>Note 3</sup>  | dBm/SCS      | 1, 2               | -Infinity                   | -87.7 |
| $\hat{E}_s/I_{ot}$  | dB           | 1, 2               | -Infinity                   | 8     |
| $\hat{E}_s/N_{oc}$  | dB           | 1, 2               | -Infinity                   | 8     |
| $I_o$ <sup>Note3</sup>  | dBm/95.04MHz | 1, 2               | -66.7                       | -58.0 |
| Propagation Condition   |              | 1, 2               | AWGN                        |       |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |              |                    |                             |       |

#### A.8.4.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement

reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

**Table A.8.4.2.6.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Test case        | Measurement reporting delay (ms) |               |               |               |
|------------------|----------------------------------|---------------|---------------|---------------|
|                  | Test 1: D1 ms                    | Test 2: D2 ms | Test 3: D3 ms | Test 4: D4 ms |
| UE power class 3 | 4800                             | 51200         | 4800          | 51200         |

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.8.4.2.7 NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used

#### A.8.4.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.7.1-1, A.8.4.2.7.1-2 and A.8.4.2.7.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.7.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.7.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.8.4.2.7.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in non-DRX**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations.

**Table A.8.4.2.7.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Parameter   | Unit | Test configuration | Value                 |        | Comment   |
|---|------|--------------------|-----------------------|--------|---|
|   |      |                    | Test 1                | Test 2 |   |
| E-UTRA RF Channel Numbers   |      | 1, 2               | 1                     |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Numbers   |      | 1, 2               | 1                     |        | One FR2 NR carrier frequency is used.   |
| Active cell   |      | 1, 2               | E-UTRA cell 1 (PCell) |        | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.      |
| Neighbour cell  |      | 1, 2               | NR cell 2             |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id  |      | 1, 2               | 0                     | 4      | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset  |      | 1, 2               | 39                    | 19     | As specified in TS 36.331 [16].   |
| b1-ThresholdNR  | dBm  | 1, 2               | Note 1                |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]               |
| Hysteresis  | dB   | 1, 2               | 0                     |        |   |
| CP length   |      | 1, 2               | Normal                |        |   |
| TimeToTrigger   | s    | 1, 2               | 0                     |        |   |
| Filter coefficient  |      | 1, 2               | 0                     |        | L3 filtering is not used  |
| DRX   |      | 1, 2               | OFF                   |        | DRX is not used   |
| Time offset between serving and neighbour cells                       |      | 1                  | 3ms                   |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3μs                   |        | Synchronous cells.  |
| T1  | s    | 1, 2               | 5                     |        |   |
| T2  | s    | 1, 2               | 5                     | 3      |   |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.5.1-3 |      |                    |                       |        |   |

**Table A.8.4.2.7.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Parameter   | Unit         | Test configuration | Cell 2                      |       |
|---|--------------|--------------------|-----------------------------|-------|
|   |              |                    | T1                          | T2    |
| AoA setup defined in A.3.15.1   |              | 1, 2               | Setup 1                     |       |
| Assumption for UE beams <sup>Note 5</sup>   |              | 1, 2               | Rough                       |       |
| NR RF Channel Number  |              | 1, 2               | 1                           |       |
| Duplex mode   |              | 1, 2               | TDD                         |       |
| TDD configuration   |              | 1, 2               | TDDConf.3.1                 |       |
| BW <sub>channel</sub>   | MHz          | 1, 2               | 100: N <sub>RB,c</sub> = 66 |       |
| OCNG patterns defined in A.3.2.1.1  |              | 1, 2               | OP.1                        |       |
| SMTC configuration defined in A.3.11.1 and A.3.11.2   |              | 1                  | SMTC.2                      |       |
|   |              | 2                  | SMTC.1                      |       |
| PDSCH/PDCCH subcarrier spacing  | kHz          | 1, 2               | 120                         |       |
| b1-Threshold <sub>NR</sub>   UE power class 3   | dBm/SCS      | 1, 2               | -106                        |       |
| EPRE ratio of PSS to SSS  |              | 1, 2               | 0                           |       |
| EPRE ratio of PBCH DMRS to SSS  |              |                    |                             |       |
| EPRE ratio of PBCH to PBCH DMRS   |              |                    |                             |       |
| EPRE ratio of PDCCH DMRS to SSS   |              |                    |                             |       |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |                    |                             |       |
| EPRE ratio of PDSCH DMRS to SSS   |              |                    |                             |       |
| EPRE ratio of PDSCH to PDSCH  |              |                    |                             |       |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |                    |                             |       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |                    |                             |       |
| <sup>Note2</sup><br>$N_{oc}$  | dBm/15kHz    | 1, 2               | -104.7                      |       |
| <sup>Note2</sup><br>$N_{oc}$  | dBm/SCS      | 1, 2               | -95.7                       |       |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS      | 1, 2               | -Infinity                   | -87.7 |
| $\hat{E}_s/I_{ot}$  | dB           | 1, 2               | -Infinity                   | 8     |
| $\hat{E}_s/N_{oc}$  | dB           | 1, 2               | -Infinity                   | 8     |
| $I_o$ <sup>Note3</sup>  | dBm/95.04MHz | 1, 2               | -66.7                       | -58.0 |
| Propagation Condition   |              | 1, 2               | AWGN                        |       |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |              |                    |                             |       |

#### A.8.4.2.7.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

**Table A.8.4.2.7.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Test case        | Measurement reporting delay (ms) |               |
|------------------|----------------------------------|---------------|
|                  | Test 1: D1 ms                    | Test 2: D2 ms |
| UE power class 3 | 4160                             | 2080          |

#### A.8.4.2.8 NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is used

##### A.8.4.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.8.1-1, A.8.4.2.8.1-2 and A.8.4.2.8.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.8.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.8.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.8.4.2.8.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in DRX**

| Configuration   | Description   |
|---|---|
| 1   | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |   |



**Table A.8.4.2.8.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX**

| Parameter   | Unit | Test configuration | Value                 |        |        |        | Comment   |
|---|------|--------------------|-----------------------|--------|--------|--------|---|
|   |      |                    | Test 1                | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number  |      | 1, 2               | 1                     |        |        |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number  |      | 1, 2               | 1                     |        |        |        | One FR2 NR carrier frequency is used.   |
| Active cell   |      | 1, 2               | E-UTRA cell 1 (PCell) |        |        |        | E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.      |
| Neighbour cell  |      | 1, 2               | NR cell 2             |        |        |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id  |      | 1, 2               | 0                     | 4      |        |        | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset  |      | 1, 2               | 39                    | 19     |        |        | As specified in TS 36.331 [16].   |
| b1-ThresholdNR  | dBm  | 1, 2               | Note 1                |        |        |        | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]               |
| Hysteresis  | dB   | 1, 2               | 0                     |        |        |        |   |
| CP length   |      | 1, 2               | Normal                |        |        |        |   |
| TimeToTrigger   | s    | 1, 2               | 0                     |        |        |        |   |
| Filter coefficient  |      | 1, 2               | 0                     |        |        |        | L3 filtering is not used  |
| DRX   |      |                    | DRX.9                 | DRX.12 | DRX.9  | DRX.12 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells                       |      | 1                  | 3ms                   |        |        |        | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | 2                  | 3μs                   |        |        |        | Synchronous cells.  |
| T1  | s    | 1, 2               | 5                     |        |        |        |   |
| T2  | s    | 1, 2               | 7                     | 70     | 7      | 70     |   |
| Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.8.1-3 |      |                    |                       |        |        |        |   |

**Table A.8.4.2.8.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection**

| Parameter   | Unit         | Test configuration | Cell 2                      |        |
|---|--------------|--------------------|-----------------------------|--------|
|   |              |                    | T1                          | T2     |
| AoA setup defined in A.3.15.1   |              | 1, 2               | Setup 1                     |        |
| Assumption for UE beams <sup>Note 5</sup>   |              | 1, 2               | Rough                       |        |
| NR RF Channel Number  |              | 1, 2               | 1                           |        |
| Duplex mode   |              | 1, 2               | TDD                         |        |
| TDD configuration   |              | 1, 2               | TDDConf.3.1                 |        |
| BW <sub>channel</sub>   | MHz          | 1, 2               | 100: N <sub>RB,c</sub> = 66 |        |
| OCNG patterns defined in A.3.2.1.1  |              | 1, 2               | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2   |              | 1                  | SMTC.2                      |        |
|   |              | 2                  | SMTC.1                      |        |
| PDSCH/PDCCH subcarrier spacing  | kHz          | 1, 2               | 120                         |        |
| b1-ThresholdNR   UE power class 3   | dBm/SCS      | 1, 2               | -106                        |        |
| EPRE ratio of PSS to SSS  |              | 1, 2               | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS   |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH  |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |                    |                             |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/15kHz    | 1, 2               | -104.7                      |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/SCS      | 1, 2               | -95.7                       |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS      | 1, 2               | -Infinity                   | -87.7  |
| $\hat{E}_s/I_{ot}$  | dB           | 1, 2               | -Infinity                   | 8      |
| $\hat{E}_s/N_{oc}$  | dB           | 1, 2               | -Infinity                   | 8      |
| $I_o$ <sup>Note3</sup>  | dBm/95.04MHz | 1, 2               | -66.7                       | -58.08 |
| Propagation Condition   |              | 1, 2               | AWGN                        |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation</p> |              |                    |                             |        |

#### A.8.4.2.8.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

**Table A.8.4.2.8.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX**

| Test case        | Measurement reporting delay (ms) |               |               |               |
|------------------|----------------------------------|---------------|---------------|---------------|
|                  | Test 1: D1 ms                    | Test 2: D2 ms | Test 3: D3 ms | Test 4: D4 ms |
| UE power class 3 | 6240                             | 66560         | 6240          | 66560         |

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.8.4.2.9 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16

##### A.8.4.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements when UE is configured with *highSpeedInterRAT-NR-r16*.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.9.1-1, A.8.4.2.9.1-2, A.8.4.2.9.1-3 and A.8.4.2.9.1-4.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.8.4.2.9.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR1 for UE configured with highSpeedInterRAT-NR-r16**

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

**Table A.8.4.2.9.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Parameter  | Unit | Test configuration | Value                 | Comment   |
|--|------|--------------------|-----------------------|---|
| E-UTRA RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number   |      | 1, 2, 3, 4, 5, 6   | 1                     | One FR1 NR carrier frequency is used.   |
| Active cell  |      | 1, 2, 3, 4, 5, 6   | E-UTRA cell 1 (PCell) | E-UTRA cell 1 is on E-UTRA RF channel number 1.                                     |
| Neighbour cell   |      | 1, 2, 3, 4, 5, 6   | NR cell 2             | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id   |      | 1, 2, 3, 4, 5, 6   | 0                     | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].                           |
| Measurement gap offset   |      | 1, 2, 3, 4, 5, 6   | 39                    | As specified in TS 36.331 [16].   |
| b2-Threshold1  | dBm  | 1, 2, 3, 4, 5, 6   | Note 1                | E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]       |
| b2-Threshold2NR  | dBm  | 1, 2, 3, 4, 5, 6   | Note 2                | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]               |
| Hysteresis   | dB   | 1, 2, 3, 4, 5, 6   | 0                     |   |
| CP length  |      | 1, 2, 3, 4, 5, 6   | Normal                |   |
| TimeToTrigger  | s    | 1, 2, 3, 4, 5, 6   | 0                     |   |
| Filter coefficient   |      | 1, 2, 3, 4, 5, 6   | 0                     | L3 filtering is not used  |
| DRX  |      | 1, 2, 3, 4, 5, 6   | DRX.5                 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells                        |      | 1, 4               | 3ms                   | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |      | 2, 3, 5, 6         | 3μs                   | Synchronous cells.  |
| T1   | s    | 1, 2, 3, 4, 5, 6   | 5                     |   |
| T2   | s    | 1, 2, 3, 4, 5, 6   | 5                     |   |
| Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.9.1-3   |      |                    |                       |   |
| Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.9.1-4 |      |                    |                       |   |

**Table A.8.4.2.9.1-3: E-UTRAN PCeLL specific test parameters for NR inter-RAT event triggered reporting with NR neighbour cell in FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Unit | Configuration | Cell 1 |    |
|-----------|------|---------------|--------|----|
|           |      |               | T1     | T2 |
|           |      |               |        |    |

|  |           |                  |  |                                     |
|--|-----------|------------------|--|-------------------------------------|
| RF channel number  |           | 1, 2, 3, 4, 5, 6 | 1  |                                     |
| Duplex mode  |           | 1, 2, 3          | FDD  |                                     |
|  |           | 4, 5, 6          | TDD  |                                     |
| TDD special subframe configuration <sup>Note1</sup>  |           | 4, 5, 6          | 6  |                                     |
| TDD uplink-downlink configuration <sup>Note1</sup>   |           | 4, 5, 6          | 1  |                                     |
| BW <sub>channel</sub>  | MHz       | 1, 2, 3, 4, 5, 6 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                                     |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |                                     |
|  |           | 4, 5, 6          | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |                                     |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1, 2, 3          | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                                     |
|  |           | 4, 5, 6          | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                                     |
| OCNG Patterns <sup>Note2</sup>   |           | 1, 2, 3          | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |                                     |
|  |           | 4, 5, 6          | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |                                     |
| b2-Threshold1  | dBm       | 1, 2, 3, 4, 5, 6 | -77  |                                     |
| PBCH_RA  | dB        | 1, 2, 3, 4, 5, 6 | 0  |                                     |
| PBCH_RB  |           |                  |  |                                     |
| PSS_RA   |           |                  |  |                                     |
| SSS_RA   |           |                  |  |                                     |
| PCFICH_RB  |           |                  |  |                                     |
| PHICH_RA   |           |                  |  |                                     |
| PHICH_RB   |           |                  |  |                                     |
| PDCCH_RA   |           |                  |  |                                     |
| PDCCH_RB   |           |                  |  |                                     |
| PDSCH_RA   |           |                  |  |                                     |
| PDSCH_RB   |           |                  |  |                                     |
| OCNG_RA <sup>Note3</sup>   |           |                  |  |                                     |
| OCNG_RB <sup>Note3</sup>   |           |                  |  |                                     |
| N <sub>oc</sub> <sup>Note4</sup>   |           |                  |  |                                     |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                                  |
| $\bar{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2, 3, 4, 5, 6 | 17   | 17                                  |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                                 |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87  | -87                                 |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/9MHz  | 1, 2, 3, 4, 5, 6 | -59.13+10log(N <sub>RB,c</sub> /50)  | -59.13+10log(N <sub>RB,c</sub> /50) |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2, 3, 4, 5, 6 | AWGN   |                                     |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2, 3, 4, 5, 6 | 1x2 Low  |                                     |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 5: <math>\bar{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |                  |  |                                     |

**Table A.8.4.2.9.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Parameter  | Unit        | Test configuration | Cell 2                      |        |
|--|-------------|--------------------|-----------------------------|--------|
|  |             |                    | T1                          | T2     |
| NR RF Channel Number   |             | 1, 2, 3, 4, 5, 6   | 1                           |        |
| Duplex mode  |             | 1, 4               | FDD                         |        |
|  |             | 2, 3, 5, 6         | TDD                         |        |
| TDD configuration  |             | 2, 5               | TDDConf.1.1                 |        |
|  |             | 3, 6               | TDDConf.2.1                 |        |
| BW <sub>channel</sub>  | MHz         | 1, 2, 4, 5         | 10: N <sub>RB,c</sub> = 52  |        |
|  |             | 3, 6               | 40: N <sub>RB,c</sub> = 106 |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |             | 1, 2, 3, 4, 5, 6   | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2  |             | 1, 4               | SMTC.2                      |        |
|  |             | 2, 3, 5, 6         | SMTC.1                      |        |
| PDSCH/PDCCH subcarrier spacing   | kHz         | 1, 2, 4, 5         | 15                          |        |
|  |             | 3, 6               | 30                          |        |
| b2-Threshold2NR  | dBm/SCS     | 1, 2, 4, 5         | -101                        |        |
|  |             | 3, 6               | -98                         |        |
| EPRE ratio of PSS to SSS   |             | 1, 2, 3, 4, 5, 6   | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS   |             |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS  |             |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS  |             |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |             |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS  |             |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH   |             |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |             |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |             |                    |                             |        |
| <sup>Note2</sup><br>N <sub>∞</sub>   | dBm/15kHz   |                    |                             |        |
| <sup>Note2</sup><br>N <sub>∞</sub>   | dBm/SCS     | 1, 2, 4, 5         | -98                         |        |
|  |             | 3, 6               | -95                         |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS     | 1, 2, 4, 5         | -Infinity                   | -91    |
|  |             | 3, 6               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$   | dB          | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$   | dB          | 1, 2, 3, 4, 5, 6   | -Infinity                   | 7      |
| I <sub>o</sub> <sup>Note3</sup>  | dBm/9.36MHz | 1, 2, 4, 5         | -70.05                      | -62.26 |
|  |             | 3, 6               | -63.95                      | -56.16 |
| Propagation Condition  |             | 1, 2, 4, 5         | AWGN1944                    |        |
|  |             | 3,6                | AWGN3334                    |        |
| Antenna Configuration and Correlation Matrix   |             | 1, 2, 3, 4, 5, 6   | 1x2 Low                     |        |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{\infty}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> |             |                    |                             |        |

#### A.8.4.2.9.2 Test Requirements

The UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 4.8s from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

**NOTE:** The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.5 Measurement performance

### A.8.5.1 SFTD accuracy

#### A.8.5.1.1 SFTD accuracy

##### A.8.5.1.1.1 Test Purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for inter-RAT FR1 SFTD measurements.

##### A.8.5.1.1.2 Test Environment

Supported test configurations are shown in Table A.8.5.1.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is inter-RAT NR FR1 target cell. The test parameters of cell 1 are given in clause A.8.5.1.1.2-2. The test parameters of cell 2 are given in Table A.8.5.1.1.2-3. The SFTD between PCell and target cell shall be set by the test equipment to one of the time differences in Table A.8.5.1.1.2-4.

**Table A.8.5.1.1.2-1: Supported test configurations for SFTD accuracy**

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

Table A.8.5.1.1.2-2: Test parameters for SFTD accuracy (Cell 1)

| Parameter   | Unit   | Test 1  |
|---|--|---|
| E-UTRA RF Channel Number  |  | 1   |
| Duplex mode   |  | FDD or TDD  |
| TDD special subframe configuration <sup>Note1</sup>                                 |  | 6   |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |  | 1   |
| $BW_{\text{channel}}$   |  | 5 MHz: $N_{RB,c} = 25$<br>10 MHz: $N_{RB,c} = 50$<br>20 MHz: $N_{RB,c} = 100$   |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |  | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD          |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |  | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD      |
| OCNG Patterns <sup>Note2</sup>  |  | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA   | dB   | 0   |
| PBCH_RB   | dB   |   |
| PSS_RA  | dB   |   |
| SSS_RA  | dB   |   |
| PCFICH_RB   | dB   |   |
| PHICH_RA  | dB   |   |
| PHICH_RB  | dB   |   |
| PDCCH_RA  | dB   |   |
| PDCCH_RB  | dB   |   |
| PDSCH_RA  | dB   |   |
| PDSCH_RB  | dB   |   |
| OCNG_RA <sup>Note3</sup>  | dB   |   |
| OCNG_RB <sup>Note3</sup>  | dB   |   |
| $N_{oc}$ <sup>Note4</sup>   | dBm/15 kHz   |   |
| $\bar{E}_s/N_{oc}$  | dB   | -3  |
| $\bar{E}_s/I_{ot}$  | dB   | -3  |
| RSRP <sup>Note5</sup>   | dBm/15 kHz   | -107  |
| SCH_RP <sup>Note5</sup>   | dBm/15 kHz   | -107  |
| $I_o$ <sup>Note5</sup>  | dBm/Ch BW  | -74.45<br>+10log<br>( $N_{RB,c}/50$ )   |
| Propagation Condition   |  | AWGN  |
| Antenna Configuration   |  | 1x2   |
| Note 1:   | Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  |   |
| Note 2:   | DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.   |   |
| Note 3:   | OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |   |
| Note 4:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |
| Note 5:   | $E_s/I_{ot}$ , RSRP, SCH_RP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |



**Table A.8.5.1.1.2-3: Test parameters for SFTD accuracy (Cell 2)**

| Parameter   |  | Config  | Unit        | Test 1                      |
|---|--|---------|-------------|-----------------------------|
| SSB GSCN  |  | 1~6     |             | freq1                       |
| Duplex mode                                       |  | 1,4     |             | FDD                         |
|   |  | 2,5     |             | TDD                         |
|   |  | 3,6     |             | TDD                         |
| TDD Configuration                                 |  | 1,4     |             | N/A                         |
|   |  | 2,5     |             | TDDConf.1.1                 |
|   |  | 3,6     |             | TDDConf.2.1                 |
| BW <sub>channel</sub>                             |  | 1,4     | MHz         | 10: N <sub>RB,c</sub> = 52  |
|   |  | 2,5     |             | 10: N <sub>RB,c</sub> = 52  |
|   |  | 3,6     |             | 40: N <sub>RB,c</sub> = 106 |
| PDSCH Reference measurement channel               |  | 1,4     |             | SR.1.1 FDD                  |
|   |  | 2,5     |             | SR.1.1 TDD                  |
|   |  | 3,6     |             | SR.2.1 TDD                  |
| RMSI CORESET Reference Channel                    |  | 1,4     |             | CR.1.1 FDD                  |
|   |  | 2,5     |             | CR.1.1 TDD                  |
|   |  | 3,6     |             | CR.2.1 TDD                  |
| RMC CORESET Reference Channel                     |  | 1,4     |             | CCR.1.1 FDD                 |
|   |  | 2,5     |             | CCR.1.1 TDD                 |
|   |  | 3,6     |             | CCR.2.1 TDD                 |
| SSB configuration                                 |  | 1,4     |             | SSB.1 FR1                   |
|   |  | 2,5     |             | SSB.1 FR1                   |
|   |  | 3,6     |             | SSB.2 FR1                   |
| SMTC configuration                                |  | 1~6     |             | SMTC.1                      |
| DL BWP configuration                              |  | 1~6     |             | DLBWP.1.1                   |
| UL BWP configuration                              |  | 1~6     |             | ULBWP.1.1                   |
| OCNG Patterns                                     |  | 1~6     |             | OP.1                        |
| EPRE ratio of PSS to SSS                          |  | 1~6     | dB          | 0                           |
| EPRE ratio of PBCH DMRS to SSS                    |  |         |             |                             |
| EPRE ratio of PBCH to PBCH DMRS                   |  |         |             |                             |
| EPRE ratio of PDCCH DMRS to SSS                   |  |         |             |                             |
| EPRE ratio of PDCCH to PDCCH DMRS                 |  |         |             |                             |
| EPRE ratio of PDSCH DMRS to SSS                   |  |         |             |                             |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |         |             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |         |             |                             |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |         |             |                             |
| $N_{oc}$ <sup>Note2</sup>                         | NR_FDD_FR1_A, NR_TDD_FR1_A <sup>NOTE 5</sup> |         |             |                             |
|   | NR_FDD_FR1_B                                 |         |             |                             |
|   | NR_TDD_FR1_C                                 |         |             |                             |
|   | NR_FDD_FR1_D, NR_TDD_FR1_D                   |         |             |                             |
|   | NR_FDD_FR1_E, NR_TDD_FR1_E                   |         |             |                             |
|   | NR_FDD_FR1_F                                 |         |             |                             |
|   | NR_FDD_FR1_G                                 |         |             |                             |
|   | NR_FDD_FR1_H                                 |         |             |                             |
| $N_{oc}$ <sup>Note2</sup>                         | NR_FDD_FR1_A, NR_TDD_FR1_A <sup>NOTE 5</sup> | 1,2,4,5 | dBm/SSB SCS | -104                        |
|   | NR_FDD_FR1_B                                 |         |             |                             |
|   | NR_TDD_FR1_C                                 |         |             |                             |
|   | NR_FDD_FR1_D, NR_TDD_FR1_D                   |         |             |                             |
|   | NR_FDD_FR1_E, NR_TDD_FR1_E                   |         |             |                             |
|   | NR_FDD_FR1_F                                 |         |             |                             |
|   | NR_FDD_FR1_G                                 |         |             |                             |
|   | NR_FDD_FR1_H                                 |         |             |                             |
|   | NR_FDD_FR1_A, NR_TDD_FR1_A <sup>NOTE 5</sup> | 3,6     |             | -101                        |
|   | NR_FDD_FR1_B                                 |         |             |                             |

|                       |                                      |         |               |        |
|-----------------------|--------------------------------------|---------|---------------|--------|
|                       | NR_TDD_FR1_C                         |         |               |        |
|                       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D        |         |               |        |
|                       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E        |         |               |        |
|                       | NR_FDD_FR1_F                         |         |               |        |
|                       | NR_FDD_FR1_G                         |         |               |        |
|                       | NR_FDD_FR1_H                         |         |               |        |
|                       | $\hat{E}_s / I_{ot}$                 | 1~6     | dB            | -3     |
|                       | $\hat{E}_s / N_{oc}$                 | 1~6     | dB            | -3     |
| SS-RSRP<br>Note3      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A NOTE 5 | 1,2,4,5 | dBm/SCS       | -107   |
|                       | NR_FDD_FR1_B                         |         |               |        |
|                       | NR_TDD_FR1_C                         |         |               |        |
|                       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D        |         |               |        |
|                       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E        |         |               |        |
|                       | NR_FDD_FR1_F                         |         |               |        |
|                       | NR_FDD_FR1_G                         |         |               |        |
|                       | NR_FDD_FR1_H                         |         |               |        |
|                       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A NOTE 5 | 3,6     | dBm/SCS       | -104   |
|                       | NR_FDD_FR1_B                         |         |               |        |
|                       | NR_TDD_FR1_C                         |         |               |        |
|                       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D        |         |               |        |
|                       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E        |         |               |        |
|                       | NR_FDD_FR1_F                         |         |               |        |
|                       | NR_FDD_FR1_G                         |         |               |        |
|                       | NR_FDD_FR1_H                         |         |               |        |
| I <sub>o</sub> Note3  | NR_FDD_FR1_A,<br>NR_TDD_FR1_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz  | -74.28 |
|                       | NR_FDD_FR1_B                         |         |               |        |
|                       | NR_TDD_FR1_C                         |         |               |        |
|                       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D        |         |               |        |
|                       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E        |         |               |        |
|                       | NR_FDD_FR1_F                         |         |               |        |
|                       | NR_FDD_FR1_G                         |         |               |        |
|                       | NR_FDD_FR1_H                         |         |               |        |
|                       | NR_FDD_FR1_A,<br>NR_TDD_FR1_A NOTE 5 | 3,6     | dBm/38.16 MHz | -68.18 |
|                       | NR_FDD_FR1_B                         |         |               |        |
|                       | NR_TDD_FR1_C                         |         |               |        |
|                       | NR_FDD_FR1_D,<br>NR_TDD_FR1_D        |         |               |        |
|                       | NR_FDD_FR1_E,<br>NR_TDD_FR1_E        |         |               |        |
|                       | NR_FDD_FR1_F                         |         |               |        |
|                       | NR_FDD_FR1_G                         |         |               |        |
|                       | NR_FDD_FR1_H                         |         |               |        |
| Propagation condition | 1~6                                  |         | AWGN          |        |
| Antenna configuration | 1~6                                  |         | 1x2           |        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |

**Table A.8.5.1.1.2-4: Timing offsets for SFTD accuracy test**

| Condition | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
|-----------|-------------------------------------|---|
| 1         | 100                                 | -122000   |
| 2         | 300                                 | -60540  |
| 3         | 500                                 | 1000  |
| 4         | 700                                 | 62540   |
| 5         | 900                                 | 124000  |

### A.8.5.1.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and inter-RAT NR target cell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

## A.8.5.2 E-UTRA – NR Inter-RAT Measurement Performance requirements

### A.8.5.2.1 SS-RSRP

#### A.8.5.2.1.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

##### A.8.5.2.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.1 in TS 36.133 [15] for inter-RAT FR1 SS-RSRP measurements.

##### A.8.5.2.1.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.1.1.2-2.

**Table A.8.5.2.1.1.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.8.5.2.1.1.2-2: SS-RSRP inter-RAT test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|-----------|------|--------|--------|
|           |      | Cell 2 | Cell 2 |

| SSB ARFCN                                |                    |                        |          | freq1          |        | freq1                      |      |        |  |
|--|--------------------|------------------------|----------|----------------|--------|----------------------------|------|--------|--|
| Duplex mode                              | Config 1,4         |                        |          | FDD            |        |                            |      |        |  |
|  | Config 2,3,5,6     |                        |          | TDD            |        |                            |      |        |  |
| TDD configuration                        | Config 1,4         |                        |          | Not Applicable |        |                            |      |        |  |
|  | Config 2,5         |                        |          | TDDConf.1.1    |        |                            |      |        |  |
|  | Config 3,6         |                        |          | TDDConf.2.1    |        |                            |      |        |  |
| Downlink initial BWP configuration       |                    |                        |          | DLBWP.0.1      |        |                            |      |        |  |
| Uplink initial BWP configuration         |                    |                        |          | ULBWP.0.1      |        |                            |      |        |  |
| DRX Cycle configuration                  |                    |                        | ms       | Not Applicable |        |                            |      |        |  |
| PDSCH Reference measurement channel      | Config 1,4         |                        |          | -              |        | -                          |      |        |  |
|  | Config 2,5         |                        |          |                |        |                            |      |        |  |
|  | Config 3,6         |                        |          |                |        |                            |      |        |  |
| RMSI CORESET Reference Channel           | Config 1,4         |                        |          | -              |        | -                          |      |        |  |
|  | Config 2,5         |                        |          |                |        |                            |      |        |  |
|  | Config 3,6         |                        |          |                |        |                            |      |        |  |
| Dedicated CORESET Reference Channel      | Config 1,4         |                        |          | -              |        | -                          |      |        |  |
|  | Config 2,5         |                        |          |                |        |                            |      |        |  |
|  | Config 3,6         |                        |          |                |        |                            |      |        |  |
| OCNG Patterns                            |                    |                        |          | OP.1           |        |                            |      |        |  |
| SS-RSSI-Measurement                      |                    |                        |          | Not Applicable |        |                            |      |        |  |
| SMTC configuration                       |                    |                        |          | SMTC.1         |        |                            |      |        |  |
| SSB configuration                        | Config 1,2,4,5     |                        |          | SSB.1 FR1      |        |                            |      |        |  |
|  | Config 3,6         |                        |          | SSB.2 FR1      |        |                            |      |        |  |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5     |                        | kHz      | 15             |        |                            |      |        |  |
|  | Config 3,6         |                        |          | 30             |        |                            |      |        |  |
| EPRE ratio of PSS to SSS                 |                    |                        | dB       | 0              | 0      | 0                          | 0    |        |  |
| EPRE ratio of PBCH DMRS to SSS           |                    |                        |          |                |        |                            |      |        |  |
| EPRE ratio of PBCH to PBCH DMRS          |                    |                        |          |                |        |                            |      |        |  |
| EPRE ratio of PDCCH DMRS to SSS          |                    |                        |          |                |        |                            |      |        |  |
| EPRE ratio of PDCCH to PDCCH DMRS        |                    |                        |          |                |        |                            |      |        |  |
| EPRE ratio of PDSCH DMRS to SSS          |                    |                        |          |                |        |                            |      |        |  |
| EPRE ratio of PDSCH to PDSCH             |                    |                        |          |                |        |                            |      |        |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |                        |          |                |        |                            |      |        |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                    |                        |          |                |        |                            |      |        |  |
| $N_{oc}$<br>Note2                        | Config 1,2,3,4,5,6 | NR_FDD_FR1_A           |          | dBm/15k Hz     | -94.65 |                            | -117 |        |  |
|  |                    | NR_TDD_FR1_A<br>NOTE 6 |          |                |        |                            |      |        |  |
|  |                    | NR_FDD_FR1_B           | -116.5   |                |        |                            |      |        |  |
|  |                    | NR_TDD_FR1_C           | -116     |                |        |                            |      |        |  |
|  |                    | NR_FDD_FR1_D           | -115.5   |                |        |                            |      |        |  |
|  |                    | NR_TDD_FR1_D           |          |                |        |                            |      |        |  |
|  |                    | NR_FDD_FR1_E           | -115     |                |        |                            |      |        |  |
|  |                    | NR_TDD_FR1_E           | -114.5   |                |        |                            |      |        |  |
|  |                    | NR_FDD_FR1_F           | -114     |                |        |                            |      |        |  |
| NR_TDD_FR1_F                             | -113.5             |                        |          |                |        |                            |      |        |  |
| $N_{oc}$<br>Note2                        | Config 1,2,4,5     |                        | dBm/SC S | -94.65         |        | Same as $N_{oc}$ for 15kHz |      |        |  |
|  |                    |                        |          |                |        |                            |      |        |  |
|  |                    |                        |          |                |        |                            |      |        |  |
|  |                    |                        |          |                |        |                            |      |        |  |
|  |                    |                        |          |                |        |                            |      |        |  |
|  | Config 3,6         | NR_FDD_FR1_A           |          | -91.65         |        | -114                       |      |        |  |
|  |                    | NR_TDD_FR1_A<br>NOTE 6 |          |                |        |                            |      |        |  |
|  |                    | NR_FDD_FR1_B           |          |                |        |                            |      | -113.5 |  |
|  |                    | NR_TDD_FR1_C           |          |                |        |                            |      | -113   |  |
| NR_FDD_FR1_D                             | -112.5             |                        |          |                |        |                            |      |        |  |
| NR_TDD_FR1_D                             |                    |                        |          |                |        |                            |      |        |  |
| NR_FDD_FR1_E                             | -112               |                        |          |                |        |                            |      |        |  |
| NR_TDD_FR1_E                             | -111.5             |                        |          |                |        |                            |      |        |  |
| NR_FDD_FR1_F                             | -111               |                        |          |                |        |                            |      |        |  |
| NR_TDD_FR1_F                             | -110.5             |                        |          |                |        |                            |      |        |  |
| NR_FDD_FR1_G                             | -110.5             |                        |          |                |        |                            |      |        |  |
| NR_TDD_FR1_G                             | -110.5             |                        |          |                |        |                            |      |        |  |
| NR_FDD_FR1_H                             | -110.5             |                        |          |                |        |                            |      |        |  |
| NR_TDD_FR1_H                             | -110.5             |                        |          |                |        |                            |      |        |  |
| $\hat{E}_s / I_{ot}$                     |                    |                        | dB       | 10             | -4     |                            |      |        |  |

| $\hat{E}_s / N_{oc}$  |                              |  | dB             | 10                                     | -4                                     |        |
|---|------------------------------|--|----------------|--|--|--------|
| SS-RSRP <sup>Not e3</sup>   | Config 1,2,4,5               | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SC<br>S    | -84.65                                 | -121                                   |        |
|   |                              | NR_FDD_FR1_B                           |                |  | -120.5                                 |        |
|   |                              | NR_TDD_FR1_C                           |                |  | -120                                   |        |
|   |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                |  | -119.5                                 |        |
|   |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                |  | -119                                   |        |
|   |                              | NR_FDD_FR1_F                           |                |  | -118.5                                 |        |
|   |                              | NR_FDD_FR1_G                           |                |  | -118                                   |        |
|   |                              | NR_FDD_FR1_H                           |                |  | -117.5                                 |        |
|   |                              | Config 3,6                             |                |  | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | -81.65 |
|   | NR_FDD_FR1_B                 |  | -117.5         |  |  |        |
|   | NR_TDD_FR1_C                 |  | -117           |  |  |        |
|   | NR_FDD_FR1_D<br>NR_TDD_FR1_D |  | -116.5         |  |  |        |
|   | NR_FDD_FR1_E<br>NR_TDD_FR1_E |  | -116           |  |  |        |
|   | NR_FDD_FR1_F                 |  | -115.5         |  |  |        |
|   | NR_FDD_FR1_G                 |  | -115           |  |  |        |
|   | NR_FDD_FR1_H                 |  | -114.5         |  |  |        |
|   | Io <sup>Note3</sup>          |  | Config 1,2,4,5 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz                        |        |
|   |                              | NR_FDD_FR1_B                           |                | -87.26                                 |  |        |
| NR_TDD_FR1_C  |                              | -86.76                                 |                |  |  |        |
| NR_FDD_FR1_D<br>NR_TDD_FR1_D  |                              | -86.26                                 |                |  |  |        |
| NR_FDD_FR1_E<br>NR_TDD_FR1_E  |                              | -85.76                                 |                |  |  |        |
| NR_FDD_FR1_F  |                              | -85.26                                 |                |  |  |        |
| NR_FDD_FR1_G  |                              | -84.76                                 |                |  |  |        |
| NR_FDD_FR1_H  |                              | -84.26                                 |                |  |  |        |
| Config 3,6  |                              | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |                | dBm/<br>38.16MH<br>Z                   |  | -50.19 |
|   |                              | NR_FDD_FR1_B                           | -84.26         |  |  |        |
|   |                              | NR_TDD_FR1_C                           | -83.76         |  |  |        |
|   |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           | -83.26         |  |  |        |
|   |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           | -82.76         |  |  |        |
|   |                              | NR_FDD_FR1_F                           | -82.26         |  |  |        |
|   |                              | NR_FDD_FR1_G                           | -81.76         |  |  |        |
|   |                              | NR_FDD_FR1_H                           | -81.26         |  |  |        |
|   |                              | Propagation condition                  |                |  | -                                      |        |
| Antenna configuration   |                              |  | -              | 1x2                                    |  |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |                              |  |                |  |  |        |

## A.8.5.2.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

## A.8.5.2.1.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

## A.8.5.2.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.1 in TS 36.133 [15] for inter-RAT FR2 SS-RSRP measurements.

## A.8.5.2.1.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.2.2-1. In this test case there are two cells on different carriers. Absolute accuracy requirements of SS-RSRP inter-RAT measurement are tested by using test setup in Table A.8.5.2.1.2.2-2 and Table A.8.5.2.1.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.8.5.2.1.2.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.8.5.2.1.2.2-2: SS-RSRP Inter-RAT general test parameters**

| Parameter   | Unit | Test 1                      | Test 2                      |
|---|------|-----------------------------|-----------------------------|
|   |      | Cell 2                      | Cell 2                      |
| SSB ARFCN   |      | Freq1                       | freq1                       |
| Duplex mode   |      | TDD                         | TDD                         |
| TDD configuration   |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>   | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| Downlink initial BWP configuration  |      | DLBWP.0.1                   |                             |
| Uplink initial BWP configuration  |      | ULBWP.0.1                   |                             |
| DRX cycle configuration   | ms   | Not applicable              |                             |
| PDSCH Reference measurement channel   |      | -                           | -                           |
| RMSI CORESET Reference Channel  |      | -                           | -                           |
| OCNG Patterns   |      | OP.1                        | OP.1                        |
| SMTc configuration  |      | SMTc.1                      | SMTc.1                      |
| SSB configuration   |      | SSB.3 FR2                   | SSB.3 FR2                   |
| PDSCH/PDCCH subcarrier spacing  | kHz  | 120                         | 120                         |
| EPRE ratio of PSS to SSS  | dB   | 0                           | 0                           |
| EPRE ratio of PBCH_DMRS to SSS  |      |                             |                             |
| EPRE ratio of PBCH to PBCH_DMRS   |      |                             |                             |
| EPRE ratio of PDCCH_DMRS to SSS   |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH_DMRS   |      |                             |                             |
| EPRE ratio of PDSCH_DMRS to SSS   |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH_DMRS   |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |      |                             |                             |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |      |                             |                             |
| Note 2: Void  |      |                             |                             |
| Note 3: Void  |      |                             |                             |
| Note 4: Void  |      |                             |                             |



Table A.8.5.2.1.2.2-3: SS-RSRP Inter-RAT OTA related test parameters

| Parameter   | Unit                           | Test 1                        | Test 2                                      |
|---|--------------------------------|-------------------------------|---|
|   |                                | Cell 2                        | Cell 2                                      |
| Angle of arrival configuration  |                                | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1               |
| Assumption for UE beams <sup>Note 10</sup>  |                                | Rough                         | Rough                                       |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -105                          | N/A   |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note4</sup>       | -96                           | N/A   |
| $E_s$   | dBm/SCS <sup>Note4</sup>       |                               | (Table B.2.3-2 Rx Beam Peak +1dB) (Note 7)  |
| $\hat{E}_s / N_{oc}$  | dB                             | 11                            | N/A   |
| SSB_RP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -85                           | (Table B.2.3-2 Rx Beam Peak +1dB) (Note 7)  |
| $\hat{E}_s / I_{ot_{BB}}$ <sup>Note 2, Note 9</sup>   | dB                             | 9.97                          | -3.81                                       |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -55.65                        | (Table B.2.3-2 Rx Beam Peak +30dB) (Note 8) |
| <p>Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.</p> <p>Note 5: Void</p> <p>Note 6: Void</p> <p>Note 7: SSB_RP is applied at 1dB above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 8: <math>I_o</math> is applied at <math>10\log_{10}(792)\text{dB}+1\text{dB}</math> above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 9: Calculation of <math>E_s/I_{ot_{BB}}</math> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor <math>\Delta MB_P</math> from TS 38.101-2 [19] Table 6.2.1.3-4.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                                |                               |   |

### A.8.5.2.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

## A.8.5.2.2 SS-RSRQ

### A.8.5.2.2.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

#### A.8.5.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.2 in TS 36.133 [15] for inter-RAT FR1 SS-RSRQ measurements.

#### A.8.5.2.2.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.2.1.2-2.

**Table A.8.5.2.2.1.2-1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations**

| <b>Config</b> | <b>Description</b>   |
|---------------|--|
| 1             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 2             | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 3             | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                     |
| 4             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode                    |
| 5             | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode                    |
| 6             | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                     |
| Note:         | The UE is only required to be tested in one of the supported test configurations |

Table A.8.5.2.2.1.2-2: SS-RSRQ inter-RAT test parameters

| Parameter | Unit | Test 1 | Test 2 | Test 3 |
|-----------|------|--------|--------|--------|
|           |      | Cell 2 | Cell 2 | Cell 2 |

| SSB ARFCN                                |                |              | freq1          |                                | freq1          |                       | freq1 |   |
|--|----------------|--------------|----------------|--------------------------------|----------------|-----------------------|-------|---|
| Duplex mode                              | Config 1,4     |              | FDD            |                                |                |                       |       |   |
|  | Config 2,3,5,6 |              | TDD            |                                |                |                       |       |   |
| TDD configuration                        | Config 1,4     |              | Not Applicable |                                |                |                       |       |   |
|  | Config 2,5     |              | TDDConf.1.1    |                                |                |                       |       |   |
|  | Config 3,6     |              | TDDConf.2.1    |                                |                |                       |       |   |
| Downlink initial BWP configuration       |                |              | DLBWP.0.1      |                                |                |                       |       |   |
| Uplink initial BWP configuration         |                |              | ULBWP.0.1      |                                |                |                       |       |   |
| DRX Cycle configuration                  |                |              | ms             |                                | Not Applicable |                       |       |   |
| PDSCH Reference measurement channel      | Config 1,4     |              | -              | -                              | -              | -                     | -     | - |
|  | Config 2,5     |              | -              | -                              | -              | -                     | -     | - |
|  | Config 3,6     |              | -              | -                              | -              | -                     | -     | - |
| RMSI CORESET Reference Channel           | Config 1,4     |              | -              | -                              | -              | -                     | -     | - |
|  | Config 2,5     |              | -              | -                              | -              | -                     | -     | - |
|  | Config 3,6     |              | -              | -                              | -              | -                     | -     | - |
| Dedicated CORESET Reference Channel      | Config 1,4     |              | -              | -                              | -              | -                     | -     | - |
|  | Config 2,5     |              | -              | -                              | -              | -                     | -     | - |
|  | Config 3,6     |              | -              | -                              | -              | -                     | -     | - |
| OCNG Patterns                            |                |              | OP.1           |                                |                |                       |       |   |
| SS-RSSI-Measurement                      |                |              | Not Applicable |                                |                |                       |       |   |
| SMTc configuration                       |                |              | SMTc.1         |                                |                |                       |       |   |
| SSB configuration                        | Config 1,2,4,5 |              | SSB.1 FR1      |                                |                |                       |       |   |
|  | Config 3,6     |              | SSB.2 FR1      |                                |                |                       |       |   |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2,4,5 |              | 15             |                                |                |                       |       |   |
|  | Config 3,6     |              | 30             |                                |                |                       |       |   |
| EPRE ratio of PSS to SSS                 |                |              | dB             |                                | 0              | 0                     | 0     | 0 |
| EPRE ratio of PBCH DMRS to SSS           |                |              |                |                                |                |                       |       |   |
| EPRE ratio of PBCH to PBCH DMRS          |                |              |                |                                |                |                       |       |   |
| EPRE ratio of PDCCH DMRS to SSS          |                |              |                |                                |                |                       |       |   |
| EPRE ratio of PDCCH to PDCCH DMRS        |                |              |                |                                |                |                       |       |   |
| EPRE ratio of PDSCH DMRS to SSS          |                |              |                |                                |                |                       |       |   |
| EPRE ratio of PDSCH to PDSCH             |                |              |                |                                |                |                       |       |   |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                |              |                |                                |                |                       |       |   |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                |              |                |                                |                |                       |       |   |
| $N_{oc}$<br>Note2                        | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/15k<br>Hz  | -80.18                         | -106           | -116                  |       |   |
|  |                | NR_TDD_FR1_A |                |                                |                | -115.5                |       |   |
|  |                | NR_FDD_FR1_B |                |                                |                | -115                  |       |   |
|  |                | NR_TDD_FR1_C |                |                                |                | -114.5                |       |   |
|  |                | NR_FDD_FR1_D |                |                                |                | -114                  |       |   |
|  |                | NR_TDD_FR1_D |                |                                |                | -113.5                |       |   |
|  |                | NR_FDD_FR1_E |                |                                |                | -113                  |       |   |
|  |                | NR_TDD_FR1_E |                |                                |                | -112.5                |       |   |
|  |                | NR_FDD_FR1_F |                |                                |                | -112.5                |       |   |
|  | NR_TDD_FR1_F   | -112.5       |                |                                |                |                       |       |   |
| Config 3,6                               |                | -86.27       | -113           | Same as Noc for Config 1,2,4,5 |                |                       |       |   |
| $N_{oc}$<br>Note2                        | Config 1,2,4,5 |              | dBm/SC<br>S    | -80.18                         | -106           | Same as Noc for 15kHz |       |   |
|  |                | NR_FDD_FR1_A |                |                                |                | -113                  |       |   |
|  |                | NR_TDD_FR1_A |                |                                |                | -112.5                |       |   |
|  |                | NR_FDD_FR1_B |                |                                |                | -112                  |       |   |
|  |                | NR_TDD_FR1_C |                |                                |                | -111.5                |       |   |
|  |                | NR_FDD_FR1_D |                |                                |                | -111                  |       |   |
|  |                | NR_TDD_FR1_D |                |                                |                | -110.5                |       |   |
|  |                | NR_FDD_FR1_E |                |                                |                | -110.5                |       |   |
|  | NR_TDD_FR1_E   | -110         |                |                                |                |                       |       |   |
| Config 3,6                               |                | -83.27       | -110           | -113                           |                |                       |       |   |
|  |                |              |                |                                |                |                       |       |   |

|                                 |                              |  |  |                      |         |  |                 |
|---------------------------------|------------------------------|--|--|----------------------|---------|--|-----------------|
|                                 |                              | NR_FDD_FR1_H                           |  |                      |         | -109.5                                 |                 |
| $\hat{E}_s / I_{ot}$            |                              |  | dB                                     | -1.75                | -1.75   | -1.75                                  |                 |
| $\hat{E}_s / N_{ac}$            |                              |  | dB                                     | -1.75                | -1.75   | -1.75                                  |                 |
| SS-RSRP <sup>Not e3</sup>       | Config 1,2,4,5               | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SC<br>S                            | -81.93               | -107.75 | -117.75                                |                 |
|                                 |                              | NR_FDD_FR1_B                           |  |                      |         | -117.25                                |                 |
|                                 |                              | NR_TDD_FR1_C                           |  |                      |         | -116.75                                |                 |
|                                 |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |  |                      |         | -116.25                                |                 |
|                                 |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |  |                      |         | -115.75                                |                 |
|                                 |                              | NR_FDD_FR1_F                           |  |                      |         | -115.25                                |                 |
|                                 |                              | NR_FDD_FR1_G                           |  |                      |         | -114.75                                |                 |
|                                 |                              | NR_FDD_FR1_H                           |  |                      |         | -114.25                                |                 |
|                                 |                              | Config 3,6                             |  |                      |         | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | -85.02          |
|                                 | NR_FDD_FR1_B                 |  | -114.25                                |                      |         |  |                 |
|                                 | NR_TDD_FR1_C                 |  | -113.75                                |                      |         |  |                 |
|                                 | NR_FDD_FR1_D<br>NR_TDD_FR1_D |  | -113.25                                |                      |         |  |                 |
|                                 | NR_FDD_FR1_E<br>NR_TDD_FR1_E |  | -112.75                                |                      |         |  |                 |
|                                 | NR_FDD_FR1_F                 |  | -112.25                                |                      |         |  |                 |
|                                 | NR_FDD_FR1_G                 |  | -111.75                                |                      |         |  |                 |
|                                 | NR_FDD_FR1_H                 |  | -111.25                                |                      |         |  |                 |
|                                 | SS-RSRQ <sup>Note3</sup>     |  | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dB                   | -14.77  | -40.59                                 |                 |
|                                 |                              | NR_FDD_FR1_B                           |  |                      |         |  |                 |
| NR_TDD_FR1_C                    |                              |  |  |                      |         |  |                 |
| NR_FDD_FR1_D<br>NR_TDD_FR1_D    |                              |  |  |                      |         |  |                 |
| NR_FDD_FR1_E<br>NR_TDD_FR1_E    |                              |  |  |                      |         |  |                 |
| NR_FDD_FR1_F                    |                              |  |  |                      |         |  |                 |
| NR_FDD_FR1_G                    |                              |  |  |                      |         |  |                 |
| NR_FDD_FR1_H                    |                              |  |  |                      |         |  |                 |
| I <sub>o</sub> <sup>Note3</sup> |                              | Config 1,2,4,5                         | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |                      |         |  | dBm/<br>9.36MHz |
|                                 | NR_FDD_FR1_B                 |  | -85.33                                 |                      |         |  |                 |
|                                 | NR_TDD_FR1_C                 |  | -84.83                                 |                      |         |  |                 |
|                                 | NR_FDD_FR1_D<br>NR_TDD_FR1_D |  | -84.33                                 |                      |         |  |                 |
|                                 | NR_FDD_FR1_E<br>NR_TDD_FR1_E |  | -83.83                                 |                      |         |  |                 |
|                                 | NR_FDD_FR1_F                 |  | -83.33                                 |                      |         |  |                 |
|                                 | NR_FDD_FR1_G                 |  | -82.83                                 |                      |         |  |                 |
|                                 | NR_FDD_FR1_H                 |  | -82.33                                 |                      |         |  |                 |
|                                 | Config 3,6                   |  | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MH<br>z | -50     | -76.73                                 |                 |
|                                 |                              | NR_FDD_FR1_B                           | -79.23                                 |                      |         |  |                 |
|                                 |                              | NR_TDD_FR1_C                           | -78.73                                 |                      |         |  |                 |
|                                 |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           | -78.23                                 |                      |         |  |                 |
|                                 |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           | -77.73                                 |                      |         |  |                 |
|                                 |                              | NR_FDD_FR1_F                           | -77.23                                 |                      |         |  |                 |
|                                 |                              | NR_FDD_FR1_G                           | -76.73                                 |                      |         |  |                 |
|                                 |                              | NR_FDD_FR1_H                           | -76.53                                 |                      |         |  |                 |
|                                 |                              | Propagation condition                  |  |                      |         |  | -               |
|                                 | Antenna configuration        |  |  | -                    | 1x2     |  |                 |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRQ, SS-RSRP, and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |
| Note 5: | NR operating band groups are as defined in clause 3.5.2.   |
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.   |

#### A.8.5.2.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

#### A.8.5.2.2.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

##### A.8.5.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.2 in TS 36.133 [15] for inter-RAT FR2 SS-RSRQ measurements.

##### A.8.5.2.2.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.2.2-1. In this test case there are two cells on different carriers. Absolute accuracy requirements of SS-RSRQ inter-RAT measurement are tested by using test setup in Table A.8.5.2.2.2.2-2 and Table A.8.5.2.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.8.5.2.2.2-1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.8.5.2.2.2-2: SS-RSRQ Inter-RAT general test parameters

| Parameter  | Unit | Test 1                      | Test 2                      |
|--|------|-----------------------------|-----------------------------|
|  |      | Cell 2                      | Cell 2                      |
| SSB ARFCN  |      | Freq1                       | freq1                       |
| Duplex mode  |      | TDD                         | TDD                         |
| TDD configuration  |      | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>  | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| Downlink initial BWP configuration   |      | DLBWP.0.1                   |                             |
| Uplink initial BWP configuration   |      | ULBWP.0.1                   |                             |
| DRX cycle configuration  | ms   | Not applicable              |                             |
| PDSCH Reference measurement channel  |      | -                           | -                           |
| RMSI CORESET Reference Channel   |      | -                           | -                           |
| OCNG Patterns  |      | OP.1                        | OP.1                        |
| SMTC configuration   |      | SMTC.1                      | SMTC.1                      |
| SSB configuration  |      | SSB.3 FR2                   | SSB.3 FR2                   |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 120                         | 120                         |
| EPRE ratio of PSS to SSS   | dB   | 0                           | 0                           |
| EPRE ratio of PBCH_DMRS to SSS   |      |                             |                             |
| EPRE ratio of PBCH to PBCH_DMRS  |      |                             |                             |
| EPRE ratio of PDCCH_DMRS to SSS  |      |                             |                             |
| EPRE ratio of PDCCH to PDCCH_DMRS  |      |                             |                             |
| EPRE ratio of PDSCH_DMRS to SSS  |      |                             |                             |
| EPRE ratio of PDSCH to PDSCH_DMRS  |      |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |      |                             |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: Void</p> <p>Note 4: Void</p> |      |                             |                             |

Table A.8.5.2.2.2-3: SS-RSRQ Inter-RAT OTA related test parameters

| Parameter   | Unit                           | Test 1                        | Test 2  |
|---|--------------------------------|-------------------------------|---|
|   |                                | Cell 2                        | Cell 2  |
| Angle of arrival configuration  |                                | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1                     |
| Assumption for UE beams <sup>Note 10</sup>  |                                | Rough                         | Rough   |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -104.7                        | (Table B.2.3-2 Rx Beam Peak -5dB)<br>(Note 7)     |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note4</sup>       | -95.7                         | (Table B.2.3-2 Rx Beam Peak +4dB)<br>(Note 7)     |
| $\hat{E}_s / N_{oc}$  | dB                             | -0.5                          | -1.75   |
| SSB_RP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -96.2                         | (Table B.2.3-2 Rx Beam Peak +2.25dB)<br>(Note 8)  |
| SS-RSRQ <sup>Note2</sup>  | dB                             | -3.27                         | -14.82  |
| $\hat{E}_s / I_{ot}$ <sup>Note2</sup>   | dB                             | -0.5                          | -1.75   |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -63.95                        | (Table B.2.3-2 Rx Beam Peak +35.22dB)<br>(Note 9) |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP, SS-RSRQ, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.</p> <p>Note 5: Void</p> <p>Note 6: Void</p> <p>Note 7: <math>N_{oc}</math> for SCS 15kHz is applied at <math>-10\log_{10}(8)+4</math>dB above the minimum level specified in Table B.2.3-2 for beam peak. <math>N_{oc}</math> for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 8: SSB_RP is applied at 2.25dB above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 9: <math>I_o</math> is applied at <math>10\log_{10}(792)+6.22</math>dB above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                                |                               |   |

### A.8.5.2.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

In this test case there are two cells on different carriers and measurement gaps are provided

### A.8.5.2.3 SS-SINR

#### A.8.5.2.3.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

##### A.8.5.2.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS- SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.3 in TS 36.133 [15] for inter-RAT FR1 SS-SINR measurements.

##### A.8.5.2.3.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.



Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.3.1.2-2.

**Table A.8.5.2.3.1.2-1: SS- SINR Inter-RAT SS- SINR supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5      | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6      | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.8.5.2.3.1.2-2: SS-SINR inter-RAT test parameters**

| Parameter | Unit | Test 1 | Test 2 | Test 3 |
|-----------|------|--------|--------|--------|
|           |      | Cell 2 | Cell 2 | Cell 2 |

|   |                |              |            |                |        |        |
|---|----------------|--------------|------------|----------------|--------|--------|
| SSB ARFCN   |                |              |            | freq1          | freq1  | freq1  |
| Duplex mode   | Config 1,4     |              |            | FDD            |        |        |
|   | Config 2,3,5,6 |              |            | TDD            |        |        |
| TDD configuration                                   | Config 1,4     |              |            | Not Applicable |        |        |
|   | Config 2,5     |              |            | TDDConf.1.1    |        |        |
|   | Config 3,6     |              |            | TDDConf.2.1    |        |        |
| Downlink initial BWP configuration                  |                |              |            | DLBWP.0.1      |        |        |
| Uplink initial BWP configuration                    |                |              |            | ULBWP.0.1      |        |        |
| DRX Cycle configuration                             |                |              | ms         | Not Applicable |        |        |
| PDSCH Reference measurement channel                 | Config 1,4     |              |            | -              | -      | -      |
|   | Config 2,5     |              |            |                |        |        |
|   | Config 3,6     |              |            |                |        |        |
| RMSI CORESET Reference Channel                      | Config 1,4     |              |            | -              | -      | -      |
|   | Config 2,5     |              |            |                |        |        |
|   | Config 3,6     |              |            |                |        |        |
| Dedicated CORESET Reference Channel                 | Config 1,4     |              |            | -              | -      | -      |
|   | Config 2,5     |              |            |                |        |        |
|   | Config 3,6     |              |            |                |        |        |
| OCNG Patterns                                       |                |              |            | OP.1           |        |        |
| SS-RSSI-Measurement                                 |                |              |            | Not Applicable |        |        |
| SMTc configuration                                  |                |              |            | SMTc.1         |        |        |
| SSB configuration                                   | Config 1,2,4,5 |              |            | SSB.1 FR1      |        |        |
|   | Config 3,6     |              |            | SSB.2 FR1      |        |        |
| PDSCH/PDCCH subcarrier spacing                      | Config 1,2,4,5 |              | kHz        | 15             |        |        |
|   | Config 3,6     |              |            | 30             |        |        |
| EPRE ratio of PSS to SSS                            |                |              | dB         | 0              | 0      | 0      |
| EPRE ratio of PBCH DMRS to SSS                      |                |              |            |                |        |        |
| EPRE ratio of PBCH to PBCH DMRS                     |                |              |            |                |        |        |
| EPRE ratio of PDCCH DMRS to SSS                     |                |              |            |                |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS                   |                |              |            |                |        |        |
| EPRE ratio of PDSCH DMRS to SSS                     |                |              |            |                |        |        |
| EPRE ratio of PDSCH to PDSCH                        |                |              |            |                |        |        |
| EPRE ratio of OCNG DMRS to SSS <sup>(Note 1)</sup>  |                |              |            |                |        |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>(Note 1)</sup> |                |              |            |                |        |        |
| $N_{oc}$<br>Note2                                   | Config 1,2,4,5 | NR_FDD_FR1_A | dBm/15k Hz | -880           | -108.5 | -119.5 |
|   |                | NR_TDD_FR1_A |            |                |        | -119   |
|   |                | NR_FDD_FR1_B |            |                |        | -118.5 |
|   |                | NR_TDD_FR1_C |            |                |        | -118   |
|   |                | NR_FDD_FR1_D |            |                |        | -117.5 |
|   |                | NR_TDD_FR1_D |            |                |        | -117   |
|   |                | NR_FDD_FR1_E |            |                |        | -116.5 |
|   |                | NR_TDD_FR1_E |            |                |        | -116   |
|   |                | NR_FDD_FR1_F |            |                |        | -116   |
| NR_TDD_FR1_F  | -116           |              |            |                |        |        |
| $N_{oc}$<br>Note2                                   | Config 1,2,4,5 | NR_FDD_FR1_G | dBm/SC S   | [-80]          | -88    | -108.5 |
|   |                | NR_TDD_FR1_G |            |                |        | -116.5 |
|   |                | NR_FDD_FR1_H |            |                |        | -116   |
|   |                | NR_TDD_FR1_H |            |                |        | -115.5 |
|   |                | NR_FDD_FR1_A |            |                |        | -115   |
|   |                | NR_TDD_FR1_A |            |                |        | -114.5 |
|   |                | NR_FDD_FR1_B |            |                |        | -114   |
|   |                | NR_TDD_FR1_B |            |                |        | -114.5 |
|   |                | NR_FDD_FR1_C |            |                |        | -113   |
| NR_TDD_FR1_C  | -113           |              |            |                |        |        |
| $\hat{E}_s / I_{\alpha}$                            | Config 3,6     | NR_FDD_FR1_D | dB         | -1.75          | 20     | -4.0   |
|   |                | NR_TDD_FR1_D |            |                |        |        |
|   |                | NR_FDD_FR1_E |            |                |        |        |
|   |                | NR_TDD_FR1_E |            |                |        |        |
|   |                | NR_FDD_FR1_F |            |                |        |        |
|   |                | NR_TDD_FR1_F |            |                |        |        |
|   |                | NR_FDD_FR1_G |            |                |        |        |
|   |                | NR_TDD_FR1_G |            |                |        |        |
|   |                | NR_FDD_FR1_H |            |                |        |        |
| NR_TDD_FR1_H  |                |              |            |                |        |        |

| $\hat{E}_s / N_{oc}$         |                              |  | dB                                     | -1.75                                  | 20                    | -4.0   |  |        |
|------------------------------|------------------------------|--|--|--|-----------------------|--------|--|--------|
| SS-RSRP <sup>Note3</sup>     | Config 1,2,4,5               | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SC<br>S                            | -89.75                                 | -88.5                 | -123.5 |  |        |
|                              |                              | NR_FDD_FR1_B                           |  |  |                       |        | -123                                   |        |
|                              |                              | NR_TDD_FR1_C                           |  |  |                       |        | -122.5                                 |        |
|                              |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |  |  |                       |        | -122                                   |        |
|                              |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |  |  |                       |        | -121.5                                 |        |
|                              |                              | NR_FDD_FR1_F                           |  |  |                       |        | -121                                   |        |
|                              |                              | NR_FDD_FR1_G                           |  |  |                       |        | -120.5                                 |        |
|                              |                              | NR_FDD_FR1_H                           |  |  |                       |        | -120                                   |        |
|                              |                              | Config 3,6                             |  |  |                       |        | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | -86.75 |
|                              | NR_FDD_FR1_B                 |  |  | -120                                   |                       |        |  |        |
|                              | NR_TDD_FR1_C                 |  |  | -119.5                                 |                       |        |  |        |
|                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D |  |  | -119                                   |                       |        |  |        |
|                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E |  |  | -118.5                                 |                       |        |  |        |
|                              | NR_FDD_FR1_F                 |  |  | -118                                   |                       |        |  |        |
|                              | NR_FDD_FR1_G                 |  |  | -117.5                                 |                       |        |  |        |
|                              | NR_FDD_FR1_H                 |  |  | -117                                   |                       |        |  |        |
|                              | SS-SINR <sup>Note3</sup>     |  |  | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dB                    | -1.75  | 20                                     | -4.0   |
|                              |                              | NR_FDD_FR1_B                           |  |  |                       |        |  |        |
| NR_TDD_FR1_C                 |                              |  |  |  |                       |        |  |        |
| NR_FDD_FR1_D<br>NR_TDD_FR1_D |                              |  |  |  |                       |        |  |        |
| NR_FDD_FR1_E<br>NR_TDD_FR1_E |                              |  |  |  |                       |        |  |        |
| NR_FDD_FR1_F                 |                              |  |  |  |                       |        |  |        |
| NR_FDD_FR1_G                 |                              |  |  |  |                       |        |  |        |
| NR_FDD_FR1_H                 |                              |  |  |  |                       |        |  |        |
| Io <sup>Note3</sup>          |                              | Config 1,2,4,5                         | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz                        |                       |        |  |        |
|                              | NR_FDD_FR1_B                 |  | -89.59                                 |  |                       |        |  |        |
|                              | NR_TDD_FR1_C                 |  | -89.09                                 |  |                       |        |  |        |
|                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D |  | -88.59                                 |  |                       |        |  |        |
|                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E |  | -88.09                                 |  |                       |        |  |        |
|                              | NR_FDD_FR1_F                 |  | -87.59                                 |  |                       |        |  |        |
|                              | NR_FDD_FR1_G                 |  | -87.09                                 |  |                       |        |  |        |
|                              | NR_FDD_FR1_H                 |  | -86.59                                 |  |                       |        |  |        |
|                              | Config 3,6                   |  | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |  | dBm/<br>38.16MHz<br>z | -51.73 | -54.41                                 | -84    |
|                              |                              | NR_FDD_FR1_B                           | -83.5                                  |  |                       |        |  |        |
|                              |                              | NR_TDD_FR1_C                           | -83                                    |  |                       |        |  |        |
|                              |                              | NR_FDD_FR1_D<br>NR_TDD_FR1_D           | -82.5                                  |  |                       |        |  |        |
|                              |                              | NR_FDD_FR1_E<br>NR_TDD_FR1_E           | -82                                    |  |                       |        |  |        |
|                              |                              | NR_FDD_FR1_F                           | -81.5                                  |  |                       |        |  |        |
|                              |                              | NR_FDD_FR1_G                           | -81                                    |  |                       |        |  |        |
|                              |                              | NR_FDD_FR1_H                           | -80.5                                  |  |                       |        |  |        |
|                              |                              | Propagation condition                  |  |  |                       |        |  |        |
|                              | Antenna configuration        |  |  |  | -                     | 1x2    |  |        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-SINR, SS-RSRP, and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | NR operating band groups are as defined in clause 3.5.2.   |
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.   |

#### A.8.5.2.3.1.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].

#### A.8.5.2.3.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

##### A.8.5.2.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS- SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.3 in TS 36.133 [15] for inter-RAT FR2 SS-SINR measurements.

##### A.8.5.2.3.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.2.2-1. In this test case there are two cells on different carriers. Absolute accuracy requirements of SS-SINR inter-RAT measurement are tested by using test setup in Table A.8.5.2.3.2.2-2 and A.8.5.2.3.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

**Table A.8.5.2.3.2.2-1: SS-SINR Inter-RAT SS-SINR supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2             | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.8.5.2.3.2.2-2: SS-SINR Inter-RAT general test parameters

| Parameter  | Unit | Test 1                      | Test 2                      | Test 3                      |
|--|------|-----------------------------|-----------------------------|-----------------------------|
|  |      | Cell 2                      | Cell 2                      | Cell 2                      |
| SSB ARFCN  |      | Freq1                       | freq1                       | freq1                       |
| Duplex mode  |      | TDD                         | TDD                         | TDD                         |
| TDD configuration  |      | TDDConf.3.1                 | TDDConf.3.1                 | TDDConf.3.1                 |
| BW <sub>channel</sub>  | MHz  | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 | 100: N <sub>RB,c</sub> = 66 |
| Downlink initial BWP configuration   |      | DLBWP.0.1                   |                             |                             |
| Uplink initial BWP configuration   |      | ULBWP.0.1                   |                             |                             |
| DRX cycle configuration  | ms   | Not applicable              |                             |                             |
| PDSCH Reference measurement channel  |      | -                           | -                           | -                           |
| RMSI CORESET Reference Channel   |      | -                           | -                           | -                           |
| OCNG Patterns  |      | OP.1                        | OP.1                        | OP.1                        |
| SMTTC configuration  |      | SMTTC.1                     | SMTTC.1                     | SMTTC.1                     |
| SSB configuration  |      | SSB.3 FR2                   | SSB.3 FR2                   | SSB.3 FR2                   |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 120                         | 120                         | 120                         |
| EPRE ratio of PSS to SSS   | dB   | 0                           | 0                           | 0                           |
| EPRE ratio of PBCH_DMRS to SSS   |      |                             |                             |                             |
| EPRE ratio of PBCH to PBCH_DMRS  |      |                             |                             |                             |
| EPRE ratio of PDCCH_DMRS to SSS  |      |                             |                             |                             |
| EPRE ratio of PDCCH to PDCCH_DMRS  |      |                             |                             |                             |
| EPRE ratio of PDSCH_DMRS to SSS  |      |                             |                             |                             |
| EPRE ratio of PDSCH to PDSCH_DMRS  |      |                             |                             |                             |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |      |                             |                             |                             |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Void</p> <p>Note 3: Void</p> <p>Note 4: Void</p> |      |                             |                             |                             |

Table A.8.5.2.3.2-3: SS-SINR Inter-RAT OTA related test parameters

| Parameter   | Unit                           | Test 1                        | Test 2                        | Test 3  |
|---|--------------------------------|-------------------------------|-------------------------------|---|
|   |                                | Cell 2                        | Cell 2                        | Cell 2  |
| Angle of arrival configuration  |                                | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1 | Setup 1 according to A.3.15.1                     |
| Assumption for UE beams <sup>Note 10</sup>  |                                | Rough                         | Rough                         | Rough   |
| $N_{oc}$ <sup>Note1</sup>   | dBm/15kHz <sup>Note4</sup>     | -104.7                        | -104.7                        | (Table B.2.3-2 Rx Beam Peak -5dB)<br>(Note 7)     |
| $N_{oc}$ <sup>Note1</sup>   | dBm/SCS <sup>Note4</sup>       | -95.7                         | -95.7                         | (Table B.2.3-2 Rx Beam Peak +4dB)<br>(Note 7)     |
| $\hat{E}_s / N_{oc}$  | dB                             | -0.5                          | 11                            | -1.0  |
| SSB_RP <sup>Note2</sup>   | dBm/SCS <sup>Note4</sup>       | -96.2                         | -84.7                         | (Table B.2.3-2 Rx Beam Peak +3dB)<br>(Note 8)     |
| SS-SINR <sup>Note2</sup>  | dB                             | -0.5                          | 11                            | -1.0  |
| $\hat{E}_s / I_{ot}$ <sup>Note2</sup>   | dB                             | -0.5                          | 11                            | -1.0  |
| $I_o$ <sup>Note2</sup>  | dBm/95.04 MHz <sup>Note4</sup> | -63.95                        | -55.38                        | (Table B.2.3-2 Rx Beam Peak +35.54dB)<br>(Note 9) |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: SSB_RP, SS-SINR, <math>E_s/I_{ot}</math> and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: Void</p> <p>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.</p> <p>Note 5: Void</p> <p>Note 6: Void</p> <p>Note 7: <math>N_{oc}</math> for SCS 15kHz is applied at <math>-10\log_{10}(8)+4</math>dB above the minimum level specified in Table B.2.3-2 for beam peak. <math>N_{oc}</math> for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 8: SSB_RP is applied at 3dB above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 9: <math>I_o</math> is applied at level <math>10\log_{10}(792)+6.54</math>dB above the minimum level specified in Table B.2.3-2 for beam peak.</p> <p>Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.</p> |                                |                               |                               |   |

### A.8.5.2.3.2.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].

## A.9 V2X Tests

### A.9.1 V2X Tests in FR1

#### A.9.1.1 Test for V2X UE Transmit Timing

##### A.9.1.1.1 Test for GNSS as Synchronization Reference Source

###### A.9.1.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE timing requirements as specified in clause 12.2.2, when the GNSS is used as timing reference. For this test, the UE is triggered by the test loop function to transmit for V2X sidelink communication.

Table A.9.1.1.1.1-1 defines test parameters for UE transmit timing accuracy tests for V2X. There is one GNSS based synchronization source during the test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1.

**Table A.9.1.1.1.1-1: V2X Sidelink Test Parameters for UE Transmit Timing Tests for GNSS as Timing Reference**

| Parameter   | Unit | Value  | Comment  |
|---|------|--|--|
| RF Channel Number   |      | 1  | HD carrier in Band n47 or n38                      |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 1</sup>                             | MHz  | 20 ( $N_{\text{RB},c} = 50$ ) or<br>40 ( $N_{\text{RB},c} = 100$ ) |  |
| SCS   | kHz  | 30   |  |
| Active cell   |      | None   |  |
| Active SyncRef UE   |      | None   |  |
| V2X sidelink communication preconfiguration   |      | As specified in section A.3.21.2                                   | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel   |      | CC.1A HD   | As specified in Table A.3.21.3-1                   |
| PSSCH Reference Measurement Channel   |      | CD.1A HD   | As specified in Table A.3.21.3-2                   |
| Propagation condition   |      | AWGN   |  |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |      |  |  |

#### A.9.1.1.1.2 Test requirements

For parameters specified in Tables A.9.1.1.1-1, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.2. The timing accuracy is verified by using PSSCH transmissions.

#### A.9.1.1.2 Test for SyncRef UE as Synchronization Reference Source

##### A.9.1.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in clause 12.2.5, when SyncRef UE is used as timing reference. For this test, the UE is triggered by the test loop function to transmit for V2X sidelink communication.

Table A.9.1.1.2.1-1 defines test parameters for UE transmit timing accuracy tests for V2X sidelink Communication. There is one active SyncRef UE in this test without either serving cell and or GNSS signals. Before the test starts, the UE has been synchronized to the SyncRef UE. The transmit timing accuracy is verified by using the transmission timing of PSSCH transmissions.

**Table A.9.1.1.2.1-1: General Test Parameters for V2X UE Transmit Timing Test for SyncRef UE as Timing Reference**

| Parameter  |  | Unit      | Value   | Comment  |
|--|--|-----------|---|--|
| RF Channel Number  |  |           | 1   | HD carrier in Band n47 or n38                      |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 3</sup>  |  | MHz       | 20 ( $N_{RB,c} = 50$ ) or 40 ( $N_{RB,c} = 100$ ) |  |
| SCS  |  | kHz       | 30  |  |
| Active cell  |  |           | None  |  |
| Active SyncRef UE  |  |           | SyncRef UE 1                                      | Transmitting S-SSB on RF channel number 1          |
| V2X sidelink communication preconfiguration  |  |           | As specified in section A.3.21.2                  | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel  |  |           | CC.1A HD  | As specified in Table A.3.21.3-1                   |
| PSSCH Reference Measurement Channel  |  |           | CD.1A HD  | As specified in Table A.3.21.3-2                   |
| $N_{oc}$ <sup>Note1,2</sup>  |  | dBm/30kHz | -95   |  |
| SyncRef UE 1   | sl-SSB-TimeAllocation                    |           | sl-SSB-TimeAllocation1                            |  |
|  | slssid                                   |           | 30  |  |
|  | inCoverage                               |           | TRUE  | In MIB-SL  |
|  | networkControlledSyncTx                  |           | ON  |  |
|  | V2X sidelink communication configuration |           | As specified in section A.3.21.2                  | IE values unless specified otherwise in this test. |
|  | $\hat{E}_s/N_{oc}$                       |           | 3   |  |
|  | PSBCH-RSRP <sup>Note1, Note 2</sup>      | dBm/30kHz | -92   |  |
| Propagation condition  |  |           | AWGN  |  |
| <p>Note 1: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 2: S-PSS <math>E_s/N_{oc}</math> and S-SSS <math>E_s/N_{oc}</math> are set the same as PSBCH <math>E_s/N_{oc}</math>.</p> <p>Note 3: The UE is only required to be tested in one of the supported test configurations.</p> |  |           |   |  |

### A.9.1.1.2.2 Test requirements

For parameters specified in Tables A.9.1.1.2.1-1, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.5. The timing accuracy is verified by using PSSCH transmissions.

### A.9.1.1.3 Test for FR1 NR Cell as Synchronization Reference Source

#### A.9.1.1.3.1 Test Purpose and Environment

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in clause 12.2.3, when the downlink timing of the serving cell (RRC\_IDLE) or PCell (RRC\_CONNECTED) on a non-V2X sidelink carrier is used as timing reference. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X sidelink communication.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

Table A.9.1.1.3.1-1, A.9.1.1.3.1-2 and A.9.1.1.3.1-3 define test parameters for UE transmit timing accuracy tests for V2X sidelink Communication. There is one active cell (PCell) in this test. The transmit timing accuracy is verified by using the transmission timing of PSSCH transmissions.



**Table A.9.1.1.3.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description  |
|---------------|--|
| 1             | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                             |
| 2             | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                             |
| 3             | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                             |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.9.1.1.3.1-2: V2X Sidelink Test Parameters for V2X UE Transmit Timing Accuracy Test for gNB as Timing Reference**

| Parameter   | Unit | Value   | Comment  |
|---|------|---|--|
| RF Channel Number   |      | 1   | HD carrier in Band n47 or n38                      |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 1</sup>                             | MHz  | 20 ( $N_{RB,c} = 50$ ) or 40 ( $N_{RB,c} = 100$ ) |  |
| SCS   | kHz  | 30  |  |
| Active cell   |      | Cell 1  |  |
| Active SyncRef UE   |      | None  |  |
| V2X sidelink communication configuration  |      | As specified in section A.3.21.2                  | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel   |      | CC.1A HD  | As specified in Table A.3.21.3-1                   |
| PSSCH Reference Measurement Channel   |      | CD.1A HD  | As specified in Table A.3.21.3-2                   |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |      |   |  |

**Table A.9.1.1.3.1-3: Cell Test Parameters for V2X UE Transmit Timing Accuracy Test for gNB as Timing Reference**

| Parameter  |              | Unit         | Cell 1                 |
|--|--------------|--------------|------------------------|
| RF Channel Number  |              |              | 2                      |
| Duplex Mode  | Config 1     |              | FDD                    |
|  | Config 2,3   |              | TDD                    |
| TDD configuration  | Config 1     |              | Not Applicable         |
|  | Config 2     |              | TDDConf.1.1            |
|  | Config 3     |              | TDDConf.2.1            |
| Channel Bandwidth<br>( $BW_{channel}$ )  | Config 1,2   | MHz          | 10: $N_{RB,c} = 52$    |
|  | Config 3     |              | 40: $N_{RB,c} = 106$   |
| Initial BWP Configuration  |              |              | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP Configuration  |              |              | DLBWP.1.1<br>ULBWP.1.1 |
| DRX Cycle  |              |              | N/A                    |
| PDSCH Reference<br>measurement<br>channel  | Config 1     |              | SR.1.1 FDD             |
|  | Config 2     |              | SR.1.1 TDD             |
|  | Config 3     |              | SR.2.1 TDD             |
| CORESET Reference<br>Channel   | Config 1     |              | CR.1.1 FDD             |
|  | Config 2     |              | CR.1.1 TDD             |
|  | Config 3     |              | CR.2.1 TDD             |
| Dedicated CORESET<br>Reference Channel   | Config 1     |              | CCR.1.1 FDD            |
|  | Config 2     |              | CCR.1.1 TDD            |
|  | Config 3     |              | CCR.2.1 TDD            |
| SSB configuration  | Config 1,2   |              | SSB.1 FR1              |
|  | Config 3     |              | SSB.2 FR1              |
| SMTTC Configuration  |              |              | SMTTC.2                |
| OCNG Patterns  |              |              | OP.1                   |
| EPRE ratio of PSS to SSS   |              | dB           | 0                      |
| EPRE ratio of PBCH DMRS to SSS   |              |              |                        |
| EPRE ratio of PBCH to PBCH DMRS  |              |              |                        |
| EPRE ratio of PDCCH DMRS to SSS  |              |              |                        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |              |                        |
| EPRE ratio of PDSCH DMRS to SSS  |              |              |                        |
| EPRE ratio of PDSCH to PDSCH   |              |              |                        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |              |              |                        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |              |                        |
| $N_{oc}$ Note2   | Config 1,2,3 |              |                        |
| $N_{oc}$ Note2   | Config 1,2   | dBm/SCS      | -98                    |
|  | Config 3     |              | -95                    |
| $\hat{E}_s / N_{oc}$   |              | dB           | 3                      |
| SS-RSRP Note3  | Config 1,2   | dBm/SCS      | -95                    |
|  | Config 3     |              | -92                    |
| $I_0$ Note 3   | Config 1,2   | dBm/9.36 MHz | -65.2                  |
|  | Config 3     | dBm/38.1 MHz | -59.2                  |
| Propagation Condition  |              |              | AWGN                   |
| Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |              |                        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |              |                        |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |              |                        |

**A.9.1.1.3.2 Test requirements**

For parameters specified in Tables A.9.1.1.3.1-1 A.9.1.1.3.1-2 and A.9.1.1.3.1-3, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.3. The timing accuracy is verified by using PSSCH transmissions.

## A.9.1.2 Test for Initiation/Cease of S-SSB Transmission with V2X Sidelink Communication

### A.9.1.2.1 Test for FR1 NR Cell as synchronization reference source without gap under non-DRX

#### A.9.1.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the V2X UE meets the requirements related to the maximum evaluation time allowed to initiate and cease S-SSB transmissions defined in clause 12.3.1.1, when the reference timing used for sidelink transmissions is a NR serving cell in FR1 on a non-V2X sidelink carrier.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

Supported test configurations for FR1 NR cell are shown in Table A.9.1.2.1.1-1.

**Table A.9.1.2.1.1-1: Supported Test Configurations for FR1 NR cell as synchronization reference source**

| Configuration | Description   |
|---------------|---|
| 1             | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                              |
| 2             | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                              |
| 3             | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                              |
| Note 1:       | The UE is only required to pass in one of the supported test configurations in FR1. |
| Note 2:       | For NR SL, SL BW is one between 20MHz and 40MHz, and SL SCS is 30kHz.               |

The test parameters are given in Table A.9.1.2.1.1-2 and Table A.9.1.2.1.1-3 below. There is one active cell in this test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the SS-RSRP of the PCell is above *syncTxThreshIC* and the UE is not expected to be transmitting S-SSB.

During T2, the SS-RSRP of the PCell is lowered below *syncTxThreshIC* and the UE is expected to initiate S-SSB transmissions.

During T3, the SS-RSRP of the PCell is increased back to be above *syncTxThreshIC* and the UE is expected to cease S-SSB transmissions.

**Table A.9.1.2.1.1-2: Test Parameters for Initiation/Cease of SLSS Transmission Test for FR1 NR cell as synchronization reference source**

| Parameter                                | Unit    | Value                            | Comment   |
|--|---------|----------------------------------|---|
| SCS                                      | kHz     | 30                               |   |
| Active cell                              |         | Cell 1                           | Serving cell on RF channel number 1                                       |
| Active SyncRef UE                        |         | None                             |   |
| Active V2X UE                            |         | V2X UE                           | Transmitting S-SSB on RF channel number 2 (HD carrier in Band n47 or n38) |
| V2X sidelink communication configuration |         | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test                         |
| networkControlledSyncTx                  |         | Not configured                   |   |
| syncTxThreshIC                           | dBm/SCS | -110                             | In SIB12  |
| DRX                                      |         | OFF                              |   |
| T1                                       | s       | 3                                |   |
| T2                                       | s       | 5.24                             |   |
| T3                                       | s       | 5.24                             |   |

**Table A.9.1.2.1.1-3: FR1 NR Cell Specific Test Parameters for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source**

| Parameter  |              | Unit          | Cell1                      |        |        |
|--|--------------|---------------|----------------------------|--------|--------|
|  |              |               | T1                         | T2     | T3     |
| NR RF Channel Number   |              |               | 1                          |        |        |
| Duplex Mode  | Config 1     |               | FDD                        |        |        |
|  | Config 2,3   |               | TDD                        |        |        |
| TDD configuration  | Config 1     |               | Not applicable             |        |        |
|  | Config 2     |               | TDDConf.1.1                |        |        |
|  | Config 3     |               | TDDConf.2.1                |        |        |
| Channel Bandwidth (BW <sub>channel</sub> )   | Config 1,2   | MHz           | 10:NR <sub>B,C</sub> = 52  |        |        |
|  | Config 3     |               | 40:NR <sub>B,C</sub> = 106 |        |        |
| Initial BWP Configuration  |              |               | DLBWP.0.1<br>ULBWP.0.1     |        |        |
| Dedicated BWP Configuration  |              |               | DLBWP.1.1<br>ULBWP.1.1     |        |        |
| DRx Cycle  |              | ms            | N/A                        |        |        |
| PDSCH Reference measurement channel  | Config 1     |               | SR.1.1 FDD                 |        |        |
|  | Config 2     |               | SR.1.1 TDD                 |        |        |
|  | Config 3     |               | SR.2.1 TDD                 |        |        |
| CORESET Reference Channel  | Config 1     |               | CR.1.1 FDD                 |        |        |
|  | Config 2     |               | CR.1.1 TDD                 |        |        |
|  | Config 3     |               | CR.2.1 TDD                 |        |        |
| Dedicated CORESET Reference Channel  | Config 1     |               | CCR.1.1 FDD                |        |        |
|  | Config 2     |               | CCR.1.1 TDD                |        |        |
|  | Config 3     |               | CCR.2.1 TDD                |        |        |
| SSB configuration  | Config 1,2   |               | SSB.1 FR1                  |        |        |
|  | Config 3     |               | SSB.2 FR1                  |        |        |
| SMTC Configuration   | Config 1     |               | SMTC.2                     |        |        |
|  | Config 2,3   |               | SMTC.1                     |        |        |
| TRS configuration  | Config 1     |               | TRS.1.1 FDD                |        |        |
|  | Config 2     |               | TRS.1.1 TDD                |        |        |
|  | Config 3     |               | TRS.1.2 TDD                |        |        |
| OCNG Patterns  |              |               | OP.1                       |        |        |
| EPRE ratio of PSS to SSS   |              | dB            | 0                          |        |        |
| EPRE ratio of PBCH DMRS to SSS   |              |               |                            |        |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |               |                            |        |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |               |                            |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |               |                            |        |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |               |                            |        |        |
| EPRE ratio of PDSCH to PDSCH   |              |               |                            |        |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |              |               |                            |        |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |              |               |                            |        |        |
| $N_{oc}$ <sup>Note2</sup>  | Config 1,2,3 | dBm/15 kHz    | -110                       |        |        |
|  | Config 1,2   | dBm /SCS      | -110                       |        |        |
|  | Config 3     |               | -107                       |        |        |
| $\hat{E}_s / N_{oc}$   |              | dB            | 4.5                        | -4.5   | 4.5    |
| $\hat{E}_s / I_{ot}$   |              | dB            | 4.5                        | -4.5   | 4.5    |
| SS-RSRP <sup>Note3</sup>   | Config 1,2   | dBm /SCS      | -105.5                     | -114.5 | -105.5 |
|  | Config 3     |               | -102.5                     | -111.5 | -102.5 |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1,2   | dBm /9.36MHz  | -76.2                      | -80.7  | -76.2  |
|  | Config 3     | dBm/ 38.16MHz | -70.1                      | -74.6  | -70.1  |
| Propagation condition  |              |               | AWGN                       |        |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |              |               |                            |        |        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |               |                            |        |        |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |              |               |                            |        |        |
| Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |              |               |                            |        |        |

### A.9.1.2.1.2 Test Requirements

The S-SSB transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the S-SSB transmission.

The S-SSB transmission initiation delay shall be less than 0.56 s.

The S-SSB transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the S-SSB transmission.

The S-SSB transmission cease delay shall be less than 0.56 s.

The rate of correct initiation/cease delay of S-SSB transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of S-SSB transmissions can be expressed as:  $T_{\text{evaluate,SLSS}} + \text{S-SSB period}$ ,

Where:

$T_{\text{evaluate,SLSS}} = 0.4 \text{ sec}$  (as specified in clause 12.3.1.1);

S-SSB period = 160ms.

### A.9.1.2.2 Test for SyncRef UE as synchronization reference source

#### A.9.1.2.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to the evaluation time allowed to initiate and cease S-SSB transmissions defined in clause 12.3.1.4, when the reference timing used for sidelink transmissions is a SyncRef UE.

The test parameters are given in Table A.9.1.2.2.1-1 and Table A.9.1.2.2.1-2 below. There are neither active cells nor GNSS signals in this test. There is one active SyncRef UE (SyncRef UE 1) in this test. The test system shall emulate SyncRef UE 1 to transmit S-SSB every synchronization period.

Prior to start of test, test system is required to ensure that the V2X UE is synchronized to the SyncRef UE 1 and is transmitting S-SSB as derived from the S-SSB of SyncRef UE 1 as per clause 5.8.5.3 of TS 38.331[2]. For the test configuration, the SLSSID used by the V2X UE shall be 30 with *inCoverage* IE in MIB-SL set as FALSE. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the PSBCH-RSRP of SyncRef UE 1 is above *syncTxThreshOOC* and the UE is not expected to be transmitting S-SSB.

During T2, the PSBCH-RSRP of SyncRef UE 1 is lowered below *syncTxThreshOOC* and the UE is expected to initiate S-SSB transmissions.

During T3, the PSBCH-RSRP of SyncRef UE 1 is increased back to be above *syncTxThreshOOC* and the UE is expected to cease S-SSB transmissions.

**Table A.9.1.2.2.1-1: Test Parameters for Initiation/Cease of S-SSB Transmission Test for SyncRef UE as synchronization reference source**

| Parameter                                   | Unit      | Value                            | Comment   |
|---|-----------|----------------------------------|---|
| SCS   | kHz       | 30                               |   |
| Active cell                                 |           | None                             |   |
| Active SyncRef UE                           |           | SyncRef UE 1                     | Transmitting S-SSB on RF channel number 1 (HD carrier in Band n47 or n38) |
| Active V2X UE                               |           | V2X UE                           | Transmitting S-SSB on RF channel number 1 (HD carrier in Band n47 or n38) |
| V2X sidelink communication preconfiguration |           | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test                         |
| networkControlledSyncTx                     |           | Not configured                   |   |
| syncTxThreshOoC                             | dBm/30kHz | -97                              |   |
| T1  | s         | 3                                |   |
| T2  | s         | 5.24                             |   |
| T3  | s         | 5.24                             |   |

**Table A.9.1.2.2.1-2: SyncRef UE Specific Test Parameters for Initiation/Cease of S-SSB Transmission Test for SyncRef UE as synchronization reference source**

| Parameter  | Unit  | SyncRef UE 1                                    |        |       |
|--|---|---|--------|-------|
|  |   | T1  | T2     | T3    |
| NR RF Channel Number   |   | 1   |        |       |
| V2X SL communication resource pool configuration             |   | As specified in Table A.3.21.2-2                |        |       |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note3</sup> | MHz   | 20( $N_{RB,c} = 50$ ) or 40( $N_{RB,c} = 100$ ) |        |       |
| SLSSID   |   | 30  |        |       |
| inCoverage   |   | TRUE  |        |       |
| networkControlledSyncTx                                      |   | ON  |        |       |
| $N_{oc}$ <sup>Note1</sup>                                    | dBm/30 kHz  | -98   |        |       |
| $\hat{E}_s / I_{ot}$   | dB  | 5.5   | -3.5   | 5.5   |
| PSBCH $\hat{E}_s / N_{oc}$                                   | dB  | 5.5   | -3.5   | 5.5   |
| PSBCH-RSRP <sup>Note2</sup>                                  | dBm/30 kHz  | -92.5   | -101.5 | -92.5 |
| $I_o$ <sup>Note2</sup>                                       | dBm /3.96MHz  | -70.2   | -75.2  | -70.2 |
| Propagation condition  |   | AWGN  |        |       |
| Note 1:  | Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.        |   |        |       |
| Note 2:  | PSBCH-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves. $I_o$ level is based on the allocated RBs for S-PSS/S-SSS/PSBCH symbols. |   |        |       |
| Note 3:  | The UE is only required to be tested in one of the supported test configurations.   |   |        |       |
| Note 4:  | S-PSS $E_s/N_{oc}$ and S-SSS $E_s/N_{oc}$ are set the same as PSBCH $E_s/N_{oc}$ .  |   |        |       |

#### A.9.1.2.2.2 Test Requirements

The S-SSB transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the S-SSB transmission.

The S-SSB transmission initiation delay shall be less than 0.8 s.

The S-SSB transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the S-SSB transmission.

The S-SSB transmission cease delay shall be less than 0.8 s.

The rate of correct initiation/cease delay of S-SSB transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of S-SSB transmissions can be expressed as:  $T_{\text{evaluate,SLSS}} + \text{S-SSB period}$ ,

Where:

- $T_{\text{evaluate,SLSS}} = 0.64$  sec (as specified in clause 12.3.1.4);
- S-SSB period = 160ms.

### A.9.1.3 Test for V2X Synchronization Reference Selection/Reselection

#### A.9.1.3.1 Test for GNSS configured as the highest priority

##### A.9.1.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, when GNSS is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.3.1.1-1 and A.9.1.3.1.1-2 below. There are no GNSS signals in this test. There are three active SyncRef UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) in this test. The test system shall emulate SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 to transmit S-SSB every S-SSB period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its S-SSB transmissions. When the V2X UE is not synchronized to any SyncRef UE, then the V2X UE shall use the SLSS ID belonging to set id\_oon. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are all powered off before starting the test. During T1, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as synchronization source. During T2, SyncRef UE 2 is powered ON and the V2X UE will select SyncRef UE 2 as the synchronization source. During T3, SyncRef UE 3 is powered ON and the V2X UE will reselect to SyncRef UE 3 as the synchronization source.

**Table A.9.1.3.1.1-1: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority**

| Parameter                                |                               | Unit | Value  | Comment   |
|--|-------------------------------|------|--|---|
| SCS                                      |                               | kHz  | 30   |   |
| Initial condition                        | Active synchronization source |      | Sync Ref UE 1                                | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL.  |
| T2 end condition                         | Active synchronization source |      | Sync Ref UE 2                                | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 336 and in-coverage set as FALSE in MIB-SL. |
| Final condition                          | Active synchronization source |      | Sync Ref UE 3                                | UE transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL.    |
| Active SyncRef UEs                       |                               |      | SyncRef UE 1<br>SyncRef UE 2<br>SyncRef UE 3 | Transmitting S-SSB on RF channel number 1 (HD carrier in Band n47 or n38)   |
| Timing offset among SyncRef UEs          |                               | μs   | CP/2   | Synchronous   |
| Frequency offset of SyncRef UE 1,2,3     |                               | ppm  | 0  |   |
| V2X sidelink Communication configuration |                               |      | As specified in Table A. 3.21.2-2            | IE values unless specified otherwise in this test.  |
| sl-SyncPriority                          |                               |      | gnss   |   |
| syncTxThreshOoC                          |                               |      | +infinity                                    |   |
| T1                                       |                               | s    | 24   |   |
| T2                                       |                               | s    | 16   |   |
| T3                                       |                               | s    | 3.2  |   |

**Table A.9.1.3.1.1-2: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority**

| Parameter  | Unit          | SyncRef UE 1                                      |     |       | SyncRef UE 2  |     |     | SyncRef UE 3 |           |     |
|--|---------------|---|-----|-------|---------------|-----|-----|--------------|-----------|-----|
|  |               | T1  | T2  | T3    | T1            | T2  | T3  | T1           | T2        | T3  |
| NR RF Channel Number   |               | 1(HD carrier in Band n47 or n38)                  |     |       |               |     |     |              |           |     |
| Channel Bandwidth<br>( $BW_{channel}$ ) <sup>Note 4</sup>  | MHz           | 20 ( $N_{RB,c} = 50$ ) or 40 ( $N_{RB,c} = 100$ ) |     |       |               |     |     |              |           |     |
| V2X Sidelink<br>Communication resource<br>pool configuration   |               | As specified in Table A.3.21.2-2                  |     |       |               |     |     |              |           |     |
| networkControlledSyncTx  |               | ON  |     |       | N/A           |     |     | ON           |           |     |
| syncTxThreshOoC  | dBm/15<br>kHz | N/A   |     |       | +infinity     |     |     | N/A          |           |     |
| SLSSID   |               | 30  |     |       | 0             |     |     | 0            |           |     |
| inCoverage (in MIB-SL)   |               | TRUE  |     |       | FALSE         |     |     | TRUE         |           |     |
| $N_{oc}$ <sup>Note1</sup>  | dBm/30<br>kHz | -95   |     |       |               |     |     |              |           |     |
| $\hat{E}_s / N_{oc}$   | dB            | 0   | 0   | 0     | -<br>infinity | 0   | 0   | -infinity    | -infinity | 3   |
| $\hat{E}_s / I_{ot}$   | dB            | 0   | 0   | -4.76 | -<br>infinity | 0   | 0   | -infinity    | -infinity | 0   |
| PSBCH-RSRP <sup>Note2, Note 3</sup>  | dBm/30<br>kHz | -95   | -95 | -95   | -<br>infinity | -95 | -95 | -infinity    | -infinity | -92 |
| Propagation Condition  |               | AWGN  |     |       |               |     |     |              |           |     |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: S-PSS Es/lot and S-SSS Es/lot are set the same as PSBCH Es/lot.</p> <p>Note 4: The UE is only required to be tested in one of the supported test configurations.</p> |               |   |     |       |               |     |     |              |           |     |

### A.9.1.3.1.2 Test Requirements

During T1, SyncRef UE selection delay is defined as the time from the beginning of T1 to the time UE is synchronized to SyncRef UE 1, and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T1.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection delay can be expressed as:

$$\text{SyncRef UE selection delay} = T_{\text{detect,SyncRef UE}} + T_{\text{evaluate,SLSS}} + \text{S-SSB period}$$

Where

- $T_{\text{detect,SyncRef UE}} = 8\text{sec}$  (as specified in sub-clause 12.4)
- $T_{\text{evaluate,SLSS}} = 0.64\text{ sec}$  (as specified in sub-clause 12.3)
- S-SSB period = 160ms

This gives a total of 8.8 seconds.

2) During T2, SyncRef UE reselection delay is defined as the time from the beginning of T2 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2 and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed to 336 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE reselection delay from start of T2.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE reselection delay can be expressed as:



$$\text{SyncRef UE reselection delay} = T_{\text{detect,SyncRef UE}} + T_{\text{evaluate,SLSS}} + \text{S-SSB period}$$

Where

- $T_{\text{detect,SyncRef UE}} = 8\text{sec}$  (as specified in sub-clause 12.4)
- $T_{\text{evaluate,SLSS}} = 0.64$  (as specified in sub-clause 12.3)
- S-SSB period = 160ms

This gives a total of 8.8 seconds.

3) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 2 to SyncRef UE 3, and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 3 as the synchronization source. For the test configuration, the SLSS ID will still be 0 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE reselection delay from start of T3.

The SyncRef UE reselection delay shall be less than 2.4sec. The SyncRef UE reselection delay can be expressed as:

$$\text{SyncRef UE reselection delay} = T_{\text{detect,SyncRef UE}} + T_{\text{evaluate,SLSS}} + \text{S-SSB period}$$

Where

- $T_{\text{detect,SyncRef UE}} = 1.6\text{sec}$  (as specified in sub-clause 12.4)
- $T_{\text{evaluate,SLSS}} = 0.64$  (as specified in sub-clause 12.3)
- S-SSB period = 160 ms

This gives a total of 2.4 seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and S-SSB transmissions during the duration of T2, and does not drop or delay more than 30% of its S-SSB transmissions during the duration of T3.

The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

### A.9.1.3.2 Test for FR1 NR Cell configured as the highest priority

#### A.9.1.3.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, when gNB is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

This test is applicable for V2X sidelink communication capable UEs that support gNB as synchronization source and sidelink operation.

#### Table A.9.1.3.2.1-1: Void

The test parameters are given in Table A.9.1.3.2.1-2 and A.9.1.3.2.1-3 below. There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1. There are two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2) in this test. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit S-SSB every S-SSB period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its S-SSB transmissions. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. During T1, both SyncRef UE 1 and SyncRef UE 2 are powered off and the V2X UE will select GNSS as synchronization source. During T2, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as the synchronization source. During T3,

a higher priority SyncRef UE 2 is additionally powered ON and the V2X UE will reselect to the higher priority SyncRef UE 2 as the synchronization source.

**Table A.9.1.3.2.1-2: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority**

| Parameter   |                               | Unit | Value                            | Comment  |
|---|-------------------------------|------|----------------------------------|--|
| SCS   |                               | kHz  | 30                               |  |
| Initial condition                                   | Active synchronization source |      | GNSS                             | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as TRUE in MIB-SL.       |
| T2 end condition                                    | Active synchronization source |      | Sync Ref UE 1                    | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 336+59 and in-coverage set as FALSE in MIB-SL. |
| Final condition                                     | Active synchronization source |      | Sync Ref UE 2                    | UE transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL.      |
| Active cell   |                               |      | None                             |  |
| Active SyncRef UEs                                  |                               |      | SyncRef UE 1<br>SyncRef UE 2     | Transmitting S-SSB on RF channel number 1  |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 |                               | ms   | 3                                | Asynchronous   |
| Frequency offset of SyncRef UE 1,2                  |                               | ppm  | 0                                |  |
| V2X sidelink Communication preconfiguration         |                               |      | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test.   |
| syncPriority  |                               |      | <i>gnb</i>                       |  |
| syncTxThreshOoC                                     |                               |      | 13 (+infinity)                   |  |
| T1  |                               | s    | 24                               |  |
| T2  |                               | s    | 16                               |  |
| T3  |                               | s    | 16                               |  |

**Table A.9.1.3.2.1-3: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority**

| Parameter  | Unit       | SyncRef UE 1  |     |       | SyncRef UE 2                     |           |     |
|--|------------|---|-----|-------|----------------------------------|-----------|-----|
|  |            | T1  | T2  | T3    | T1                               | T2        | T3  |
| NR RF Channel Number   |            | 1(HD carrier in Band n47 or n38)                          |     |       |                                  |           |     |
| Channel Bandwidth (BW <sub>channel</sub> ) <sup>Note 4</sup>   | MHz        | 20(N <sub>RB,c</sub> = 50) or 40(N <sub>RB,c</sub> = 100) |     |       |                                  |           |     |
| V2X Sidelink Communication resource pool configuration   |            | As specified in Table A.3.21.2-2                          |     |       | As specified in Table A.3.21.2-2 |           |     |
| networkControlledSyncTx  |            | N/A   |     |       | ON                               |           |     |
| syncTxThreshOoC  | dBm/15 kHz | +infinity   |     |       | N/A                              |           |     |
| SLSSID   |            | 59  |     |       | 30                               |           |     |
| inCoverage (in MIB-SL)   |            | FALSE   |     |       | TRUE                             |           |     |
| $N_{oc}$ <sup>Note1</sup>  | dBm/30 kHz | -95   |     |       |                                  |           |     |
| $\hat{E}_s / N_{oc}$   | dB         | -infinity   | 0   | 0     | -infinity                        | -infinity | 3   |
| $\hat{E}_s / I_{ot}$   | dB         | -infinity   | 0   | -4.76 | -infinity                        | -infinity | 0   |
| PSBCH-RSRP <sup>Note2, Note 3</sup>  | dBm/30 kHz | -infinity   | -95 | -95   | -infinity                        | -infinity | -92 |
| Propagation Condition  |            | AWGN  |     |       |                                  |           |     |
| <p>Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: S-PSS Es/lot and S-SSS Es/lot are set the same as PSBCH Es/lot.</p> <p>Note 4: The UE is only required to be tested in one of the supported test configurations.</p> |            |   |     |       |                                  |           |     |

### A.9.1.3.2.2 Test Requirements

1) During T2, SyncRef UE selection delay is defined as the time from the beginning of T2 to the time UE is synchronized to SyncRef UE 1 and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 336+59 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

$$\text{SyncRef UE selection/reselection delay} = T_{\text{detect,SyncRef UE}} + T_{\text{evaluate,SLSS}} + \text{S-SSB period}$$

Where

- $T_{\text{detect,SyncRef UE}} = 8\text{sec}$  (as specified in sub-clause 12.4)
- $T_{\text{evaluate,SLSS}} = 0.64\text{sec}$  (as specified in sub-clause 12.3)
- S-SSB period = 160ms

This gives a total of 8.8 seconds.

2) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2, and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed to 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

$$\text{SyncRef UE selection/reselection delay} = T_{\text{detect,SyncRef UE}} + T_{\text{evaluate,SLSS}} + \text{S-SSB period}$$

Where

- $T_{\text{detect,SyncRef UE}} = 8\text{sec}$  (as specified in sub-clause 12.4)
- $T_{\text{evaluate,SLSS}} = 0.64\text{ sec}$  (as specified in sub-clause 12.3)
- S-SSB period = 160ms

This gives a total of 8.8 seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and S-SSB transmissions during the duration of T2 and T3.

## A.9.1.4 Test for L1 SL-RSRP Measurement

### A.9.1.4.1 Test for V2X UE Autonomous Resource Selection/Reselection

#### A.9.1.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.1.1-1 and A. 9.1.4.1.1-2 below. There are 50 active V2X sidelink UEs (UE0~UE49) in this test. Both the UE under test and active V2X sidelink UEs select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test parameters for GNSS signals are defined in B.4.1. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH every 5ms. At the beginning of whole test, the test equipment shall send one AT command to trigger the UE under test continuously transmits PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for 20 active V2X sidelink UEs(UE10~UE29) is above the measurement threshold, and the resource occupied by the 20 active V2X sidelink UEs is expected to be excluded in the resource selection procedure and,
- the measured PSSCH-RSRP for other 30 active V2X sidelink UEs(UE0~UE9, UE30~UE49) is low the measurement threshold, and the resource occupied by the 30 active V2X sidelink UEs is expected to be included in the resource selection procedure.

During T2, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for the 20 active V2X sidelink UEs(UE10~UE29) is below the measurement threshold, and the resource occupied by the 20 active V2X sidelink UEs is expected to be included in the resource selection procedure and,
- the measured PSSCH-RSRP for other 30 active V2X sidelink UEs(UE0~UE9, UE30~UE49) is above the measurement threshold, and the resource occupied by the 30 active V2X sidelink UEs is expected to be excluded in the resource selection procedure.

**Table A.9.1.4.1.1-1: Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements**

| Parameter   |   | Unit          | Value  | Comment  |
|---|---|---------------|--|--|
| NR RF Channel Number  |   |               | 1  | HD carrier in Band n47 or n38  |
| Channel Bandwidth (BW <sub>channel</sub> ) <sup>Note 2</sup>                              |   | MHz           | 20 (N <sub>RB,c</sub> = 50) or<br>40 (N <sub>RB,c</sub> = 100) |  |
| SCS   |   | kHz           | 30   |  |
| V2X sidelink communication pre-configuration  |   |               | As specified in Table A.3.21.2-1 and A.3.21.2-3                | IE values unless specified otherwise in this test.   |
| sl-TimeResource-r16 included in SL-ResourcePool   |   |               | 1111111111   | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3])  |
| sl-NumSubchannel-r16 included in SL-ResourcePool  |   |               | 5  | Indicates the number of sub-channels for TX resource pool  |
| sl-SubchannelSize-r16 included in SL-ResourcePool   |   |               | 10   | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB  |
| Number of Active Sidelink UEs   |   |               | 50   | Active Sidelink UE $i = 0, \dots, 49$  |
| <i>SL-Thres-RSRP</i>  |   |               | 12   | Corresponding -106 dBm as defined in Section 6.3.5 in TS38.331[2]<br>Same for all priority level pairs.  |
| Active Sidelink UEs (UE $i = 0, \dots, 49$ )  | V2X sidelink Communication preconfiguration           |               | As specified in Table A.3.21.2-1 And A.3.21.2-3                | IE values unless specified otherwise in this test.   |
|   | sl-TimeResource-r16 included in SL-ResourcePool       |               | {1} <sup>Note1</sup>   | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3])  |
|   | sl-NumSubchannel-r16 included in SL-ResourcePool      |               | 1  | Indicates the number of sub-channels for TX resource pool  |
|   | sl-StartRB-Subchannel-r16 included in SL-ResourcePool |               | $\text{floor}(i/10) \times 10$                                 | Indicates the lowest RB index of the subchannel with the lowest index.<br>UE 0~9 start RB=0;<br>UE 10~19 start RB=10;<br>UE 20~29 start RB=20;<br>UE 30~39 start RB=30;<br>UE 40~49 start RB=40; |
|   | sl-SubchannelSize-r16 included in SL-ResourcePool     |               | 10   | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB  |
| Timing offset among Active Sidelink UEs   |   | $\mu\text{s}$ | CP/2   | Synchronous  |
| Note 1: {1} is a sequence of nine 0's with one 1 in $(\text{mod}(i,10)+1)$ 'th position.  |   |               |  |  |
| Note 2: The UE is only required to be tested in one of the supported test configurations. |   |               |  |  |

**Table A.9.1.4.1.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements**

| Parameter  | Unit        | Active Sidelink UE <i>i</i><br>( <i>i</i> = 0, ..., 49) |        |
|--|-------------|---|--------|
|  |             | T1  | T2     |
| NR RF Channel Number   | -           | 1   |        |
| Channel Bandwidth<br>( $BW_{channel}$ ) <sup>Note 5</sup>  | MHz         | 20 ( $N_{RB,c} = 50$ ) or 40 ( $N_{RB,c} = 100$ )       |        |
| PSCCH RMC (defined in A.3.21.3)  | -           | CC.1A HD  |        |
| PSSCH RMC (defined in A.3.21.3)  | -           | CD.1A HD  |        |
| $N_{oc}$ <sup>Note1</sup>  | dBm/30 kHz  | -111  | -121   |
| $\hat{E}_s/N_{oc}$ <sup>Note3</sup>  | dB          | 10  |        |
| $\hat{E}_s/I_{ot}$ <sup>Note2,3</sup>  | dB          | 10  |        |
| $\hat{E}_s/N_{oc}$ <sup>Note4</sup>  | dB          | 0   | 20     |
| $\hat{E}_s/I_{ot}$ <sup>Note2,4</sup>  | dB          | 0   | 20     |
| PSSCH-RSRP <sup>1</sup> <sup>Note 2,3</sup>  | dBm/SC S    | -101  | -111   |
| PSSCH -RSRP <sup>2</sup> <sup>Note 2,4</sup>   | dBm/SC S    | -111  | -101   |
| SL-RSSI <sup>1</sup> <sup>Note 2,3</sup>   | dBm/3.6 MHz | -79.79  | -89.79 |
| SL-RSSI <sup>2</sup> <sup>Note 2,4</sup>   | dBm/3.6 MHz | -87.20  | -80.17 |
| Antenna Configuration  | -           | 1x2   |        |
| Propagation Condition  | -           | AWGN  |        |
| <p>Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 2: <math>E_s/I_{ot}</math>, PSSCH-RSRP and SL-RSSI levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 3: For UE 20 to 29, occupying subchannel #1/2</p> <p>Note 4: For UE 0 to 19 and 30 to 49, occupying subchannel #0/3/4</p> <p>Note 5: The UE is only required to be tested in one of the supported test configurations.</p> |             |   |        |

#### A.9.1.4.1.2 Test Requirements

The test time T1 and T2 should be long enough. The rate of PSSCH transmissions on the resources on subchannel #1 or #2 shall be less than 10% during T1. The rate of PSSCH transmissions on the resources on subchannel #1 or #2 shall be more than 90% during T2.

#### A.9.1.4.2 Test for V2X UE Resource Pre-emption

##### A.9.1.4.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource pre-emption for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A. 9.1.4.2.1-1 and A.12. 9.1.4.1-2 below. There is one active V2X sidelink UE in this test. Both the UE under test and the active V2X sidelink UE select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test parameters for GNSS signals are defined in B.4.1. At the beginning of whole test, the test equipment shall send one message with a

SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test needs continuously transmit PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipment are configured such that the active V2X sidelink UE is not transmitting. The UE under test shall transmit SL data and reserve future resources. The resource reservation is decoded by the active V2X sidelink UE. The point in time at which resource reservation from the UE under test is decoded by the active V2X sidelink UE defines the start of time period T2. During T2, the active V2X sidelink UE reserves the same resource as the UE under test with high priority data no later than slot  $n - T_{\text{pre-empt}}$ .

**Table A. 9.1.4.2.1-1: Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements**

| Parameter   |   | Unit | Value  | Comment   |
|---|---|------|--|---|
| NR RF Channel Number  |   |      | 1  | HD carrier in Band n47 and n38  |
| Channel Bandwidth (BW <sub>channel</sub> ) <sup>Note 1</sup>                                      |   | MHz  | 20 (N <sub>RB,c</sub> = 50) or<br>40 (N <sub>RB,c</sub> = 100) |   |
| SCS   |   | kHz  | 30   |   |
| V2X sidelink communication pre-configuration  |   |      | As specified in Table A.3.21.2-1 and A.3.21.2-3                | IE values unless specified otherwise in this test.  |
| sl-TimeResource-r16 included in SL-ResourcePool in SL-ResourcePool in sl-TxPoolSelectedNormal-r16 |   |      | 10000000000000000000   | Indicates the time resource of resource pool within <i>sl-Period</i> . (see TS 38.213 [3])<br>Note that this is for Tx pool.        |
| sl-TimeResource-r16 included in SL-ResourcePool in sl-RxPool-r16                                  |   |      | 11111111111111111111   | Indicates the time resource of resource pool within <i>sl-Period</i> . (see TS 38.213 [3])<br>Note that this is for Rx pool.        |
| sl-NumSubchannel-r16 included in SL-ResourcePool  |   |      | 1  | Indicates the number of subchannels in the corresponding resource pool, which consists of contiguous PRBs only                      |
| sl-SubchannelSize-r16 included in SL-ResourcePool   |   |      | 10   | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB               |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool   |   |      | 10   | Indicates the lowest RB index of the subchannel with the lowest index.  |
| Number of Active Sidelink UEs   |   |      | 1  |   |
| <i>SL-Thres-RSRP</i>  |   |      | 12   | Corresponding -106 dBm as defined in Section 6.3.8 in TS38.331[2]   |
| Active Sidelink UEs   | V2X sidelink Communication preconfiguration           |      | As specified in Table A.3.21.2-1 and A.3.21.2-3                | IE values unless specified otherwise in this test.  |
|   | sl-TimeResource-r16 included in SL-ResourcePool       |      | 11111111111111111111   | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
|   | sl-NumSubchannel-r16 included in SL-ResourcePool      |      | 1  | Indicates the number of sub-channels for TX resource pool   |
|   | sl-StartRB-Subchannel-r16 included in SL-ResourcePool |      | 10   | Indicates the lowest RB index of the subchannel with the lowest index.  |
|   | sl-SubchannelSize-r16 included in SL-ResourcePool     |      | 10   | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB               |
| Timing offset among Active Sidelink Ues   |   | μs   | CP/2   | Synchronous   |
| Note 1: The UE is only required to be tested in one of the supported test configurations.         |   |      |  |   |



**Table A.9.1.4.2.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements**

| Parameter   | Unit   | Active Sidelink UE  |      |
|---|--|---|------|
|   |  | T1  | T2   |
| NR RF Channel Number  | -  | 1   |      |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 3</sup> | MHz  | 20 ( $N_{\text{RB,c}} = 50$ ) or 40 ( $N_{\text{RB,c}} = 100$ ) |      |
| PSCCH RMC (defined in A.3.21.3)                               | -  | CC.1A HD  |      |
| PSSCH RMC (defined in A.3.21.3)                               | -  | CD.1A HD  |      |
| $N_{oc}$ <sup>Note1</sup>                                     | dBm/30 kHz   | N/A   | -100 |
| PSCCH $\hat{E}_s/N_{oc}$                                      | dB   |   | 5    |
| PSSCH $\hat{E}_s/N_{oc}$                                      | dB   |   | 5    |
| PSCCH $\hat{E}_s/I_{ot}$ <sup>Note2</sup>                     | dB   |   | 5    |
| PSSCH $\hat{E}_s/I_{ot}$ <sup>Note2</sup>                     | dB   |   | 5    |
| PSSCH-RSRP <sup>Note 2</sup>                                  | dBm/30kHz  |   | -95  |
| Antenna Configuration   | -  | 1x2   |      |
| Propagation Condition   | -  | AWGN  |      |
| Note 1:   | Interference from other Ues and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |      |
| Note 2:   | Es/lot, PSSCH-RSRP have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |      |
| Note 3:   | The UE is only required to be tested in one of the supported test configurations.  |   |      |

### A.9.1.4.2.2 Test Requirements

The test time T1 and T2 should be long enough. The UE under test is required to trigger resource reselection and not to transmit on the reserved resource at slot n when the high priority reservation is transmitted by the active V2X sidelink UE before  $n-T_{\text{pre-empt}}$ , where

$$T_{\text{pre-empt}} = T_3 + T_{\text{proc},0}$$

$$T_3 = 5 \text{ slots and } T_{\text{proc},0} = 1 \text{ slot for FR1.}$$

The rate of PSSCH transmissions on the resources at slot n shall be less than 10% during repeated tests.

### A.9.1.4.3 Test for V2X UE Resource Re-evaluation

#### A.9.1.4.3.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource re-evaluation for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.3.1-1, A.9.1.4.3.1-2 and A.9.1.4.3.1-3 below. There are 130 active V2X sidelink UEs in this test. The first 100 active V2X sidelink UEs are scheduled with 50ms periodicity. The last 30 active V2X sidelink Ues are aperiodic service UE with retransmission reservation period equaling 15ms.

Both the UE under test and active V2X sidelink Ues select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink Ues. The test parameters for GNSS signals are defined in B.4.1.

The test consists of three duration T0, T1, T2.

During T0, the signal from Test Equipment are configured. The resource occupied by the active V2X sidelink UEs is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold. The test equipment shall just configure the resource pool for the test UE without the MAC PDU for transmission channel configuration.

During T1, the signal from Test Equipment are configured. Some of the resource occupied by the active V2X sidelink Ues is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold and some of the resource occupied by the active V2X sidelink Ues is expected to be included in the resource selection procedure such that the measured PSSCH-RSRP is below the measurement threshold. The test system shall emulate the active V2X sidelink Ues to transmit PSCCH/PSSCH every 50ms according to the RSRP level specified in the Table A. 9.1.4.3.1-2, but UE #0~29 will be silent during T2

At the end of T1, where slot index mod 100 = 99, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test shall be scheduled to periodically transmit PSCCH/PSSCH.

During T2, the additional aperiodic active V2X sidelink UEs from Test Equipment are configured in the beginning 30 slots, and the resource occupied by these active V2X sidelink UEs is expected to be excluded in the resource re-evaluation procedure such that the measured PSSCH-RSRP is above the measurement threshold shown in Table A. 9.1.4.3.1-2. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH with the maximum number of reserved PSCCH/PSSCH resources equalling  $n_2$  and time resource assignment interval as 15ms.

During T2, the test UE is expeted to reselect the resources and transmit the PSCCH/PSSCH in the newly re-evaluated resources.

**Table A.9.1.4.3.1-1: Test Parameters for V2X UE Resource Selection Tests for Re-evaluation**

| Parameter  |   | Unit | Value  | Comment   |
|--|---|------|--|---|
| NR RF Channel Number   |   |      | 1  | HD carrier in Band n47 and n38  |
| Channel Bandwidth (BW <sub>channel</sub> ) <sup>Note 2</sup>   |   | MHz  | 20 (N <sub>RB,c</sub> = 50) or 40 (N <sub>RB,c</sub> = 100)  |   |
| SCS  |   | kHz  | 30   |   |
| V2X sidelink communication pre-configuration   |   |      | As specified in Table A.3.21.2-2   | IE values unless specified otherwise in this test.  |
| sl-TimeResource-r16 included in SL-ResourcePool  |   |      | 11111111111111111111<br>11111111111111111111<br>11111111111111111111<br>11111111111111111111<br>11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool   |   |      | 1  | Indicates the number of sub-channels for TX resource pool   |
| sl-SubchannelSize-r16 included in SL-ResourcePool  |   |      | 10   |   |
| sl-StartRB-Subchannel-r16  |   |      | 0  |   |
| Number of Active Sidelink UEs  |   |      | 130  | Active Sidelink UE i = 0, ..., 129  |
| SL-Thres-RSRP-r16  |   |      | 17   | Corresponding -96 dBm as defined in Section 6.3.5 in TS38.331[2]  |
| Active Sidelink UEs(UE i=0-99)   | V2X sidelink Communication preconfiguration       |      | As specified in Table A.3.21.2-2   | IE values unless specified otherwise in this test.  |
|  | sl-TimeResource-r16 included in SL-ResourcePool   |      | {1 <sub>i</sub> } <sup>Note1</sup>   | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3])       |
|  | sl-NumSubchannel-r16 included in SL-ResourcePool  |      | 1  | Indicates the number of sub-channels for TX resource pool   |
|  | sl-SubchannelSize-r16 included in SL-ResourcePool |      | 10   | Indicates the size of sub-channels for TX resource pool   |
|  | sl-ResourceReservePeriod 2-r16                    | ms   | 50   |   |
| Active Sidelink UEs(UE i= 100-129)   | V2X sidelink Communication preconfiguration       |      | As specified in Table A.3.21.2-2   | IE values unless specified otherwise in this test.  |
|  | sl-TimeResource-r16 included in SL-ResourcePool   |      | {1 <sub>i</sub> } <sup>Note1</sup>   | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3])       |
|  | sl-NumSubchannel-r16 included in SL-ResourcePool  |      | 1  | Indicates the number of sub-channels for TX resource pool   |
|  | sl-SubchannelSize included in SL-ResourcePool     |      | 10   | Indicates the size of sub-channels for TX resource pool   |
|  | sl-MultiReserveResource-r16                       |      | enabled  |   |
|  | sl-MaxNumPerReserve-r16                           |      | n2   |   |
|  | sl-ResourceReservePeriod 2-r16                    |      | 0  | Unit:ms   |
| Timing offset among Active Sidelink UEs  |   | μs   | CP/2   | Synchronous   |
| T0   |   | s    | 1  |   |
| T1   |   | ms   | 50   |   |
| T2   |   | ms   | 50   |   |
| Note 1: {1 <sub>i</sub> } is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position. |   |      |  |   |
| Note 2: The UE is only required to be tested in one of the supported test configurations.            |   |      |  |   |

**Table A.9.1.4.3.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #0...99)**

| Parameter   | Unit   | Active Sidelink UE i<br>(i = 0, ..., 99)          |           |
|---|--|---|-----------|
|   |  | T1  | T2        |
| NR RF Channel Number  | -  | 1   |           |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 7</sup> | MHz  | 20 ( $N_{RB,c} = 50$ ) or 40 ( $N_{RB,c} = 100$ ) |           |
| PSSCH RMC (defined in A.3.21.3)                               | -  | CC.1A HD  |           |
| PSSCH RMC (defined in A.3.21.3)                               | -  | CD.1A HD  |           |
| $N_{oc}$ <sup>Note1</sup>                                     | dBm/SCS  | -103  |           |
| PSSCH1 $\hat{E}_s/N_{oc}$ <sup>Note 3</sup>                   | dB   | 22  | 22        |
| PSSCH2 $\hat{E}_s/N_{oc}$ <sup>Note 4</sup>                   | dB   | 2   | 2         |
| PSSCH3 $\hat{E}_s/N_{oc}$ <sup>Note 5</sup>                   | dB   | 12  | -infinity |
| PSSCH4 $\hat{E}_s/N_{oc}$ <sup>Note 6</sup>                   | dB   | 12  | 12        |
| PSSCH1 $\hat{E}_s/I_{ot}$ <sup>Note2,3</sup>                  | dB   | 22  | 22        |
| PSSCH2 $\hat{E}_s/I_{ot}$ <sup>Note2,4</sup>                  | dB   | 2   | 2         |
| PSSCH3 $\hat{E}_s/I_{ot}$ <sup>Note2,5</sup>                  | dB   | 12  | -infinity |
| PSSCH4 $\hat{E}_s/I_{ot}$ <sup>Note2,6</sup>                  | dB   | 12  | 12        |
| PSSCH -RSRP1 <sup>Note 2, 3</sup>                             | dBm/SCS  | -81   | -81       |
| PSSCH -RSRP2 <sup>Note 2, 4</sup>                             | dBm/SCS  | -101  | -101      |
| PSSCH -RSRP3 <sup>Note 2, 5</sup>                             | dBm/SCS  | -91   | -infinity |
| PSSCH -RSRP4 <sup>Note 2, 6</sup>                             | dBm/SCS  | -91   | -91       |
| Antenna Configuration   | -  | 1x2   |           |
| Propagation Condition   | -  | AWGN  |           |
| Note 1:   | Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |           |
| Note 2:   | $\hat{E}_s/I_{ot}$ , PSSCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |           |
| Note 3:   | UE #50~64 and UE #85~99 will periodically occupy the subchannels on the slot with "#slot index mod 100" = #50-64 and #85-99.   |   |           |
| Note 4:   | UE #30~49 will periodically occupy the subchannels on the slot with "#slot index mod 100" = #30-49.  |   |           |
| Note 5:   | UE #0~29 will periodically occupy the subchannels on the slot with "#slot index mod 100" = #0-29.  |   |           |
| Note 6:   | UE #65~84 will periodically occupy the subchannels on the slot with "#slot index mod 100" = #65-84.  |   |           |
| Note 7:   | The UE is only required to be tested in one of the supported configurations.   |   |           |

**Table A.9.1.4.3.1-3: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #100...129)**

| Parameter   | Unit   | Active Sidelink UE <i>i</i><br>( <i>i</i> = 100, ..., 129)      |     |
|---|--|---|-----|
|   |  | T1  | T2  |
| NR RF Channel Number  | -  | 1   |     |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 4</sup> | MHz  | 20 ( $N_{\text{RB,c}} = 50$ ) or 40 ( $N_{\text{RB,c}} = 100$ ) |     |
| PSCCH RMC (defined in A.3.21.3)                               | -  | CC.1A HD  |     |
| PSSCH RMC (defined in A.3.21.3)                               | -  | CD.1 A HD   |     |
| $N_{oc}$ <sup>Note1</sup>                                     | dBm/SCS  | -103  |     |
| PSSCH $\hat{E}_s/N_{oc}$                                      | dB   | -infinity   | 22  |
| PSSCH $\hat{E}_s/I_{ot}$ <sup>Note2</sup>                     | dB   | -infinity   | 22  |
| PSSCH-RSRP <sup>Note 2, Note 3</sup>                          | dBm/SCS  | -infinity   | -81 |
| Antenna Configuration   | -  | 1x2   |     |
| Propagation Condition   | -  | AWGN  |     |
| Note 1:   | Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |     |
| Note 2:   | Es/Iot, PSSCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |   |     |
| Note 3:   | UE #100~129 will occupy the subchannels on the slots with "#slot index mod 100"= #0-29 during T2.  |   |     |
| Note 4:   | The UE is only required to be tested in one of the supported configurations.   |   |     |

### A.9.1.4.3.2 Test Requirements

The rate of PSSCH transmissions on the resources of the subchannels which are occupied by UE #65-84 shall be more than 90% during T2.

## A.9.1.5 Test for Congestion Control Measurement

### A.9.1.5.1 Test Purpose and Environment

The purpose of this test is to verify the congestion control measurement requirements in section 12.6. For UE supporting NR Uu and sidelink operation, this test will also verify that V2X UE makes correct reporting of an event.

The test parameters are given in Table A.9.1.5.1-1, Table A.9.1.5.1-2, A.9.1.5.1-3 and A.9.1.5.1-4 below. There are 4 active V2X sidelink UEs in this test. The test system shall emulate the active sidelink UE to transmit PSCCH/PSSCH every 50ms. Additionally, For UE supporting NR Uu and sidelink operation, there is an active Cell (Cell 1) in this test. For UE only supporting NR sidelink, There are no active cell and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During T1, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with lower transmission power every 50ms. During T2, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with higher transmission power every 50ms.

For UE supporting NR Uu and sidelink operation, the UE under test and all active sidelink UEs select PCell as synchronization source. In the measurement control information it is indicated to the V2X UE that event-triggered reporting with Event C1 is used.

For UE only supporting NR sidelink, the UE under test and all active sidelink UEs select GNSS as synchronization source. The UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

For UE supporting NR Uu and sidelink operation, Supported test configurations for FR1 NR cell are shown in Table A.9.1.5.1.1-1.

**Table A.9.1.5.1.1-1: Supported Test Configurations for FR1 NR cell (only for UE supporting both NR Uu and sidelink operation)**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                             |
| 2                    | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                             |
| 3                    | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                             |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.9.1.5.1-2: General test parameters for Congestion Control Measurement Test for V2X UE**

| Parameter   |  | Unit          | Value  | Comment   |
|---|--|---------------|--|---|
| NR RF Channel Number  |  |               | 1  | HD carrier in Band n47 or n38   |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 2</sup>   |  | MHz           | 20 ( $N_{\text{RB},c} = 50$ ) or<br>40 ( $N_{\text{RB},c} = 100$ )   |   |
| SCS   |  | kHz           | 30   |   |
| V2X sidelink communication configuration  |  |               | As specified in Table A.3.21.2-1 and A.3.21.2-3  | IE values unless specified otherwise in this test.  |
| sl-TimeResource-r16 included in SL-ResourcePool   |  |               | 11111111111111111111<br>11111111111111111111<br>11111111111111111111<br>11111111111111111111<br>11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool  |  |               | 1  | ENUMERATED {n1}   |
| sl-SubchannelSize included in SL-ResourcePool   |  |               | 10   | ENUMERATED {n10}  |
| sl-StartRB-Subchannel-r16   |  |               | 0  |   |
| <i>threshS-RSSI-CBR</i>   |  |               | 19   | Corresponding -74dBm as defined in Section 6.3.8 in TS38.331[2]   |
| Active Cell <sup>Note 3</sup>   |  |               | Cell 1   |   |
| Number of Active Sidelink UEs every 50ms  |  |               | 4  | Active Sidelink UE $i$ , where $i = 0, 1, 2, 3$   |
| Active Sidelink UEs ( $i = 0, 1, 2, 3$ )  | V2X sidelink Communication configuration         |               | As specified in Table A.3.21.2-1 and A.3.21.2-3  | IE values unless specified otherwise in this test.  |
|   | sl-TimeResource-r16 included in SL-ResourcePool  |               | {1 <sub><math>i</math></sub> } <sup>Note 1</sup>   | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
|   | sl-NumSubchannel-r16 included in SL-ResourcePool |               | 1  |   |
|   | sl-SubchannelSize included in SL-ResourcePool    |               | 10   |   |
| Timing offset between V2X UE and Active Sidelink UEs  |  | $\mu\text{s}$ | CP/2   | Synchronous   |
| c1-Threshold-r16 <sup>Note 3</sup>  |  |               | 2  | Corresponding 0.02 as defined in Section 6.3.2 in TS38.331[2]   |
| sl-CBR-RangeConfigList-r16 <sup>Note 4</sup>  |  |               | [2 100]  | Two ranges are defined by this list: 0 to 0.02 and 0.02 to 1  |
| sl-CR-Limit-r16 <sup>Note 4</sup>   |  |               | 10000 and 10   | Corresponding to the two CBR ranges: if $\text{CBR} > 0.02$ , $\text{CR} \leq 0.001$ , otherwise $\text{CR} > 0.001$                |
| sl-Thres-RSRP-r16 <sup>Note 4</sup>   |  |               | 12   | Configure threshold $< -98.64\text{dBm}/30\text{kHz}$ to ensure not blocking transmission   |
| Hysteresis  |  |               | 0  |   |
| Time To Trigger   |  | s             | 0  |   |
| Filter coefficient  |  |               | 0  | L3 filtering is not used  |
| T1  |  | s             | 5  |   |
| T2  |  | s             | 5  |   |
| Note 1: {1 <sub><math>i</math></sub> } is a sequence of ninety nine 0's with one 1 in $i+1$ 'th position. |  |               |  |   |
| Note 2: The UE is only required to be tested in one of the channel bandwidths.                            |  |               |  |   |
| Note 3: Only for UE supporting both Uu and sidelink operation.  |  |               |  |   |
| Note 4: Only for UE supporting sidelink operation but not supporting Uu.                                  |  |               |  |   |



**Table A.9.1.5.1-3: Active sidelink UE specific test parameters for Congestion Control Measurement Test for V2X UE**

| Parameter   | Unit   | Active Sidelink UE $i$ ( $i = 0, 1, 2, 3$ )                     |        |
|---|--|---|--------|
|   |  | T1  | T2     |
| NR RF Channel Number  |  | 1   |        |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 7</sup> | MHz  | 20 ( $N_{\text{RB},c} = 50$ ) or 40 ( $N_{\text{RB},c} = 100$ ) |        |
| PSCCH RMC (defined in A.3.21.3)                               |  | CC.1A HD  |        |
| PSSCH RMC (defined in A.3.21.3)                               |  | CD.1A HD  |        |
| $N_{oc}$ <sup>Note 1</sup>                                    | dBm/30 kHz   | -103  |        |
| $\hat{E}_s/N_{oc}$  | dB   | 4.35  | 10.32  |
| PSSCH-RSRP <sup>Note 2</sup>                                  | dBm/30 kHz   | -98.65  | -92.68 |
| SL-RSSI1 <sup>Note 2,3</sup>                                  | dBm/3.6 MHz  | -76.5   | -71.5  |
| SL-RSSI2 <sup>Note 2,4</sup>                                  | dBm/3.6 MHz  | -82.21  | -82.21 |
| Io1 <sup>Note 2,5</sup>                                       | dBm/3.6 MHz  | -76.5   | -71.5  |
| Io2 <sup>Note 2,6</sup>                                       | dBm/3.6 MHz  | -82.21  | -82.21 |
| Propagation Condition   | -  | AWGN  |        |
| Note 1:   | Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |        |
| Note 2:   | PSSCH $E_s/N_{oc}$ , PSSCH-RSRP, SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.                       |   |        |
| Note 3:   | SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with "SFN mod 5 = 0".  |   |        |
| Note 4:   | SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with "SFN mod 5 = 0" and the slot# 0-9 with "SFN mod 5 = 1, ..., 4".   |   |        |
| Note 5:   | Io1 is the Io level measured on the slot# 0 - 3 with "SFN mod 5 = 0".  |   |        |
| Note 6:   | Io2 is the Io level measured on the slot# 4-9 with "SFN mod 5 = 0" and the slot# 0-9 with "SFN mod 5 = 1, ..., 4".   |   |        |
| Note 7:   | The UE is only required to be tested in one of the supported test configurations.  |   |        |

**Table A.9.1.5.1-4: Cell Test Parameters for Congestion Control Measurement Test for V2X UE (only for UE supporting both NR Uu and sidelink operation)**

| Parameter  |              | Unit         | Cell 1                 |
|--|--------------|--------------|------------------------|
| RF Channel Number  |              |              | 2                      |
| Duplex Mode  | Config 1     |              | FDD                    |
|  | Config 2,3   |              | TDD                    |
| TDD configuration  | Config 1     |              | Not Applicable         |
|  | Config 2     |              | TDDConf.1.1            |
|  | Config 3     |              | TDDConf.2.1            |
| Channel Bandwidth<br>( $BW_{channel}$ )  | Config 1,2   | MHz          | 10: $N_{RB,c} = 52$    |
|  | Config 3     |              | 40: $N_{RB,c} = 106$   |
| Initial BWP Configuration  |              |              | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP Configuration  |              |              | DLBWP.1.1<br>ULBWP.1.1 |
| DRX Cycle  |              |              | N/A                    |
| PDSCH Reference<br>measurement<br>channel  | Config 1     |              | SR.1.1 FDD             |
|  | Config 2     |              | SR.1.1 TDD             |
|  | Config 3     |              | SR.2.1 TDD             |
| CORESET Reference<br>Channel   | Config 1     |              | CR.1.1 FDD             |
|  | Config 2     |              | CR.1.1 TDD             |
|  | Config 3     |              | CR.2.1 TDD             |
| Dedicated CORESET<br>Reference Channel   | Config 1     |              | CCR.1.1 FDD            |
|  | Config 2     |              | CCR.1.1 TDD            |
|  | Config 3     |              | CCR.2.1 TDD            |
| SSB configuration  | Config 1,2   |              | SSB.1 FR1              |
|  | Config 3     |              | SSB.2 FR1              |
| SMTTC Configuration  |              |              | SMTTC.2                |
| OCNG Patterns  |              |              | OP.1                   |
| EPRE ratio of PSS to SSS   |              | dB           | 0                      |
| EPRE ratio of PBCH DMRS to SSS   |              |              |                        |
| EPRE ratio of PBCH to PBCH DMRS  |              |              |                        |
| EPRE ratio of PDCCH DMRS to SSS  |              |              |                        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |              |                        |
| EPRE ratio of PDSCH DMRS to SSS  |              |              |                        |
| EPRE ratio of PDSCH to PDSCH   |              |              |                        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |              |              |                        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |              |                        |
| $N_{oc}$ <sup>Note2</sup>  | Config 1,2,3 | dBm/15 kHz   | -98                    |
| $N_{oc}$ <sup>Note2</sup>  | Config 1,2   | dBm/SCS      | -98                    |
|  | Config 3     |              | -95                    |
| $\hat{E}_s / N_{oc}$   |              | dB           | 3                      |
| SS-RSRP <sup>Note3</sup>   | Config 1,2   | dBm/SCS      | -95                    |
|  | Config 3     |              | -92                    |
| $I_o$ <sup>Note 3</sup>  | Config 1,2   | dBm/9.36 MHz | -65.2                  |
|  | Config 3     | dBm/38.1 MHz | -59.2                  |
| Propagation Condition  |              |              | AWGN                   |
| Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |              |                        |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |              |                        |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |              |                        |

### A.9.1.5.2 Test Requirements

For UEs that support NR Uu and sidelink operation, the UEs shall not send event C1 triggered measurement reports during T1 and shall send event C1 triggered measurement reports during T2.

For UEs that support sidelink operation only, the UE channel occupancy ratio shall be larger than 0.001 during T1, and the UE channel occupancy ratio shall be no larger than 0.001 during T2.

The rate of correct events observed during repeated tests shall be at least 98%.

## A.9.1.6 Test for Interruption

### A.9.1.6.1 Test for Interruption to WAN due to V2X Sidelink Communication

#### A.9.1.6.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to interruptions due to V2X sidelink communication defined in clause 12.7.1 under the following additional conditions:

- The UE is out of coverage on the V2X sidelink carrier and is associated with a serving cell on a non-V2X sidelink carrier

This test is applicable for V2X sidelink communication capable UEs that support inter-band concurrent V2X sidelink operation.

For this test, the UE is triggered by the test loop function or the upper layers to monitor V2X sidelink communication.

The test parameters are given in Table A.9.1.6.1.1-1, Table A.9.1.6.1.1-2, Table A.9.1.6.1.1-3 and Table A.9.1.6.1.1-4. The test consists of one active cell (PCell) on the serving RF channel 1, and there are no active cells on RF channel 2. On RF channel 2, the test consists of 8 active Sidelink UEs in this test transmitting V2X sidelink communication. The UE under test and all active sidelink UEs select the active cell as synchronization source.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the UE is in RRC\_IDLE and monitoring the V2X sidelink communication transmission from other active Sidelink UEs on the V2X sidelink communication resources.

During T2, the test system establishes a RRC connection with the UE. No PDSCH traffic is scheduled for UE, and the UE is expected to transmit *SidelinkUEInformationNR* indicating *sl-RxInterestedFreqList*. On reception of *SidelinkUEInformationNR*, the test system shall send RRC reconfiguration message to the UE and wait for the UE to respond with RRC reconfiguration complete message before transitioning to T3. If the UE does not transmit *SidelinkUEInformationNR* for up to 2 second, the test system shall transition to T3.

During T3, the UE is scheduled with PDSCH traffic on PCell downlink. The test system will count the missed ACK/NACKs during T3 to verify the allowed interruptions during V2X sidelink communication (no missed ACK/NACKs are allowed).

**Table A.9.1.6.1.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description  |
|---------------|--|
| 1             | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                             |
| 2             | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz                             |
| 3             | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                             |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR1 |

Table A.9.1.6.1.1-2: Test Parameters for Interruptions due to V2X Sidelink Communication

| Parameter           | Unit | Value  | Comment  |
|---------------------|------|--|--|
| RF Channel Number   | -    | 1, 2   | RF channel 1 is non-V2X sidelink carrier<br>RF channel 2 is V2X sidelink carrier |
| SCS                 | kHz  | 30   |  |
| Active cell         | -    | Cell 1   | PCell on RF channel number 1   |
| CP length of Cell 1 | -    | Normal   |  |
| T1                  | s    | 5.12   |  |
| T2                  | s    | Up to receiving RRC reconfiguration setup complete from the UE, or up to 2 second if UE does not transmit <i>SidelinkUEInformationNR</i> during this period. |  |
| T3                  | s    | 10   |  |

Table A.9.1.6.1.1-3: Slidelink Communication Configuration for Interruptions due to V2X Sidelink Communication

| Parameter   | Unit  | Value   | Comment  |  |
|---|---|---|--|--|
| RF Channel Number   | -   | 2   | HD carrier in Band n47 or n38                      |  |
| Channel Bandwidth ( $BW_{\text{channel}}$ ) <sup>Note 1</sup> | MHz   | 20 ( $N_{RB,c} = 50$ ) or 40 ( $N_{RB,c} = 100$ ) |  |  |
| V2X sidelink Communication configuration                      | -   | As specified in section A.3.21.2                  | IE values unless specified otherwise in this test. |  |
| Number of Active Sidelink UEs                                 | -   | 8   | Active Sidelink UE $i = 0, \dots, 7$               |  |
| Active Sidelink UEs (UE $i = 0, \dots, 7$ )                   | V2X sidelink Communication configuration              | -   | As specified in section A.3.21.2                   | IE values unless specified otherwise in this test.   |
|   | PSCCH Reference Measurement Channel                   | -   | CC.1A HD   | As specified in Table A.3.21.3-1   |
|   | PSSCH Reference Measurement Channel                   | -   | CD.1A HD   | As specified in Table A.3.21.3-2   |
|   | sl-NumSubchannel-r16 included in SL-ResourcePool      | -   | 1  | Indicates the number of sub-channels for TX resource pool  |
|   | sl-StartRB-Subchannel-r16 included in SL-ResourcePool | -   | $i$  | Indicates the lowest RB index of the subchannel with the lowest index for active Sidelink UE $i = 0, \dots, 7$ . |
|   | PSBCH-RSRP  | dBm/30kHz   | -95  |  |

Note 1: The UE is only required to be tested in one of the supported test configurations.

**Table A.9.1.6.1.1-4: Cell specific test parameters for interruptions due to V2X sidelink communication**

| Parameter   |              | Unit         | Cell 1                      |           |            |
|---|--------------|--------------|-----------------------------|-----------|------------|
|   |              |              | T1                          | T2        | T3         |
| RF Channel Number   |              |              | 1                           |           |            |
| UE RRC state  |              |              | IDLE                        | CONNECTED |            |
| Duplex Mode   | Config 1     |              | FDD                         |           |            |
|   | Config 2,3   |              | TDD                         |           |            |
| TDD configuration   | Config 1     |              | Not Applicable              |           |            |
|   | Config 2     |              | TDDConf.1.1                 |           |            |
|   | Config 3     |              | TDDConf.2.1                 |           |            |
| Channel Bandwidth (BW <sub>channel</sub> )  | Config 1,2   | MHz          | 10: N <sub>RB,c</sub> = 52  |           |            |
|   | Config 3     |              | 40: N <sub>RB,c</sub> = 106 |           |            |
| Initial BWP Configuration   |              |              | DLBWP.0.1<br>ULBWP.0.1      |           |            |
| Dedicated BWP Configuration   |              |              | DLBWP.1.1<br>ULBWP.1.1      |           |            |
| DRX Cycle   |              |              | N/A                         |           |            |
| PDSCH Reference measurement channel   | Config 1     |              | N/A                         | None      | SR.1.1 FDD |
|   | Config 2     |              | N/A                         | None      | SR.1.1 TDD |
|   | Config 3     |              | N/A                         | None      | SR.2.1 TDD |
| CORESET Reference Channel   | Config 1     |              | CR.1.1 FDD                  |           |            |
|   | Config 2     |              | CR.1.1 TDD                  |           |            |
|   | Config 3     |              | CR.2.1 TDD                  |           |            |
| Dedicated CORESET Reference Channel   | Config 1     |              | CCR.1.1 FDD                 |           |            |
|   | Config 2     |              | CCR.1.1 TDD                 |           |            |
|   | Config 3     |              | CCR.2.1 TDD                 |           |            |
| SSB configuration   | Config 1,2   |              | SSB.1 FR1                   |           |            |
|   | Config 3     |              | SSB.2 FR1                   |           |            |
| SMTC Configuration  |              |              | SMTC.2                      |           |            |
| OCNG Patterns   |              |              | OP.1                        |           |            |
| EPRE ratio of PSS to SSS  |              | dB           | 0                           |           |            |
| EPRE ratio of PBCH DMRS to SSS  |              |              |                             |           |            |
| EPRE ratio of PBCH to PBCH DMRS   |              |              |                             |           |            |
| EPRE ratio of PDCCH DMRS to SSS   |              |              |                             |           |            |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |              |                             |           |            |
| EPRE ratio of PDSCH DMRS to SSS   |              |              |                             |           |            |
| EPRE ratio of PDSCH to PDSCH  |              |              |                             |           |            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |              |              |                             |           |            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |              |                             |           |            |
| $N_{oc}$ <sup>Note2</sup>   | Config 1,2,3 | dBm/15 kHz   | -98                         |           |            |
| $N_{oc}$ <sup>Note2</sup>   | Config 1,2   | dBm/SCS      | -98                         |           |            |
|   | Config 3     |              | -95                         |           |            |
| $\hat{E}_s / N_{oc}$  |              | dB           | 3                           |           |            |
| SS-RSRP <sup>Note3</sup>  | Config 1,2   | dBm/SCS      | -95                         |           |            |
|   | Config 3     |              | -92                         |           |            |
| I <sub>o</sub> <sup>Note 3</sup>  | Config 1,2   | dBm/9.36 MHz | -65.3                       |           |            |
|   | Config 3     | dBm/38.1 MHz | -59.2                       |           |            |
| Antenna Configuration   |              |              | 1x2                         |           |            |
| Propagation Condition   |              |              | AWGN                        |           |            |
| <p>Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |              |              |                             |           |            |

**A.9.1.6.1.2 Test Requirements**

The UE shall be continuously scheduled on PCell on RF channel 1 during T3. During T3, 100% of all expected ACK/NACKs shall be transmitted by the V2X UE.

## A.10 EN-DC Tests with NR PSCell under CCA and Other NR Cells in FR1

*Editor's note: Test cases for EN-DC with NR PSCell under CCA and SCell under CCA are also included here.*

### A.10.1 RRC\_CONNECTED state mobility

#### A.10.1.1 RRC connection mobility control

##### A.10.1.1.1 Random Access

##### A.10.1.1.1.1 4-step RA type contention-based random access for NR PSCell with CCA

##### A.10.1.1.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in clause 6.2.2A.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7A.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a licensed band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.1.1.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.1.1.1-2.

**Table A.10.1.1.1.1-1: Supported test configurations for contention based random access test in FR1 for PSCell with CCA**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 2      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.10.1.1.1.1-2: General test parameters for contention based random access test in FR1 for PSCell with CCA**

| Parameter   |                      | Unit       | Test-1                              | Comments   |  |
|---|----------------------|------------|-------------------------------------|--|--|
| SSB Configuration   | Note 4, 6            | Config 1,2 | SSB.1 CCA                           | As defined in A.3.10A  |  |
|   | Note 5, 6            | Config 1,2 | SSB.2 CCA                           | As defined in A.3.10A  |  |
| DBT Window Configuration                                      |                      | Config 1,2 | DBT.1                               | As specified in A.3.28.1   |  |
| DL CCA model  |                      | Config 1,2 | As specified in A.3.26.2.1          |  |  |
| UL CCA model  |                      | Config 1,2 | As specified in A.3.26.2.2          |  |  |
| Duplex Mode for Cell 2  |                      | Config 1,2 | TDD                                 |  |  |
| TDD Configuration   |                      | Config 1,2 | TDDConf.1.1 CCA                     |  |  |
| OCNG Pattern <sup>Note 1</sup>                                |                      |            | OCNG pattern 1                      | As defined in A.3.2.1.   |  |
| PDSCH parameters <sup>Note 3</sup>                            |                      | Config 1,2 | SR.1.1 CCA                          | As defined in A.3.1A.1.  |  |
| NR RF Channel Number  |                      |            | 1                                   |  |  |
| EPRE ratio of PSS to SSS                                      |                      | dB         | 0                                   |  |  |
| EPRE ratio of PBCH_DMRS to SSS                                |                      | dB         |                                     |  |  |
| EPRE ratio of PBCH to PBCH_DMRS                               |                      | dB         |                                     |  |  |
| EPRE ratio of PDCCH_DMRS to SSS                               |                      | dB         |                                     |  |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                             |                      | dB         |                                     |  |  |
| EPRE ratio of PDSCH_DMRS to SSS                               |                      | dB         |                                     |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                             |                      | dB         |                                     |  |  |
| SSB with index 0  |                      | dB         |                                     | 3  | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|   | $\hat{E}_s / I_{ot}$ |            |                                     |  |  |
|   | $N_{oc}$             | Config 1,2 | dBm/15kHz                           | -101   |  |
|   | $\hat{E}_s / N_{oc}$ |            | dB                                  | 3  |  |
|   | SS-RSRP              |            | dBm/ SCS                            | -95  |  |
| SSB with index 1  |                      | dB         | -17                                 | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |  |
|   | $\hat{E}_s / I_{ot}$ |            |                                     |  |  |
|   | $N_{oc}$             | Config 1,2 | dBm/15kHz                           |  | -101   |
|   | $\hat{E}_s / N_{oc}$ |            | dB                                  |  | -17  |
|   | SS-RSRP              |            | dBm/ SCS                            | -115   |  |
| $I_o$ <sup>Note 2</sup>                                       |                      | Config 1,2 | dBm                                 | -62.2/38.16MHz   | For symbols without SSB index 1  |
| ss-PBCH-BlockPower  |                      |            | dBm/ SCS                            | -5   | As defined in clause 6.3.2 in TS 38.331 [2].                                     |
| Configured UE transmitted power ( $P_{CMAX, f,c}$ )           |                      |            | dBm                                 | 23   | As defined in clause 6.2.4 in TS 38.101-1.                                       |
| PRACH Configuration   |                      |            | FR1 PRACH configuration 1 under CCA | As defined in A.3.8A.2.  |  |
| DL CCA probability  |                      | Note 4, 6  |                                     | 0.9375   |  |
| $P_{CCA\_DL}$   |                      | Note 5, 6  |                                     | 0.75 / 0.75  |  |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                               |                      |            |                                     | 4  |  |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                               |                      |            |                                     | Inf  |  |
| UL CCA probability  |                      | Note 4, 6  |                                     | 0.87   |  |
| $P_{CCA\_UL}$   |                      | Note 5, 6  |                                     | 0.75   |  |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                               |                      |            |                                     | 5  |  |
| $W_{CCA\_UL}$ <sup>Note 8</sup>                               |                      |            |                                     | Inf  |  |
| Semi-static channel access config period <sup>Note 4, 6</sup> |                      |            | ms                                  | 2  |  |
| Propagation Condition   |                      |            | -                                   | AWGN   |  |



|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |
| Note 2: | SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.   |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |
| Note 7: | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |
| Note 8: | A window $W_{CCA\_DL}=W_{CCA\_UL}=Inf$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.   |

#### A.10.1.1.1.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.10.1.1.1.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2A.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*, if the UL CCA is successful.

The three requirements below are relevant for all cases of PRACH transmissions described within the whole clause A.10.1.1.1.2:

- The System Simulator shall implement the UL CCA model of A.3.26.2 for the RACH occasions where PRACH transmissions are expected. The System Simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
- In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.10.1.1.1.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 transmission is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.10.1.1.1.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.10.1.1.1.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2A.2.1.4, the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

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

#### A.10.1.1.1.1.2.5 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2A.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

### A.10.1.1.1.2 4-step RA type non-contention based random access for NR PSCell with CCA

#### A.10.1.1.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in clause 6.2.2A.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7A.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a licensed band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.2.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.2.1-2.

**Table A.10.1.1.2.1-1: Supported test configurations for non-contention based random access test in FR1 for PSCell with CCA**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 2      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.10.1.1.1.2.1-2: General test parameters for non-contention based random access test in FR1 for PSCell with CCA**

| Parameter   |                      | Unit       | Test-1                              | Comments                                     |  |
|---|----------------------|------------|-------------------------------------|--|--|
| SSB Configuration   | Note 4, 6            | Config 1,2 | SSB.1 CCA                           | As defined in A.3.10A                        |  |
|   | Note 5, 6            | Config 1,2 | SSB.2 CCA                           | As defined in A.3.10A                        |  |
| DBT Window Configuration                                      |                      | Config 1,2 | DBT.1                               | As specified in A.3.28.1                     |  |
| DL CCA model  |                      | Config 1,2 | As specified in A.3.26.2.1          |  |  |
| UL CCA model  |                      | Config 1,2 | As specified in A.3.26.2.2          |  |  |
| Duplex Mode for Cell 2  |                      | Config 1,2 | TDD                                 |  |  |
| TDD Configuration   |                      | Config 1,2 | TDDConf.1.1 CCA                     |  |  |
| OCNG Pattern <sup>Note 1</sup>                                |                      |            | OCNG pattern 1                      | As defined in A.3.2.1.                       |  |
| PDSCH parameters <sup>Note 3</sup>                            |                      | Config 1,2 | SR.1.1 CCA                          | As defined in A.3.1A.1.                      |  |
| NR RF Channel Number  |                      |            | 1                                   |  |  |
| EPRE ratio of PSS to SSS                                      |                      | dB         | 0                                   |  |  |
| EPRE ratio of PBCH_DMRS to SSS                                |                      | dB         |                                     |  |  |
| EPRE ratio of PBCH to PBCH_DMRS                               |                      | dB         |                                     |  |  |
| EPRE ratio of PDCCH_DMRS to SSS                               |                      | dB         |                                     |  |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                             |                      | dB         |                                     |  |  |
| EPRE ratio of PDSCH_DMRS to SSS                               |                      | dB         |                                     |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                             |                      | dB         |                                     |  |  |
| SSB with index 0  | $\hat{E}_s / I_{ot}$ |            | dB                                  | 3  | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1,2 | dBm/15kHz                           | -101   |  |
|   | $\hat{E}_s / N_{oc}$ |            | dB                                  | 3  |  |
|   | SS-RSRP              |            | dBm/ SCS                            | -95  |  |
| SSB with index 1  | $\hat{E}_s / I_{ot}$ |            | dB                                  | -17  | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1,2 | dBm/15kHz                           | -101   |  |
|   | $\hat{E}_s / N_{oc}$ |            | dB                                  | -17  |  |
|   | SS-RSRP              |            | dBm/ SCS                            | -115   |  |
| $I_o$ <sup>Note 2</sup>                                       |                      | Config 1,2 | dBm                                 | -62.2/38.16MHz                               | For symbols without SSB index 1  |
| ss-PBCH-BlockPower  |                      | dBm/ SCS   | -5                                  | As defined in clause 6.3.2 in TS 38.331 [2]. |  |
| Configured UE transmitted power ( $P_{C_{MAX, f,c}}$ )        |                      | dBm        | 23                                  | As defined in clause 6.2.4 in TS 38.101-1.   |  |
| PRACH Configuration   |                      |            | FR1 PRACH configuration 2 under CCA | As defined in A.3.8A.2.                      |  |
| DL CCA probability  | Note 4, 6            |            | 0.9375                              |  |  |
| $P_{CCA\_DL}$   | Note 5, 6            |            | 0.75 / 0.75                         |  |  |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                               |                      |            | 4                                   |  |  |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                               |                      |            | Inf                                 |  |  |
| UL CCA probability  | Note 4, 6            |            | 0.87                                |  |  |
| $P_{CCA\_UL}$   | Note 5, 6            |            | 0.75                                |  |  |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                               |                      |            | 5                                   |  |  |
| $W_{CCA\_UL}$ <sup>Note 8</sup>                               |                      |            | Inf                                 |  |  |
| Semi-static channel access config period <sup>Note 4, 6</sup> |                      | ms         | 2                                   |  |  |
| Propagation Condition   |                      | -          | AWGN                                |  |  |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |
| Note 2: | SS-RSRP, Es/lot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.   |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |
| Note 7: | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |
| Note 8: | A window $W_{CCA\_DL}=W_{CCA\_UL}=\text{Inf}$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.  |

#### A.10.1.1.1.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.10.1.1.1.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2A.2.2.1 for SSB-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

The three requirements below are relevant for all cases of PRACH transmissions described within the whole clause A.10.1.1.1.2.2:

- The System Simulator shall implement the UL CCA model of A.3.26.2 for the RACH occasions where PRACH transmissions are expected. The System Simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
- In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.10.1.1.1.2.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.10.1.1.1.2.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.10.1.1.1.3 2-step RA type contention-based random access for NR PSCell with CCA

##### A.10.1.1.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in clause 6.2.2A.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7A.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a licensed band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.1.3.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.1.3.1-2.

**Table A.10.1.1.1.3.1-1: Supported test configurations for 2-step RA type contention based random access test in FR1 for PSCell with CCA**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 2      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.10.1.1.1.3.1-2: General test parameters for 2-step RA type contention based random access test in FR1 for PSCell with CCA**

| Parameter   |                           | Unit       | Test-1                     | Comments                           |   |
|---|---------------------------|------------|----------------------------|------------------------------------|---|
| SSB Configuration   | Note 4, 6                 | Config 1,2 | SSB.1 CCA                  | As defined in A.3.10A              |   |
|   | Note 5, 6                 | Config 1,2 | SSB.2 CCA                  | As defined in A.3.10A              |   |
| DBT Window Configuration                                      |                           | Config 1,2 | DBT.1                      | As specified in A.3.28.1           |   |
| DL CCA model  |                           | Config 1,2 | As specified in A.3.26.2.1 |                                    |   |
| UL CCA model  |                           | Config 1,2 | As specified in A.3.26.2.2 |                                    |   |
| Duplex Mode for Cell 2  |                           | Config 1,2 | TDD                        |                                    |   |
| TDD Configuration   |                           | Config 3,4 | TDDConf.1.1 CCA            |                                    |   |
| OCNG Pattern <sup>Note 1</sup>                                |                           |            | OCNG pattern 1             | As defined in A.3.2.1.             |   |
| PDSCH parameters <sup>Note 3</sup>                            |                           | Config 1,2 | SR.1.1 CCA                 | As defined in A.3.1A.1.            |   |
| NR RF Channel Number  |                           |            | 1                          |                                    |   |
| EPRE ratio of PSS to SSS                                      |                           | dB         | 0                          |                                    |   |
| EPRE ratio of PBCH_DMRS to SSS                                |                           | dB         |                            |                                    |   |
| EPRE ratio of PBCH to PBCH_DMRS                               |                           | dB         |                            |                                    |   |
| EPRE ratio of PDCCH_DMRS to SSS                               |                           | dB         |                            |                                    |   |
| EPRE ratio of PDCCH to PDCCH_DMRS                             |                           | dB         |                            |                                    |   |
| EPRE ratio of PDSCH_DMRS to SSS                               |                           | dB         |                            |                                    |   |
| EPRE ratio of PDSCH to PDSCH_DMRS                             |                           | dB         |                            |                                    |   |
| SSB with index 0  | $\hat{E}_s / I_{ot}$      |            |                            | dB                                 | 3   |
|   | $N_{oc}$                  | Config 1,2 | dBm/15kHz                  | -101                               |   |
|   | $\hat{E}_s / N_{oc}$      |            | dB                         | 3                                  |   |
|   | SS-RSRP <sup>Note 2</sup> |            | dBm/ SCS                   | -95                                |   |
| SSB with index 1  | $\hat{E}_s / I_{ot}$      |            | dB                         | -17                                | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|   | $N_{oc}$                  | Config 1,2 | dBm/15kHz                  | -101                               |   |
|   | $\hat{E}_s / N_{oc}$      |            | dB                         | -17                                |   |
|   | SS-RSRP <sup>Note 2</sup> |            | dBm/ SCS                   | -115                               |   |
| Io  |                           | Config 1,2 | dBm                        | -62.2/38.16MHz                     | For symbols without SSB index 1   |
| ss-PBCH-BlockPower  |                           |            | dBm/ SCS                   | -5                                 | As defined in clause 6.3.2 in TS 38.331 [2].  |
| Configured UE transmitted power ( $P_{C_{MAX, f,c}}$ )        |                           |            | dBm                        | 23                                 | As defined in clause 6.2.4 in TS 38.101-1.  |
| MsgA Configuration  |                           |            |                            | FR1 MsgA configuration 1 under CCA | As defined in A.3.20A.2.  |
| <i>msgA-RSRP-ThresholdSSB</i>                                 |                           |            | dBm                        | RSRP_51                            | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].            |
| DL CCA probability  | Note 4, 6                 |            |                            | 0.9375                             |   |
|   | $P_{CCA\_DL}$             | Note 5, 6  |                            | 0.75 / 0.75                        |   |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                               |                           |            |                            | 4                                  |   |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                               |                           |            |                            | Inf                                |   |
| UL CCA probability  | Note 4, 6                 |            |                            | 0.87                               |   |
|   | $P_{CCA\_UL}$             | Note 5, 6  |                            | 0.75                               |   |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                               |                           |            |                            | 5                                  |   |
| $W_{CCA\_UL}$ <sup>Note 8</sup>                               |                           |            |                            | Inf                                |   |
| Semi-static channel access config period <sup>Note 4, 6</sup> |                           | ms         |                            | 2                                  |   |
| Propagation Condition   |                           | -          |                            | AWGN                               |   |



|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |
| Note 2: | SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.   |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |
| Note 7: | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |
| Note 8: | A window $W_{CCA\_DL}=W_{CCA\_UL}=Inf$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.   |

#### A.10.1.1.1.3.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.10.1.1.1.3.2.1 MsgA Transmission

To test the UE behaviour specified in Clause 6.2.2A.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*, if the UL CCA is successful.

below are relevant for all cases of MsgA transmissions described within the clause A.10.1.1.1.3.2:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.
- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure. In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.10.1.1.1.3.2.2 MsgB Reception

To test the UE behaviour specified in Clause 6.2.2A.3.1.2 the System Simulator shall transmit a MsgB with fallbackRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 if the MsgB with a fallbackRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble .

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.10.1.1.1.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.1.3 the System Simulator shall transmit a MsgB with fallbackRAR containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.10.1.1.1.4 2-step RA type non-contention based random access for NR PSCell with CCA

#### A.10.1.1.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in clause 6.2.2A.3 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Cell 1 is on a licensed band and cell 2 is subjected to CCA. Supported test parameters are shown in Table A.10.1.1.1.4.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.10.1.1.1.4.1-2.

**Table A.10.1.1.1.4.1-1: Supported test configurations for non-contention based random access test for 2-step RA type in FR1 for PSCell with CCA**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 2      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations depending on UE capability |

**Table A.10.1.1.4.1-2: General test parameters for non-contention based random access test for 2-step RA type in FR1 for PSCell with CCA**

| Parameter  |                      | Unit       | Test-1                     | Comments  |  |
|--|----------------------|------------|----------------------------|---|--|
| SSB Configuration                                  | Note 4, 6            | Config 1,2 | SSB.1 CCA                  | As defined in A.3.10A   |  |
|  | Note 5, 6            | Config 1,2 | SSB.2 CCA                  | As defined in A.3.10A   |  |
| DBT Window Configuration                           |                      | Config 1,2 | DBT.1                      | As specified in A.3.28.1  |  |
| DL CCA model                                       |                      | Config 1,2 | As specified in A.3.26.2.1 |   |  |
| UL CCA model                                       |                      | Config 1,2 | As specified in A.3.26.2.2 |   |  |
| Duplex Mode for Cell 2                             |                      | Config 1,2 | TDD                        |   |  |
| TDD Configuration                                  |                      | Config 1,2 | TDDConf.1.1 CCA            |   |  |
| OCNG Pattern <sup>Note 1</sup>                     |                      |            | OCNG pattern 1             | As defined in A.3.2.1.  |  |
| PDSCH parameters <sup>Note 3</sup>                 |                      | Config 1,2 | SR.1.1 CCA                 | As defined in A.3.1A.1.   |  |
| NR RF Channel Number                               |                      |            | 1                          |   |  |
| EPRE ratio of PSS to SSS                           |                      | dB         | 0                          |   |  |
| EPRE ratio of PBCH_DMRS to SSS                     |                      | dB         |                            |   |  |
| EPRE ratio of PBCH to PBCH_DMRS                    |                      | dB         |                            |   |  |
| EPRE ratio of PDCCH_DMRS to SSS                    |                      | dB         |                            |   |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                  |                      | dB         |                            |   |  |
| EPRE ratio of PDSCH_DMRS to SSS                    |                      | dB         |                            |   |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                  |                      | dB         |                            |   |  |
| SSB with index 0                                   | $\hat{E}_s / I_{ot}$ |            | 3                          | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |  |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz<br>z             |   |  |
|  | $\hat{E}_s / N_{oc}$ |            | 3                          |   |  |
|  | SS-RSRP              |            | dBm/SCS                    |   | -95  |
| SSB with index 1                                   | $\hat{E}_s / I_{ot}$ |            | -17                        | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |  |
|  | $N_{oc}$             | Config 1,2 | dBm/15kHz<br>z             |   |  |
|  | $\hat{E}_s / N_{oc}$ |            | -17                        |   |  |
|  | SS-RSRP              |            | dBm/SCS                    |   | -115   |
| $I_o$ <sup>Note 2</sup>                            |                      | Config 1,2 | dBm                        | -62.2/38.16MHz  | For symbols without SSB index 1  |
| ss-PBCH-BlockPower                                 |                      |            | dBm/SCS                    | -5  | As defined in clause 6.3.2 in TS 38.331 [2].                               |
| Configured UE transmitted power ( $P_{CMAX,f,c}$ ) |                      |            | dBm                        | 23  | As defined in clause 6.2.4 in TS 38.101-1.                                 |
| MsgA Configuration                                 |                      |            |                            | FR1 MsgA configuration 2 under CCA  | As defined in A.3.20A.2.   |
| <i>msgA-RSRP-ThresholdSSB</i>                      |                      |            | dBm                        | RSRP_51   | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| DL CCA probability                                 |                      | Note 4, 6  |                            | 0.9375  |  |
| $P_{CCA\_DL}$                                      |                      | Note 5, 6  |                            | 0.75 / 0.75   |  |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                    |                      |            |                            | 4   |  |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                    |                      |            |                            | Inf   |  |
| UL CCA probability                                 |                      | Note 4, 6  |                            | 0.87  |  |
| $P_{CCA\_UL}$                                      |                      | Note 5, 6  |                            | 0.75  |  |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                    |                      |            |                            | 5   |  |

|   |  |      |  |
|---|--|------|--|
| $W_{CCA\_UL}$ <small>Note 8</small>                               |  | Inf  |  |
| Semi-static channel access config period <small>Note 4, 6</small> | ms   | 2    |  |
| Propagation Condition   | -  | AWGN |  |
| Note 1:   | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |      |  |
| Note 2:   | SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.   |      |  |
| Note 3:   | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |      |  |
| Note 4:   | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |      |  |
| Note 5:   | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |      |  |
| Note 6:   | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |      |  |
| Note 7:   | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |      |  |
| Note 8:   | A window $W_{CCA\_DL}=W_{CCA\_UL}=Inf$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.   |      |  |

#### A.10.1.1.1.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.10.1.1.1.4.2.1 MsgA Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2A.3.2.1 for MsgA transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

The three requirements below are relevant for all cases of MsgA transmissions described within the clause

##### A.10.1.1.1.4.2:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.
- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.10.1.1.1.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2A.3.2.2 the System Simulator shall transmit a MsgB containing a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble after 5 MsgA transmissions have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a

MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB if the MsgB contains a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power if Random Access Responses Reception has not been considered as successful.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.10.1.1.1.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.2.3 the System Simulator shall transmit a MsgB corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

## A.10.2 Timing

### A.10.2.1 UE transmit timing

#### A.10.2.1.1 UE Transmit Timing Test with PSCell under DL CCA

##### A.10.2.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeB when PSCell is subject to DL CCA and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2. Supported test configurations are shown in Table 10.2.1.1.1-1.

**Table A.10.2.1.1.1-1: Supported test configurations for UE transmit timing test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2      | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

Note 1: The UE is only required to be tested in one of the supported test configurations.

The test consists of E-UTRA PCell and NR PSCell, which is subject to DL CCA. The configuration for E-UTRA is given in A.3.7.2.1. Table A.10.2.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.10.2.1.1.1-3.

Table A.10.2.1.1.1-2: Cell Specific Test Parameters for UE Transmit Timing test

| Parameter  |                            | Unit        | Config | Test1                             | Test2                       |
|--|----------------------------|-------------|--------|-----------------------------------|-----------------------------|
| SSB ARFCN  |                            |             | 1,2    | Freq1                             | Freq1                       |
| TDD configuration  |                            |             | 1,2    | TDDConf.1.1 CCA                   |                             |
| BW <sub>channel</sub>  |                            | MHz         | 1,2    | 40: N <sub>RB,c</sub> = 106       |                             |
| Initial BWP Configuration  |                            |             | 1,2    | DLBWP.0.1<br>ULBWP.0.1            |                             |
| Dedicated BWP Configuration  |                            |             | 1,2    | DLBWP.1.1<br>ULBWP.1.1            |                             |
| DRX Cycle  |                            | ms          | 1,2    | N/A                               | DRX.8 <sup>Note5</sup>      |
| DL CCA model   |                            |             | 1,2    | As specified in clause A.3.26.2.1 |                             |
| UL CCA model   |                            |             | 1,2    | As specified in clause A.3.26.2.2 |                             |
| PDSCH Reference  |                            |             | 1,2    | SR.1.1 CCA                        |                             |
| CORESET Reference  |                            |             | 1,2    | CR.1.1 CCA                        |                             |
| OCNG Patterns  |                            |             | 1,2    | OCNG pattern 1                    |                             |
| SSB configuration  | Semi- static channel acces |             | 1,2    | SSB.1 CCA                         |                             |
|  | Dynamic channel acces      |             | 1,2    | SSB.2 CCA                         |                             |
| SMTTC configuration  |                            |             | 1,2    | SMTTC.1 FR1                       |                             |
| TRS configuration  |                            |             | 1,2    | TRS.1.2 TDD                       |                             |
| DL CCA probability for semi-static channel access (P <sub>CCA_DL</sub> )   |                            |             | 1,2    | 0.9375                            | 0.9375                      |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_1</sub> )  |                            |             | 1,2    | 0.75                              | 0.75                        |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_2</sub> )  |                            |             | 1,2    | 0.75                              | 0.75                        |
| UL CCA probability (P <sub>CCA_UL</sub> )  |                            |             | 1,2    | 1                                 | 1                           |
| EPRE ratio of PSS to SSS   |                            | dB          | 1,2    | 0                                 | 0                           |
| EPRE ratio of PBCH DMRS to SSS   |                            |             |        |                                   |                             |
| EPRE ratio of PBCH to PBCH DMRS  |                            |             |        |                                   |                             |
| EPRE ratio of PDCCH DMRS to SSS  |                            |             |        |                                   |                             |
| EPRE ratio of PDCCH to PDCCH DMRS  |                            |             |        |                                   |                             |
| EPRE ratio of PDSCH DMRS to SSS  |                            |             |        |                                   |                             |
| EPRE ratio of PDSCH to PDSCH   |                            |             |        |                                   |                             |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |                            |             |        |                                   |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                            |             |        |                                   |                             |
| N <sub>oc</sub> <sup>Note2</sup>   |                            | dBm/30 kHz  | 1,2    | -95                               | -95                         |
| $\hat{E}_s / I_{ot}$   |                            |             | 1,2    | 3                                 | 3                           |
| $\hat{E}_s / N_{oc}$   |                            |             | 1,2    | 3                                 | 3                           |
| SS-RSRP <sup>Note3</sup>   |                            | dBm/30 kHz  | 1,2    | -92                               | -92                         |
| I <sub>o</sub> <sup>Note3</sup>  |                            | dBm/38.1MHz | 1,2    | -59.2                             | -59.2                       |
| Propagation condition  |                            |             | 1,2    | AWGN                              |                             |
| SRS Config   |                            |             | 1,2    | SRSCConf.1 <sup>Note6</sup>       | SRSCConf.2 <sup>Note6</sup> |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: DRX related parameters are given in Table A.3.3.8-1</p> <p>Note 6: SRS configs are given in Table A.10.2.1.1.1-3.</p> <p>Note 7: Parameters P<sub>CCA_DL</sub>, P<sub>CCA_DL_1</sub>, P<sub>CCA_DL_2</sub> and P<sub>CCA_UL</sub> are defined in clause A.3.26.2.</p> <p>Note 8: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                            |             |        |                                   |                             |

**Table A.10.2.1.1.1-3: SRS Configuration for UE transmit timing**

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

#### A.10.2.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.1-1 and setup NR PCell according to parameters given in Table A.10.2.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.10.2.1.1.2-1

**Table A.10.2.1.1.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value  |                   |
|--------------------------|-------------------|-------------------|
|                          | Test1             | Test2             |
| 30                       | $+32 \cdot 64T_c$ | $+16 \cdot 64T_c$ |

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.



- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

## A.10.2.2 UE timing advance

### A.10.2.2.1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA

#### A.10.2.2.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

#### A.10.2.2.1.2 Test Parameters

Supported test configurations are shown in table A.10.2.2.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.10.2.2.1.2-2, A.10.2.2.1.2-3 and A.10.2.2.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in clause A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell which is subject to DL CCA is in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.10.2.2.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.10.2.2.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in clause 7.3.2.1, the UE adjusts its uplink timing at slot  $n+k$  for a timing advance command received in slot  $n$ . This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

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

**Table A.10.2.2.1.2-1: Supported test configurations for timing advance test**

| Config  | Description   |
|---------|---|
| 1       | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                        |
| 2       | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                        |
| Note 1: | The UE is only required to be tested in one of the supported test configurations.               |
| Note 2: | The UE supporting EN-DC only on NR band(s) with shared spectrum access is required to be tested |

**Table A.10.2.2.1.2-2: General test parameters for timing advance test**

| Parameter  | Unit | Value                  | Comment   |
|--|------|------------------------|---|
| RF channel number                                |      | Cell 1: 1<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>2 for NR PSCell  |
| Initial DL BWP                                   |      | DLBWP.0.1              | As specified in Table A.3.9.2.1-1   |
| Dedicated DL BWP                                 |      | DLBWP.1.1              | As specified in Table A.3.9.2.2-1   |
| Initial UL BWP                                   |      | ULBWP.0.1              | As specified in Table A.3.9.3.1-1   |
| Dedicated UL BWP                                 |      | ULBWP.1.1              | As specified in Table A.3.9.3.2-1   |
| Timing Advance Command ( $T_A$ ) value during T1 |      | 31                     | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ( $T_A$ ) value during T2 |      | 39                     | For 30 kHz SCS $N_{TA\_new} = N_{TA\_old} + 4096 * T_c$<br>(based on equation in clause 4.2 of TS 38.213 [3])   |
| T1   | s    | 5                      |   |
| T2   | s    | 5                      |   |

**Table A.10.2.2.1.2-3: Cell specific test parameters for timing advance test**

| Parameter         |            | Unit | Test1           |    |
|-------------------|------------|------|-----------------|----|
|                   |            |      | T1              | T2 |
| TDD configuration | Config 1,2 |      | TDDConf.1.1 CCA |    |

|   |   |               |                                   |
|---|---|---------------|-----------------------------------|
| BW <sub>channel</sub>   | Config 1,2  | MHz           | 40: N <sub>RB,c</sub> = 106       |
| BWP BW  | Config 1,2  | MHz           | 40: N <sub>RB,c</sub> = 106       |
| DRX Cycle   | Config 1,2  | ms            | Not Applicable                    |
| DL CCA model  | Config 1,2  |               | As specified in clause A.3.26.2.1 |
| UL CCA model  | Config 1,2  |               | As specified in clause A.3.26.2.2 |
| PDSCH Reference   | Config 1,2  |               | SR.1.1 CCA                        |
| CORESET Reference   | Config 1,2  |               | CR.1.1 CCA                        |
| TRS configuration   | Config 1,2  |               | TRS.1.2 TDD                       |
| OCNG Patterns   | Config 1,2  |               | OCNG pattern 1                    |
| SSB Configuration   | Semi-static channel access  | Config 1,2    | SSB.1 CCA                         |
|   | Dynamic channel access  | Config 1,2    | SSB.2 CCA                         |
| SMTTC configuration   | Config 1,2  |               | SMTTC.1 FR1                       |
| DL CCA probability for semi-static channel access (P <sub>CCA_DL</sub> )            | Config 1,2  |               | 1                                 |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_1</sub> ) | Config 1,2  |               | 1                                 |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_2</sub> ) | Config 1,2  |               | 1                                 |
| UL CCA probability P <sub>CCA</sub>   | Config 1,2  |               | 1                                 |
| EPRE ratio of PSS to SSS  |   | dB            | 0                                 |
| EPRE ratio of PBCH DMRS to SSS  |   |               |                                   |
| EPRE ratio of PBCH to PBCH DMRS   |   |               |                                   |
| EPRE ratio of PDCCH DMRS to SSS   |   |               |                                   |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |               |                                   |
| EPRE ratio of PDSCH DMRS to SSS   |   |               |                                   |
| EPRE ratio of PDSCH to PDSCH  |   |               |                                   |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |               |                                   |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |               |                                   |
| N <sub>oc</sub><br>Note2  | Config 1,2  | dBm/30 kHz    | -95                               |
|   | Config 3,6  |               | -95                               |
| $\hat{E}_s / I_{ot}$  |   | dB            | 3                                 |
| $\hat{E}_s / N_{oc}$  |   | dB            | 3                                 |
| I <sub>o</sub> Note3  | Config 1,2  | dBm/38.16M Hz | -62.58                            |
| Propagation condition   |   | -             | AWGN                              |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |               |                                   |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |               |                                   |
| Note 3:   | I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |               |                                   |
| Note 4:   | Parameters P <sub>CCA_DL</sub> , P <sub>CCA_DL_1</sub> , P <sub>CCA_DL_2</sub> and P <sub>CCA_UL</sub> are defined in clause A.3.26.2.  |               |                                   |
| Note 5:   | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.   |               |                                   |

**Table A.10.2.2.1.2-4: Sounding Reference Symbol Configuration for timing advance test**

| Field  |            | Value                  | Comment  |
|--|------------|------------------------|--|
| c-SRS  | Config 1,2 | 24                     | Frequency hopping is disabled  |
| b-SRS  |            | 0                      |  |
| b-hop  |            | 0                      |  |
| freqDomainPosition   |            | 0                      | Frequency domain position of SRS   |
| freqDomainShift  |            | 0                      |  |
| groupOrSequenceHopping   |            | neither                | No group or sequence hopping   |
| SRS-PeriodicityAndOffset   |            | sl5=4 for SCS<br>30kHz | Once every 5 slots   |
| pathlossReferenceRS  |            | ssb-Index=0            | SSB #0 is used for SRS path loss estimation  |
| usage  |            | Codebook               | Codebook based UL transmission   |
| startPosition  |            | 0                      | resourceMapping setting: SRS on last symbol of slot, and 1 symbols for SRS without repetition. |
| nrofSymbols  |            | n1                     |  |
| repetitionFactor   |            | n1                     |  |
| combOffset-n2  |            | 0                      | transmissionComb setting   |
| cyclicShift-n2   |            | 0                      |  |
| nrofSRS-Ports  |            | port1                  | Number of antenna ports used for SRS transmission  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |            |                        |  |

### A.10.2.2.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e.  $k+1$  slots after the reception of the timing advance command, where  $k=5$ .

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

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

## A.10.3 Signalling characteristics

### A.10.3.1 Radio link monitoring

#### A.10.3.1.1 Introduction

In the test cases specified in clause A.10.3.1, any uplink signal transmitted by the UE is used for detecting the in-/out-of-sync state of the UE. In terms of measurement, the uplink signal is verified based on the UE output power:

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means no uplink signal.

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

### A.10.3.1.2 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

#### A.10.3.1.2.1 Test purpose and environment

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1A.

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.10.3.1.2.1-1. The test parameters are given in Tables A.10.3.1.2.1-2, A.10.3.1.2.1-3, and A.10.3.1.2.1-4 below. There are two cells in the test: Cell 1 is the E-UTRAN PCell, and Cell 2 is the FR1 PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure A.10.3.1.2.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

**Table A.10.3.1.2.1-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.3.1.2.1-2: General test parameters for PSCell out-of-sync testing in non-DRX mode.**

| Parameter   |  | Unit | Value                               |
|---|--|------|-------------------------------------|
|   |  |      | <b>Test 1</b>                       |
| Active E-UTRA PCell   |  |      | Cell 1                              |
| E-UTRA RF Channel Number  |  |      | 1                                   |
| Active PSCell   |  |      | Cell 2                              |
| RF Channel Number   |  |      | 2                                   |
| DL CCA model  |  |      | As specified in clause A.3.26.2.1   |
| UL CCA model  |  |      | As specified in clause A.3.26.2.2   |
| Duplex mode   | Config 1,2   |      | TDD                                 |
| BW <sub>channel</sub>   | Config 1,2   | MHz  | 40: N <sub>RB,c</sub> = 106         |
| DL initial BWP configuration  | Config 1,2   |      | [DLBWP.0.1]                         |
| DL dedicated BWP configuration  | Config 1,2   |      | [DLBWP.1.1]                         |
| UL initial BWP configuration  | Config 1,2   |      | [ULBWP.0.1]                         |
| UL dedicated BWP configuration  | Config 1,2   |      | [ULBWP.1.1]                         |
| TDD configuration   | Config 1,2   |      | TDDConf.1.1 CCA                     |
| CORESET Reference Channel   | Config 1,2   |      | CR.1.1 CCA                          |
| SSB configuration for semi-static channel access <sup>Note 4, 6</sup> | Config 1,2   |      | SSB.1 CCA                           |
| SSB configuration for dynamic channel access <sup>Note 5, 6</sup>     | Config 1,2   |      | SSB.2 CCA                           |
| DBT window configuration  | Config 1,2   |      | DBT.1                               |
| PDSCH/PDCCH subcarrier spacing  | Config 1,2   |      | 30 kHz                              |
| PRACH Configuration   | Config 1,2   |      | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM RS  |  |      | 0                                   |
| OCNG parameters   |  |      | [OP.1]                              |
| CP length   |  |      | Normal                              |
| Correlation Matrix and Antenna Configuration                          |  |      | 2x2 Low                             |
| Out of sync transmission parameters                                   | DCI format   |      | [1-0]                               |
|   | Number of Control OFDM symbols                                   |      | [2]                                 |
|   | Aggregation level  | CCE  | [8]                                 |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | [4]                                 |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | [4]                                 |
|   | DMRS precoder granularity  |      | REG bundle size                     |
| REG bundle size   |  |      | [6]                                 |
| DRX   |  |      | OFF                                 |
| Gap pattern ID  |  |      | gp0                                 |
| Layer 3 filtering   |  |      | Enabled                             |
| T310 timer  |  | ms   | 0                                   |
| T311 timer  |  | ms   | 1000                                |
| N310  |  |      | 1                                   |
| N311  |  |      | 1                                   |
| CSI-RS configuration for CSI reporting                                | Config 1,2   |      | [CSI-RS.2.1 TDD]                    |
| CSI-RS for tracking   | Config 1,2   |      | [TRS.1.2 TDD]                       |
| T1  |  | s    | 0.2                                 |
| T2  |  | s    | 1.04                                |
| T3  |  | s    | 1.04                                |
| D1  |  | s    | 1                                   |

NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  
 NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  
 NOTE 3: E-UTRAN is in non-DRX mode under test.  
 Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  
 Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  
 Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table A.10.3.1.2.1-3: Cell-specific test parameters for PSCell out-of-sync testing in non-DRX mode.**

| Parameter   |            | Unit    | Test 1   |      |     |  |  |  |
|---|------------|---------|--|------|-----|--|--|--|
|   |            |         | T1   | T2   | T3  |  |  |  |
| DL CCA probability<br>$P_{CCA\_DL}$   | Note 6,8   |         | $P_{CCA\_DL}=0.9375$                           |      |     |  |  |  |
|   | Note 7,8   |         | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |      |     |  |  |  |
| UL CCA probability $P_{CCA\_UL}$  |            |         | 1  |      |     |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS   |            | dB      | 4  |      |     |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |            | dB      | 0  |      |     |  |  |  |
| EPRE ratio of PBCH DMRS to SSS  |            | dB      | 0  |      |     |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS   |            | dB      |  |      |     |  |  |  |
| EPRE ratio of PSS to SSS  |            | dB      |  |      |     |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS   |            | dB      |  |      |     |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |            | dB      |  |      |     |  |  |  |
| EPRE ratio of OCNG DMRS to SSS  |            | dB      |  |      |     |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS   |            | dB      |  |      |     |  |  |  |
| SNR <sup>Note 3,4</sup> on RLM-RS   | Config 1,2 | dB      | 1  | [-7] | -15 |  |  |  |
| SNR on other channels and signals   | Config 1,2 | dB      | 1  |      |     |  |  |  |
| $N_{oc}$  | Config 1,2 | dBm/SCS | -95  |      |     |  |  |  |
| Propagation condition   |            |         | TDL-C 300 ns 100 Hz                            |      |     |  |  |  |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.<br>NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.<br>NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3, respectively, in Figure A.10.3.1.2.1-1.<br>NOTE 5: The SNR values are specified for testing a UE which supports 2 RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 is A.3.6.<br>NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |            |         |  |      |     |  |  |  |

**Table A.10.3.1.2.1-4: Measurement gap configuration for PSCell out-of-sync testing in non-DRX mode.**

| Field  | Test 1 |  |
|--|--------|--|
|  | Value  |  |
| <i>gapOffset</i>   | 0      |  |
| NOTE 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned.<br>NOTE 2: Ensure that RLM RS is partially overlapped with measurement gap. |        |  |



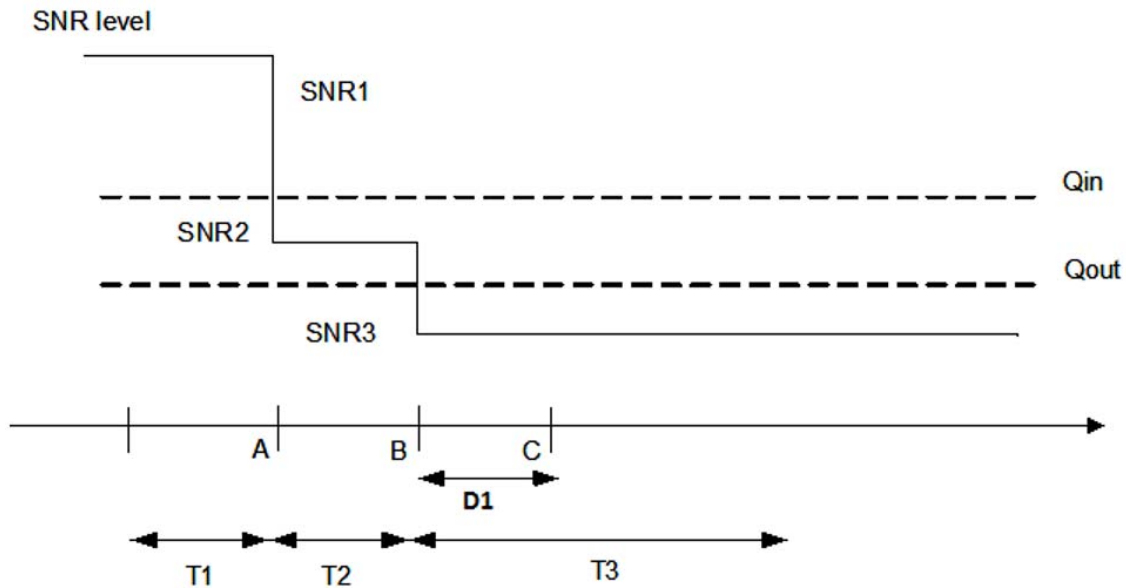


Figure A.10.3.1.2.1-1: SNR variation for out-of-sync testing.

#### A.10.3.1.2.2 Test requirements

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

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.
- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

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

#### A.10.3.1.3 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

##### A.10.3.1.3.1 Test purpose and environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1A.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.10.3.1.3.1-1. The test parameters are given in Tables A.10.3.1.3.1-2, and A.10.3.1.3.1-3 below. There are two cells in the test: Cell 1 is the E-UTRAN PCell, and Cell 2 is the FR1 PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.10.3.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model.

**Table A.10.3.1.3.1-1: Supported test configurations.**

| <b>Configuration</b>   | <b>Description</b>   |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

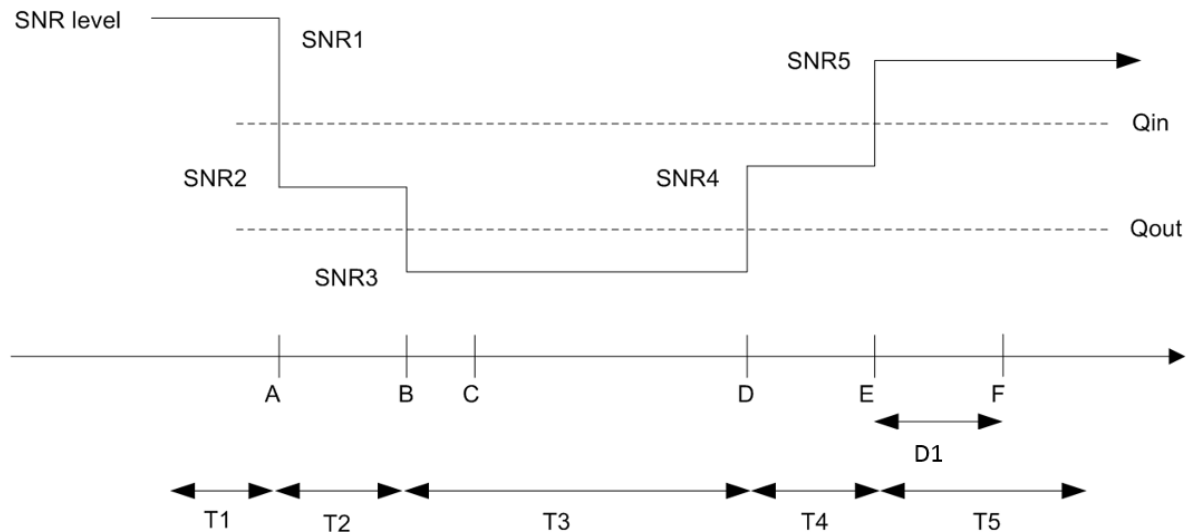
**Table A.10.3.1.3.1-2: General test parameters for PSCell in-sync testing in non-DRX mode.**

| Parameter   |  | Unit | Value                               |
|---|--|------|-------------------------------------|
|   |  |      | Test 1                              |
| Active E-UTRA PCell   |  |      | Cell 1                              |
| E-UTRA RF Channel Number  |  |      | 1                                   |
| Active PSCell   |  |      | Cell 2                              |
| RF Channel Number   |  |      | 2                                   |
| DL CCA model  |  |      | As specified in clause A.3.26.2.1   |
| UL CCA model  |  |      | As specified in clause A.3.26.2.2   |
| Duplex mode   | Config 1,2   |      | TDD                                 |
| BW <sub>channel</sub>   | Config 1,2   | MHz  | 40: N <sub>RB,c</sub> = 106         |
| DL initial BWP configuration  | Config 1,2   |      | [DLBWP.0.1]                         |
| DL dedicated BWP configuration  | Config 1,2   |      | [DLBWP.1.1]                         |
| UL initial BWP configuration  | Config 1,2   |      | [ULBWP.0.1]                         |
| UL dedicated BWP configuration  | Config 1,2   |      | [ULBWP.1.1]                         |
| TDD Configuration   | Config 1,2   |      | TDDConf.1.1 CCA                     |
| CORESET Reference Channel   | Config 1,2   |      | CR.1.1 CCA                          |
| SSB configuration for semi-static channel access <sup>Note 3, 5</sup> | Config 1,2   |      | SSB.1 CCA                           |
| SSB configuration for dynamic channel access <sup>Note 4,5</sup>      | Config 1,2   |      | SSB.2 CCA                           |
| DBT window configuration  | Config 1,2   |      | DBT.1                               |
| PDSCH/PDCCH subcarrier spacing  | Config 1,2   |      | 30 kHz                              |
| PRACH Configuration   | Config 1,2   |      | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM RS  |  |      | 0                                   |
| OCNG parameters   |  |      | OP.1                                |
| CP length   |  |      | Normal                              |
| Correlation Matrix and Antenna Configuration                          |  |      | 2x2 Low                             |
| In sync transmission parameters                                       | DCI format   |      | 1-0                                 |
|   | Number of Control OFDM symbols                                   |      | 2                                   |
|   | Aggregation level  | CCE  | 4                                   |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0                                   |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0                                   |
|   | DMRS precoder granularity  |      | REG bundle size                     |
|   | REG bundle size  |      | 6                                   |
| Out of sync transmission parameters                                   | DCI format   |      | 1-0                                 |
|   | Number of Control OFDM symbols                                   |      | 2                                   |
|   | Aggregation level  | CCE  | 8                                   |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 4                                   |

|   |  |    |                 |
|---|--|----|-----------------|
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4               |
|   | DMRS precoder granularity  |    | REG bundle size |
|   | REG bundle size  |    | 6               |
| DRX   |  |    | <i>OFF</i>      |
| Gap pattern ID  |  |    | N/A             |
| Layer 3 filtering   |  |    | <i>Enabled</i>  |
| T310 timer  |  | ms | 2000            |
| T311 timer  |  | ms | 1000            |
| N310  |  |    | 1               |
| N311  |  |    | 1               |
| CSI-RS configuration for CSI reporting  | Config 1,2   |    | CSI-RS.2.1 TDD  |
| CSI-RS for tracking   | Config 1,2   |    | TRS.1.2 TDD     |
| T1  |  | s  | 0.2             |
| T2  |  | s  | 0.2             |
| T3  |  | s  | 0.52            |
| T4  |  | s  | 0.2             |
| T5  |  | s  | 2.04            |
| D1  |  | s  | 2               |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.   |  |    |                 |
| NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.   |  |    |                 |
| NOTE 3: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |  |    |                 |
| NOTE 4: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |  |    |                 |
| NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |  |    |                 |

Table A.10.3.1.3.1-3: Cell-specific test parameters for PSCell in-sync testing in non-DRX mode.

| Parameter   |            | Unit    | Test 1   |    |    |    |    |
|---|------------|---------|--|----|----|----|----|
|   |            |         | T1   | T2 | T3 | T4 | T5 |
| DL CCA probability<br>$P_{CCA\_DL}$   | Note 6,8   |         | $P_{CCA\_DL}=0.9375$                           |    |    |    |    |
|   | Note 7,8   |         | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    |    |    |    |
| UL CCA probability $P_{CCA\_UL}$  |            |         | 1  |    |    |    |    |
| $L_{CCA\_DL}$   |            |         | 7  |    |    |    |    |
| $W_{CCA\_DL}$   |            | ms      | $T_{Evaluate\_in\_SSB\_CCA}$ NOTE 9            |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS   |            | dB      | 4  |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |            | dB      | 0  |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS  |            | dB      | 0  |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS   |            | dB      |  |    |    |    |    |
| EPRE ratio of PSS to SSS  |            | dB      |  |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS   |            | dB      |  |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH DMRS   |            | dB      |  |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS  |            | dB      |  |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS   |            | dB      |  |    |    |    |    |
| SNR on RLM-RS   | Config 1,2 | dB      |  |    |    |    |    |
| SNR on other channels and signals   | Config 1,2 | dB      | 1  |    |    |    |    |
| $N_{oc}$  | Config 1,2 | dBm/SCS | -95  |    |    |    |    |
| Propagation condition   |            |         | TDL-C 300ns 100Hz                              |    |    |    |    |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows. |            |         |  |    |    |    |    |
| NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.   |            |         |  |    |    |    |    |
| NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.   |            |         |  |    |    |    |    |
| NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.10.3.1.2.1-1.  |            |         |  |    |    |    |    |
| NOTE 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.   |            |         |  |    |    |    |    |
| NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.   |            |         |  |    |    |    |    |
| NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.   |            |         |  |    |    |    |    |
| NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.   |            |         |  |    |    |    |    |
| NOTE 9: As defined in Table 8.1A.2.2-1.   |            |         |  |    |    |    |    |



**Figure A.10.3.1.2.1-1: SNR variation for in-sync testing.**

#### A.10.3.1.3.2 Test requirements

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

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

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

#### A.10.3.1.4 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode

##### A.10.3.1.4.1 Test purpose and environment

##### A.10.3.1.4.2 Test requirements

#### A.10.3.1.5 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode

##### A.10.3.1.5.1 Test purpose and environment

##### A.10.3.1.5.2 Test requirements

### A.10.3.2 Interruption

#### A.10.3.2.1 E-UTRAN – NR interruptions during SCell operations with CCA

##### A.10.3.2.1.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during SCell operations on an NR SCC with CCA. This test will verify the interruption requirements for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1 and 8.3A. Supported test configurations are shown in table A.10.3.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.10.3.2.1.1-2 and A.10.3.2.1.1-3 below. The E-UTRAN cell specific test parameters are provided in Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell3 is NR PSCell and NR SCell. Both of cell 2 and cell 3 are subject to CCA. The test consists of five time periods, with duration of T1, T2, T3, T4 and T5. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. Throughout the test, the LTE PCell and NR PSCell are continuously scheduled in DL. The power of signals on cell 1,2 and 3 is not modified during the test.

Prior to T1, a connection is started with cell 2 as the PSCell, and measurements of cell 3 are configured with gap pattern 0, such that cell 3 is reported. This ensures that cell 3 is known at the start of time period T1 and is not itself part of the tested requirement.

The point in time at which the RRC message implying SCell addition is received at the UE antenna connector, defines the start of time period T1. Measurement gap pattern 0 shall be stopped when the SCell is configured.

The point in time at which the RRC message implying SCell addition is received at the UE antenna connector, defines the start of time period T1.

The point in time at which the MAC-CE message implying SCell activation is received at the UE antenna connector, defines the start of time period T2.

The point in time at which the MAC-CE message implying SCell deactivation is received at the UE antenna connector, defines the start of time period T3.

The point in time at which deactivation delay requirement in section 8.3A are satisfied defines the start of time period T4

The point in time at which the RRC message implying SCell release is received at the UE antenna connector, defines the start of time period T5.

**Table A.10.3.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations**

| Config   | Description  |
|--|--|
| 1  | LTE FDD<br>NR without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD<br>NR without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.3.2.1.1-2: General test parameters for Interruptions during measurements on deactivated NR SCC**

| Parameter                                | Unit | Value   | Comment  |
|--|------|---------|--|
| RF Channel Number                        |      | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell                             |      | Cell1   | PCell on E-UTRAN RF channel number 1.                          |
| Configured PSCell                        |      | Cell2   | PSCell on NR RF channel number 2.                              |
| Configured deactivated SCell             |      | Cell3   | Deactivated SCell on NR RF channel number 3.                   |
| CP length                                |      | Normal  | Applicable to Cell1, Cell2 and Cell3                           |
| DRX                                      |      | OFF     |  |
| Measurement gap pattern Id               |      | OFF     |  |
| SCell measurement cycle (measCycleSCell) | ms   | 160     |  |
| T1                                       | s    | <10     |  |
| T2                                       | s    | <10     |  |
| T3                                       | s    | <10     |  |
| T4                                       | s    | <10     |  |
| T5                                       | s    | <10     |  |

**Table A.10.3.2.1.1-3: NR cell specific test parameters for Interruptions during measurements on deactivated NR SCC**



| Parameter  |                       | Unit         | Cell2                             |    |    |    |    | Cell3                             |    |    |    |    |
|--|-----------------------|--------------|-----------------------------------|----|----|----|----|-----------------------------------|----|----|----|----|
|  |                       |              | T1                                | T2 | T3 | T4 | T5 | T1                                | T2 | T3 | T4 | T5 |
| TDD configuration  | Config 1,2            |              | TDDConf.1.1 CCA                   |    |    |    |    | TDDConf.1.1 CCA                   |    |    |    |    |
| BW <sub>channel</sub>  | Config 1,2            | MHz          | 40: N <sub>RB,c</sub> = 106       |    |    |    |    | 40: N <sub>RB,c</sub> = 106       |    |    |    |    |
| DL CCA model   | Config 1,2            |              | As specified in clause A.3.20.2.1 |    |    |    |    | As specified in clause A.3.20.2.1 |    |    |    |    |
| DL CCA probability for semi-static channel access <sup>Note6,8</sup> | P <sub>CCA_DL</sub>   |              | 0.9375                            |    |    |    |    | 0.9375                            |    |    |    |    |
| DL CCA probability for dynamic channel access <sup>Note7,8</sup>     | P <sub>CCA_DL_1</sub> |              | 0.75                              |    |    |    |    | 0.75                              |    |    |    |    |
|  | P <sub>CCA_DL_2</sub> |              | 0.75                              |    |    |    |    | 0.75                              |    |    |    |    |
| UL CCA model   | Config 1,2            |              | As specified in clause A.3.20.2.2 |    |    |    |    | ---                               |    |    |    |    |
| UL CCA probability for semi-static channel access                    | P <sub>CCA_UL</sub>   |              | 0.87                              |    |    |    |    | ---                               |    |    |    |    |
| UL CCA probability for dynamic channel access                        | P <sub>CCA_UL</sub>   |              | 0.75                              |    |    |    |    | ---                               |    |    |    |    |
| Initial BWP Configuration  | Config 1,2            |              | DLBWP.0.1                         |    |    |    |    | DLBWP.0.1                         |    |    |    |    |
| Dedicated DL BWP Configuration                                       | Config 1,2            |              | DLBWP.1.1                         |    |    |    |    | DLBWP.1.1                         |    |    |    |    |
| Initial UL BWP Configuration   | Config 1,2            |              | ULBWP.0.1                         |    |    |    |    | ULBWP.0.1                         |    |    |    |    |
| Dedicated UL BWP Configuration                                       | Config 1,2            |              | ULBWP.1.1                         |    |    |    |    | ULBWP.1.1                         |    |    |    |    |
| PDSCH reference measurement channel                                  | Config 1,2            |              | SR.1.1 CCA                        |    |    |    |    | -                                 |    |    |    |    |
| RMSI CORESET Parameters  | Config 1,2            |              | CR.1.1 CCA                        |    |    |    |    | CR.1.1 CCA                        |    |    |    |    |
| PDCCH CORESET Parameters   | Config 1,2            |              | CCR.1.1 CCA                       |    |    |    |    | CCR.1.1 CCA                       |    |    |    |    |
| TRS configuration  | Config 1,2            |              | TRS.1.2 TDD                       |    |    |    |    | TRS.1.2 TDD                       |    |    |    |    |
| OCNG Patterns  |                       |              | OP.1                              |    |    |    |    | OP.1                              |    |    |    |    |
| SSB configuration for semi-static channel access <sup>Note6,8</sup>  | Config 1,2            |              | SSB.1 CCA                         |    |    |    |    | SSB.1 CCA                         |    |    |    |    |
| SSB configuration for dynamic channel access <sup>Note7,8</sup>      | Config 1,2            |              | SSB.2 CCA                         |    |    |    |    | SSB.2 CCA                         |    |    |    |    |
| SMTTC Configuration  | Config 1,2            |              | SMTTC.1                           |    |    |    |    | SMTTC.1                           |    |    |    |    |
| DBT window configuration   | Config 1,2            |              | DBT.1                             |    |    |    |    | DBT.1                             |    |    |    |    |
| TCI state  |                       |              | TCI.State.0                       |    |    |    |    | TCI.State.0                       |    |    |    |    |
| Correlation Matrix and Antenna Configuration                         |                       |              | 1x2 Low                           |    |    |    |    | 1x2 Low                           |    |    |    |    |
| EPRE ratio of PSS to SSS   |                       |              | 0                                 |    |    |    |    | 0                                 |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS                                       |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS                                      |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS                                      |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS                                    |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS                                      |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH   |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                               |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                             |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| N <sub>oc</sub> <sup>Note 2</sup>                                    |                       | dBm/15 kHz   |                                   |    |    |    |    |                                   |    |    |    |    |
| SS-RSRP <sup>Note 3</sup>  |                       | dBm/15 kHz   | -87                               |    |    |    |    | -87                               |    |    |    |    |
| $\bar{E}_s/I_{ot}$   |                       | dB           | 17                                |    |    |    |    | 17                                |    |    |    |    |
| $\bar{E}_s/N_{oc}$   |                       | dB           | 17                                |    |    |    |    | 17                                |    |    |    |    |
| I <sub>o</sub> <sup>Note3</sup>                                      | Config 1,2            | dBm/38.16MHz | -52.86                            |    |    |    |    | -52.86                            |    |    |    |    |
| Time offset to Cell1 <sup>Note 4</sup>                               |                       | ms           | 3                                 |    |    |    |    | 3                                 |    |    |    |    |
| Time offset to Cell2 <sup>Note 5</sup>                               |                       | μs           | -                                 |    |    |    |    | 3                                 |    |    |    |    |
| Propagation Condition  |                       |              | AWGN                              |    |    |    |    | AWGN                              |    |    |    |    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells   |
| Note 5: | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.   |
| Note 6: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 7: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 8: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |

### A.10.3.2.1.2 Test Requirements

The UE shall meet the interruption requirements for SCell addition on both the victim PSCC in clause 8.2.1 and the victim LTE PCell in clause 7.32 of [15] during time T1

The UE shall meet the interruption requirements for SCell activation on both the victim PSCell in clause 8.2.1 and the victim LTE PCell in clause 7.32 of [15] during time T2. There shall be a single interruption with time window as specified in clause 8.3A.2

The UE shall meet the interruption requirements for SCell deactivation on both the victim PSCell in clause 8.2.1 and the victim LTE PCell in clause 7.32 of [15] during time T3. There shall be a single interruption with time window as specified in clause 8.3A,3

The UE shall meet the interruption requirements for deactivated SCell measurements on both the victim PSCell in clause 8.2.1 and the victim LTE PCell in clause 7.32 of [15] during time T4,3. The interruptions shall be within the time window as specified in clause 8.3A,3

The UE shall meet the interruption requirements for SCell release on both the victim PSCell in clause 8.2.1 and the victim LTE PCell in clause 7.32 of [15] during time T5.

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

## A.10.3.3 SCell activation and deactivation delay

### A.10.3.3.1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle

#### A.10.3.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for NR SCell, with NR PSCell and NR SCell both under CCA, are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 160 ms.

The supported test configurations are shown in Table A.10.3.3.1.1-1.

The test parameters are given in Table A.10.3.3.1.1-2 and cell-specific parameters for NR cells are provided in Table A.10.3.3.1.1-3 below. Cell-specific parameters for EUTRA PCell are provided in clause A.3.7.2.1.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, each with one cell: Cell 1 (PCell) on radio channel 1 (PCC) in E-UTRA, Cell 2 (PSCell) on radio channel 2 (PSCC) in NR, and Cell3 (SCell) on radio channel 3 (SCC) in NR. Before the test starts the UE is connected to Cell 1 and Cell 2, but is not aware of Cell 3, as the UE is only monitoring PCC and PSCC. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on radio channel 2. The UE now starts monitoring the SCC. At the end of T1, the test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted  $m$ , defines the start of time period T2. The UE shall be able to report a valid CSI in PSCell for the activated SCell at latest in slot  $m + (T_{\text{HARQ}} + T_{\text{activation\_time\_withCCA}} + T_{\text{CSI\_Reporting\_withCCA}}) / \text{NR\_slot\_length}$ , as defined in clause 8.3A.2. The UE shall start reporting CSI in PSCell in first available uplink resource for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting following slot  $m + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption shall fall within the time window specified in clause 8.3A.2.

The point in time at which the MAC message is received by at the UE antenna connector, in a slot # denoted  $n$ , defines the start of time period T3. The UE shall complete the activation at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ . Any PSCell interruption shall fall within the time window specified in clause 8.3A.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received, while taking into account CCA failures on SCC.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

**Table A.10.3.3.1.1-1: Supported test configurations for SCell Activation and Deactivation of known NR SCell with NR PSCell and SCell under CCA, 160 ms SCell measurement cycle**

| Configuration | Description  |
|---------------|--|
| 1             | PCC: LTE FDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | PCC: LTE TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:         | The UE is only required to be tested in one of the supported test configurations   |

**Table A.10.3.3.1.1-2: General test parameters for known SCell activation case with NR PSCell and SCell under CCA, 160 ms SCell measurement cycle**

| Parameter  | Unit    | Value   | Comment  |
|--|---------|---|--|
| RF Channel Number                                  |         | 1,2,3   | Three radio channels (1, 2, 3) are used for this test  |
| Active PCell                                       |         | Cell 1  | Primary cell on E-UTRAN RF channel number 1.   |
| Active PSCell                                      |         | Cell 2  | Primary secondary cell on NR RF channel number 2.  |
| Configured deactivated SCell                       |         | Cell 3  | Configured deactivated secondary cell on NR RF channel number 3  |
| CP length  |         | Normal  |  |
| DRX  |         | OFF   | Continuous monitoring of primary cell  |
| CQI/PMI periodicity and offset configuration index |         | 0   | CQI reporting for SCell every second subframe  |
| SCell measurement cycle (measCycleSCell)           | ms      | 160   |  |
| Cell 3 timing offset to Cell 2                     | $\mu$ s | 0   |  |
| Time alignment error between Cell 3 and Cell 2     | $\mu$ s | $\leq$ TAE as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.  |
| T1   | s       | 7   | During this time PCell and PSCell shall be known and the SCell configured and detected.  |
| T2   | s       | 1   | During this time the UE shall activate the SCell.  |
| T3   | s       | 1   | During this time the UE shall deactivate the SCell.  |
| T <sub>HARQ</sub>                                  | ms      | $k_1 \times \text{NR slot length}$                        | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by <i>dl-DataToUL-ACK</i> , the value of $k$ should be the minimum value defined in TS 38.213 [3] depends on UE's capability  |
| T <sub>CSI_Reporting</sub>                         | ms      | $10 + 5 \cdot 2^{\mu_{DL}}$                               | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]<br>$\mu_{DL}$ is the subcarrier spacing configuration for DL |

**Table A.10.3.3.1.1-3: Cell specific test parameters for known SCell activation case with NR PSCell and SCell under CCA, 160 ms SCell measurement cycle**

| Parameter  |                       | Unit             | Cell 2                               |    |    | Cell 3                               |    |    |
|--|-----------------------|------------------|--------------------------------------|----|----|--------------------------------------|----|----|
|  |                       |                  | T1                                   | T2 | T3 | T1                                   | T2 | T3 |
| Duplex mode  | Config 1,2            |                  | TDD                                  |    |    | TDD                                  |    |    |
| TDD configuration  | Config 1,2            |                  | TDDConf.1.1 CCA                      |    |    | TDDConf.1.1 CCA                      |    |    |
| BW <sub>channel</sub>  | Config 1,2            | MHz              | 40: N <sub>RB,c</sub> = 106          |    |    | 40: N <sub>RB,c</sub> = 106          |    |    |
| DL CCA model   |                       |                  | As specified in clause A.3.26.2.1    |    |    | As specified in clause A.3.26.2.1    |    |    |
| UL CCA model   |                       |                  | As specified in clause A.3.26.2.2    |    |    | As specified in clause A.3.26.2.2    |    |    |
| DL CCA probability for semi-static channel access <sup>Note5,7</sup> | P <sub>CCA_DL</sub>   |                  | 0.9375                               |    |    | 0.9375                               |    |    |
| DL CCA probability for dynamic channel access <sup>Note6,7</sup>     | P <sub>CCA_DL_1</sub> |                  | 0.75                                 |    |    | 0.75                                 |    |    |
|  | P <sub>CCA_DL_2</sub> |                  | 0.75                                 |    |    | 0.75                                 |    |    |
| UL CCA probability for semi-static channel access                    | P <sub>CCA_UL</sub>   |                  | 0.87                                 |    |    | 0.87                                 |    |    |
| UL CCA probability for dynamic channel access                        | P <sub>CCA_UL</sub>   |                  | 0.75                                 |    |    | 0.75                                 |    |    |
| L <sub>CCA_DL</sub> <sup>Note 8</sup>                                |                       |                  | 2                                    |    |    | 2                                    |    |    |
| W <sub>CCA_DL</sub> <sup>Note 8</sup>                                |                       |                  | T <sub>activation_time_withCCA</sub> |    |    | T <sub>activation_time_withCCA</sub> |    |    |
| Initial downlink BWP configuration                                   |                       |                  | DLBWP.0.2                            |    |    | DLBWP.0.2                            |    |    |
| Initial uplink BWP configuration                                     |                       |                  | ULBWP.0.1                            |    |    | ULBWP.0.1                            |    |    |
| Dedicated downlink BWP configuration                                 |                       |                  | DLBWP.0.2                            |    |    | DLBWP.0.2                            |    |    |
| Dedicated uplink BWP configuration                                   |                       |                  | ULBWP.0.1                            |    |    | ULBWP.0.1                            |    |    |
| TCI state  |                       |                  | TCI.State.0                          |    |    | TCI.State.0                          |    |    |
| TRS Configuration  | Config 1,2            |                  | TRS.1.2 TDD                          |    |    | TRS.1.2 TDD                          |    |    |
| PDSCH Reference measurement channel                                  | Config 1,2            |                  | SR.1.1 CCA                           |    |    | SR.1.1 CCA                           |    |    |
| Dedicated CORESET parameters   | Config 1,2            |                  | CCR.1.3 CCA                          |    |    | CCR.1.3 CCA                          |    |    |
| RMSI CORESET parameters  | Config 1,2            |                  | CR.1.1 CCA                           |    |    | CR.1.1 CCA                           |    |    |
| OCNG Patterns <sup>Note1</sup>                                       |                       |                  | OP.1                                 |    |    | OP.1                                 |    |    |
| SSB Configuration for semi-static channel access <sup>Note5,7</sup>  | Config 1,2            |                  | SSB.1 CCA                            |    |    | SSB.1 CCA                            |    |    |
| SSB Configuration for dynamic channel access <sup>Note6,7</sup>      | Config 1,2            |                  | SSB.2 CCA                            |    |    | SSB.2 CCA                            |    |    |
| SMTC configuration   |                       |                  | SMTC.1                               |    |    | SMTC.1                               |    |    |
| DBT window configuration   |                       |                  | DBT.1                                |    |    | DBT.1                                |    |    |
| EPRE ratio of PSS to SSS   |                       | dB               | 0                                    |    |    | 0                                    |    |    |
| EPRE ratio of PBCH DMRS to SSS                                       |                       |                  |                                      |    |    |                                      |    |    |
| EPRE ratio of PBCH to PBCH DMRS                                      |                       |                  |                                      |    |    |                                      |    |    |
| EPRE ratio of PDCCH DMRS to SSS                                      |                       |                  |                                      |    |    |                                      |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS                                    |                       |                  |                                      |    |    |                                      |    |    |
| EPRE ratio of PDSCH DMRS to SSS                                      |                       |                  |                                      |    |    |                                      |    |    |
| EPRE ratio of PDSCH to PDSCH   |                       |                  |                                      |    |    |                                      |    |    |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>                      |                       |                  |                                      |    |    |                                      |    |    |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>                     |                       |                  |                                      |    |    |                                      |    |    |
| N <sub>oc</sub> <sup>Note2</sup>                                     | Config 1,2            |                  |                                      |    |    |                                      |    |    |
| N <sub>oc</sub> <sup>Note2</sup>                                     | Config 1,2            | dBm/SCS          | -101                                 |    |    | -101                                 |    |    |
| $\bar{E}_s/I_{ot}$   |                       | dB               | 17                                   |    |    | 17                                   |    |    |
| $\bar{E}_s/N_{oc}$   |                       | dB               | 17                                   |    |    | 17                                   |    |    |
| SS-RSRP <sup>Note3</sup>   | Config 1,2            | dBm/SCS          | -84                                  |    |    | -84                                  |    |    |
| I <sub>o</sub> <sup>Note3</sup>                                      | Config 1,2            | dBm/<br>38.16MHz | -52.87                               |    |    | -52.87                               |    |    |
| Propagation condition  |                       | -                | AWGN                                 |    |    |                                      |    |    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |
| Note 3: | SS-RSRP, SCH_RP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.  |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |
| Note 8: | As specified in clause 8.3A for $L_{1,max}$ , $L_{2,1,max}$ , $L_{2,2,max}$ , $L_{3,1,max}$ , and $L_{3,2,max}$  |

### A.10.3.3.1.2 Test Requirements

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [3] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot  $m + (T_{HARQ} + T_{activation\_time\_withCCA} + T_{CSI\_Reporting\_withCCA})/NR\_slot\_length$ , where  $T_{activation\_time\_withCCA} = T_{FirstSSB} + L_1 * T_{rs} + 5ms$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{HARQ} + 3ms}{NR\_slot\_length}$ , as defined in clause 8.3A.3.

During T2, interruption on PSCell shall not occur outside slot  $m + 1 + \frac{T_{HARQ}}{NR\_slot\_length}$  to slot  $m + 1 + \frac{T_{HARQ} + 3 + T_X}{NR\_slot\_length}$  with  $T_X = T_{FirstSSB}$ .

During T3, interruption on PSCell shall not occur outside slot  $n + 1 + T_{HARQ}/NR\_slot\_length$  to slot  $n + 1 + (T_{HARQ} + 3ms)/NR\_slot\_length$ .

The interruption on PSCell shall not be more than specified for EN-DC in clause 8.2.1.2.4.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

### A.10.3.3.2 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 320 ms SCell measurement cycle

#### A.10.3.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for NR SCell, with NR PSCell and NR SCell both under CCA, are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 320 ms.

The supported test configurations are same as in Table A.10.3.3.1.1-1 above.

The test parameters are same as in Table A.10.3.3.1.1-2 above, except for parameters listed below in Table A.10.3.3.2.1-1. The cell-specific parameters are same as in Table A.10.3.3.1.1-3 above.

The test execution is the same as described in clause A.10.3.3.1 above.

**Table A.10.3.3.2.1-1: General test parameters for known NR SCell activation with NR PSCell and SCell under CCA, 320 ms SCell measurement cycle**

| Parameter                                | Unit | Value | Comment |
|--|------|-------|---------|
| SCell measurement cycle (measCycleSCell) | ms   | 320   |         |

### A.10.3.3.2.2 Test Requirements

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [3] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot  $m + (T_{\text{HARQ}} + T_{\text{activation\_time\_withCCA}} + T_{\text{CSI\_reporting\_withCCA}}) / \text{NR\_slot\_length}$ , where  $T_{\text{activation\_time\_withCCA}} = T_{\text{FirstSSB\_MAX}} + L_{2,1} * T_{\text{SMTC\_MAX}} + (1 + L_{2,2}) * T_{\text{rs}} + 5\text{ms}$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR\_slot\_length}}$ , as defined in clause 8.3A.3.

During T2, interruption on PSCell shall not occur outside slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR\_slot\_length}}$  to slot  $m + 1 + \frac{T_{\text{HARQ}} + 3 + T_{\text{X}}}{\text{NR\_slot\_length}}$  with  $T_{\text{X}} = T_{\text{FirstSSB\_MAX}} + L_{2,1} * T_{\text{SMTC\_MAX}}$ .

During T3, interruption on PSCell shall not occur outside slot  $n + 1 + T_{\text{HARQ}} / \text{NR\_slot\_length}$  to slot  $n + 1 + (T_{\text{HARQ}} + 3\text{ms}) / \text{NR\_slot\_length}$ .

The interruption on PSCell shall not be more than specified for EN-DC in clause 8.2.1.2.4.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

### A.10.3.3.3 SCell Activation and Deactivation of unknown NR SCell with NR PSCell and NR SCell under CCA

#### A.10.3.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for NR SCell, with NR PSCell and NR SCell both under CCA, are within the requirements stated in clause 8.3A, when the SCell is unknown to the UE at the time of activation.

The supported test configurations are same as in Table A.10.3.3.1.1-1 above.

The test parameters are same as in Table A.10.3.3.1.1-2 above, except for parameters listed below in Table A.10.3.3.3.1-1. The cell-specific parameters are same as in Table A.10.3.3.1.1-3 above.

The test execution is the same as described in clause A.10.3.3.1 above.

**Table A.10.3.3.3.1-1: General test parameters for unknown NR SCell activation with NR PSCell and SCell under CCA**

| Parameter | Unit | Value | Comment   |
|-----------|------|-------|---|
| T1        | s    | 0.1   | During this time period PCell and PSCell shall be known and the SCell configured, but not detected. |

#### A.10.3.3.3.2 Test Requirements

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [3] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot  $m + (T_{\text{HARQ}} + T_{\text{activation\_time\_withCCA}} + T_{\text{CSI\_reporting\_withCCA}}) / \text{NR\_slot\_length}$ , where  $T_{\text{activation\_time\_withCCA}} = T_{\text{FirstSSB\_MAX}} + (1 + L_{3,1}) * T_{\text{SMTC\_MAX}} + (2 + L_{3,2}) * T_{\text{rs}} + 5\text{ms}$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR\_slot\_length}}$ , as defined in clause 8.3A.3.



During T2, interruption on PSCell shall not occur outside slot  $m + 1 + \frac{T_{HARQ}}{NR\_slot\_length}$  to slot  $m + 1 + \frac{T_{HARQ} + 3 + T_X}{NR\_slot\_length}$  with  $T_X = T_{FirstSSB\_MAX} + L_{3,1} * T_{SMTc\_MAX}$ .

During T3, interruption on PSCell shall not occur outside slot  $n + 1 + T_{HARQ}/NR\_slot\_length$  to slot  $n + 1 + (T_{HARQ} + 3ms)/NR\_slot\_length$ .

The interruption on PSCell shall not be more than specified for EN-DC in clause 8.2.1.2.4.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## A.10.3.4 Beam failure detection and link recovery procedures

### A.10.3.4.1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

#### A.10.3.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.10.3.4.1.1-1, A.10.3.4.1.1-2, and A.10.3.4.1.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.10.3.4.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.10.3.4.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1.

**Table A.10.3.4.1.1-1: Supported test configurations for FR1 PSCell with CCA**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                      |
| 2             | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                      |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR1 |

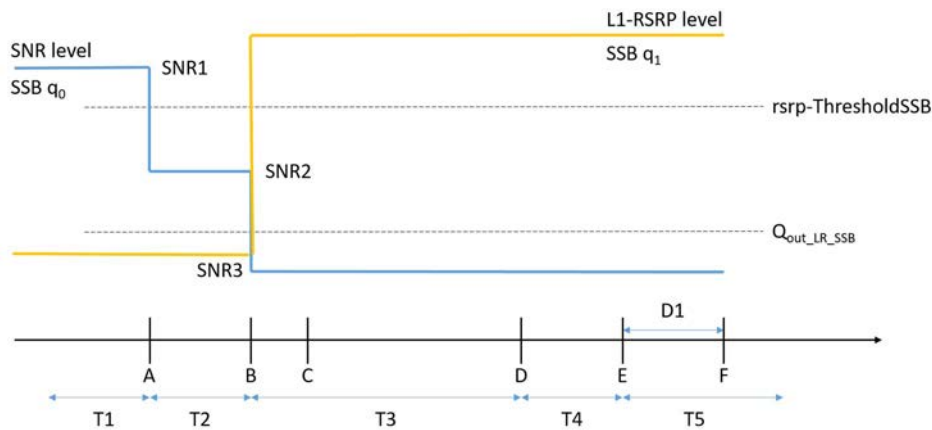
**Table A.10.3.4.1.1-2: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter                                      |  | Unit | Value  | Comment |
|--|--|------|--|---------|
|  |  |      | Test 1   |         |
| Active E-UTRA PCell                            |  |      | Cell 1   |         |
| E-UTRA RF Channel Number                       |  |      | 1  |         |
| Active PSCell                                  |  |      | Cell 2   |         |
| RF Channel Number                              |  |      | 2  |         |
| DL CCA model                                   |  |      | As specified in A.3.26.2.1   |         |
| UL CCA model                                   |  |      | As specified in A.3.26.2.2   |         |
| Duplex mode                                    | Config 1, 2  |      | TDD  |         |
| BWchannel                                      | Config 1, 2  | MHz  | 40: NRB,c = 106  |         |
| DL initial BWP configuration                   | Config 1, 2  |      | DLBWP.0.1  |         |
| DL dedicated BWP configuration                 | Config 1, 2  |      | DLBWP.1.1  |         |
| UL initial BWP configuration                   | Config 1, 2  |      | ULBWP.0.1  |         |
| UL dedicated BWP configuration                 | Config 1, 2  |      | ULBWP.1.1  |         |
| TDD configuration                              | Config 1, 2  |      | TDDConf.1.1 CCA  |         |
| CORESET Reference Channel                      | Config 1, 2  |      | CR.1.1 CCA   |         |
| SSB Configuration                              | Config 1, 2  |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |         |
| DBT Window Configuration                       | Config 1, 2  |      | DBT.1  |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1, 2  |      | 30 KHz   |         |
| PRACH Configuration                            | Config 1, 2  |      | Table A.3.8.2.2-1  |         |
| SSB Index assigned as BFD RS ( $q_0$ )         |  |      | 0  |         |
| SSB Index assigned as CBD RS ( $q_1$ )         |  |      | 1  |         |
| OCNG parameters                                |  |      | OP.1   |         |
| CP length                                      |  |      | Normal   |         |
| Correlation Matrix and Antenna Configuration   |  |      | 2x2 Low  |         |
| Beam failure detection transmission parameters | DCI format   |      | 1-0  |         |
|  | Number of Control OFDM symbols                                 |      | 2  |         |
|  | Aggregation level  | CCE  | 8  |         |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB   | 0  |         |

|   |  |             |                 |  |
|---|--|-------------|-----------------|--|
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB          | 0               |  |
|   | DMRS precoder granularity  |             | REG bundle size |  |
|   | REG bundle size  |             | 6               |  |
| DRX   |  |             | OFF             |  |
| Gap pattern ID  |  |             | gp0             |  |
| gapOffset   |  |             | 0               |  |
| rimInSyncOutOfSyncThreshold   |  |             | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2  | dBm/SCS kHz | -95             | Threshold used for $Q_{in\_LR\_SSB}$                                   |
| powerControlOffsetSS  |  |             | db0             | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount   |  |             | n1              | see TS 38.321 [7], clause 5.17   |
| beamFailureDetectionTimer   |  |             | pbfd4           | see TS 38.321 [7], clause 5.17   |
| CSI-RS configuration for CSI reporting  | Config 1, 2  |             | CSI-RS.2.1 TDD  |  |
| CSI-RS for tracking   | Config 1, 2  |             | TRS.1.2 TDD     |  |
| SSB Index assigned as RLM RS  |  |             | 0,1             |  |
| T310 timer  |  | ms          | 1000            |  |
| N310  |  |             | 2               |  |
| T1  |  | s           | 0.2             | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |  | s           | 0.93            |  |
| T3  |  | s           | 0.52            |  |
| T4  |  | s           | 0               |  |
| T5  |  | s           | 0.45            |  |
| D1  |  | s           | 0.41            |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |             |                 |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |             |                 |  |
| Note 3: E-UTRAN is in non-DRX mode under test.  |  |             |                 |  |

**Table A.10.3.4.1.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter   |             | Unit           | Test 1            |                                       |               |               |               |
|---|-------------|----------------|-------------------|---------------------------------------|---------------|---------------|---------------|
|   |             |                | T1                | T2                                    | T3            | T4            | T5            |
| DL CCA probability $P_{CCA,DL}$   | Note 10, 12 |                | 1.0               | 0.9375                                | 0.9375        | 0.9375        | 0.9375        |
|   | Note 11, 12 |                | 1.0/1.0           | 0.75/0.7<br>5                         | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability $P_{CCA,UL}$   |             |                | 1.0               | 1.0                                   | 1.0           | 1.0           | 1.0           |
| $L_{CCA,DL}$  |             |                | N/A               | 7                                     |               |               |               |
| $W_{CCA,DL}$  |             | ms             | N/A               | $T_{Evaluate\_CBD\_SSB\_CCA}$ Note 13 |               |               |               |
| EPRE ratio of PDCCH DMRS to SSS   |             | dB             | 0                 |                                       |               |               |               |
| EPRE ratio of PDCCH to PDCCH DMRS   |             | dB             |                   |                                       |               |               |               |
| EPRE ratio of PBCH DMRS to SSS  |             | dB             |                   |                                       |               |               |               |
| EPRE ratio of PBCH to PBCH DMRS   |             | dB             |                   |                                       |               |               |               |
| EPRE ratio of PSS to SSS  |             | dB             |                   |                                       |               |               |               |
| EPRE ratio of PDSCH DMRS to SSS   |             | dB             |                   |                                       |               |               |               |
| EPRE ratio of PDSCH to PDSCH DMRS   |             | dB             |                   |                                       |               |               |               |
| EPRE ratio of OCNB DMRS to SSS  |             | dB             |                   |                                       |               |               |               |
| EPRE ratio of OCNB to OCNB DMRS   |             | dB             |                   |                                       |               |               |               |
| SNR_SSB of set $q_0$  | Config 1, 2 | dB             | 5                 | -3                                    | -12           | -12           | -12           |
| SNR_SSB of set $q_1$  | Config 1, 2 | dB             | -10               | -10                                   | 10            | 10            | 10            |
| SSB_RP of set $q_1$   | Config 1, 2 | dBm/SCS<br>kHz | -105              | -105                                  | -85           | -85           | -85           |
| $N_{oc}$  | Config 1, 2 | dBm/15<br>KHz  | -98               |                                       |               |               |               |
| Propagation condition   |             |                | TDL-C 300ns 100Hz |                                       |               |               |               |
| <p>Note 1: OCNB shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNB is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNB.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT window.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6A.</p> <p>Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA,DL1}</math> and the second value corresponds to the <math>P_{CCA,DL2}</math>.</p> <p>Note 12: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> <p>Note 13: As defined in Table 8.5A.5.2-1.</p> |             |                |                   |                                       |               |               |               |



**Figure A.10.3.4.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.10.3.4.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 410$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.10.3.4.2 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

##### A.10.3.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.10.3.4.2.1-1, A.10.3.4.2.1-2, and A.4.5.5.2.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.10.3.4.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.10.3.4.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.10.3.4.2.1-1: Supported test configurations for FR1 PSCell with CCA**

| <b>Configuration</b> | <b>Description</b>   |
|----------------------|--|
| 1                    | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                      |
| 2                    | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                      |
| Note:                | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.10.3.4.2.1-2: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

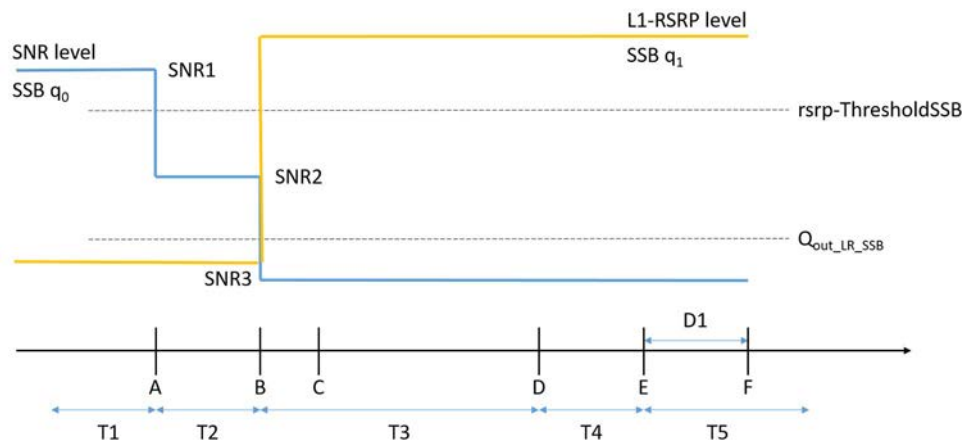


| Parameter                                      |  | Unit | Value  | Comment |
|--|--|------|--|---------|
|  |  |      | Test 1   |         |
| Active E-UTRA PCell                            |  |      | Cell 1   |         |
| E-UTRA RF Channel Number                       |  |      | 1  |         |
| Active PSCell                                  |  |      | Cell 2   |         |
| RF Channel Number                              |  |      | 2  |         |
| DL CCA model                                   |  |      | As specified in A.3.26.2.1   |         |
| UL CCA model                                   |  |      | As specified in A.3.26.2.2   |         |
| Duplex mode                                    | Config 1, 2  |      | TDD  |         |
| BWchannel                                      | Config 1, 2  | MHz  | 40: NRB,c = 106  |         |
| DL initial BWP configuration                   | Config 1, 2  |      | DLBWP.0.1  |         |
| DL dedicated BWP configuration                 | Config 1, 2  |      | DLBWP.1.1  |         |
| UL initial BWP configuration                   | Config 1, 2  |      | ULBWP.0.1  |         |
| UL dedicated BWP configuration                 | Config 1, 2  |      | ULBWP.1.1  |         |
| TDD configuration                              | Config 1, 2  |      | TDDConf.1.1 CCA  |         |
| CORESET Reference Channel                      | Config 1, 2  |      | CR.1.1 CCA   |         |
| SSB Configuration                              | Config 1, 2  |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |         |
| DBT Window Configuration                       | Config 1, 2  |      | DBT.1  |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1, 2  |      | 30 KHz   |         |
| PRACH Configuration                            | Config 1, 2  |      | Table A.3.8.2.2-1  |         |
| SSB Index assigned as BFD RS ( $q_0$ )         |  |      | 0  |         |
| SSB Index assigned as CBD RS ( $q_1$ )         |  |      | 1  |         |
| OCNG parameters                                |  |      | OP.1   |         |
| CP length                                      |  |      | Normal   |         |
| Correlation Matrix and Antenna Configuration   |  |      | 2x2 Low  |         |
| Beam failure detection transmission parameters | DCI format   |      | 1-0  |         |
|  | Number of Control OFDM symbols                                 |      | 2  |         |
|  | Aggregation level  | CCE  | 8  |         |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB   | 0  |         |

|   |  |             |                 |  |
|---|--|-------------|-----------------|--|
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB          | 0               |  |
|   | DMRS precoder granularity  |             | REG bundle size |  |
|   | REG bundle size  |             | 6               |  |
| DRX   |  |             | DRX.7           | A.3.3.7  |
| Gap pattern ID  |  |             | N.A.            |  |
| gapOffset   |  |             | 0               |  |
| rimInSyncOutOfSyncThreshold   |  |             | absent          | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1, 2  | dBm/SCS kHz | -95             | Threshold used for $Q_{in\_LR\_SSB}$                                   |
| powerControlOffsetSS  |  |             | db0             | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount   |  |             | n1              | see TS 38.321 [7], clause 5.17   |
| beamFailureDetectionTimer   |  |             | pbfd4           | see TS 38.321 [7], clause 5.17   |
| CSI-RS configuration for CSI reporting  | Config 1, 2  |             | CSI-RS.2.1 TDD  |  |
| CSI-RS for tracking   | Config 1, 2  |             | TRS.1.2 TDD     |  |
| SSB Index assigned as RLM RS  |  |             | 0,1             |  |
| T310 timer  |  | ms          | 1000            |  |
| N310  |  |             | 2               |  |
| T1  |  | s           | 1               | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |  | s           | 9.01            |  |
| T3  |  | s           | 5.16            |  |
| T4  |  | s           | 0               |  |
| T5  |  | s           | 3.89            |  |
| D1  |  | s           | 3.85            |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |  |             |                 |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |  |             |                 |  |
| Note 3: E-UTRAN is in non-DRX mode under test.  |  |             |                 |  |

**Table A.10.3.4.2.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter   |   | Unit        | Test 1            |  |           |           |           |
|---|---|-------------|-------------------|--|-----------|-----------|-----------|
|   |   |             | T1                | T2   | T3        | T4        | T5        |
| DL CCA probability $P_{CCA\_DL}$  | Semi-static channel access<br>$P_{CCA\_DL}$ <sup>Note 10, 12</sup>                |             | 1.0               | 0.9375   | 0.9375    | 0.9375    | 0.9375    |
|   | Dynamic channel access,<br>$P_{CCA\_DL\_1}/P_{CCA\_DL\_2}$ <sup>Note 11, 12</sup> |             | 1.0/1.0           | 0.75/0.75  | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA\_UL}$  |   |             | 1.0               | 1.0  | 1.0       | 1.0       | 1.0       |
| $L_{CCA\_DL}$   |   |             | N/A               | 3  |           |           |           |
| $W_{CCA\_DL}$   |   | ms          | N/A               | $T_{Evaluate\_CBD\_SSB\_CCA}$ <sup>Note 13</sup> |           |           |           |
| EPRE ratio of PDCCH DMRS to SSS   |   | dB          | 0                 |  |           |           |           |
| EPRE ratio of PDCCH to PDCCH DMRS   |   | dB          |                   |  |           |           |           |
| EPRE ratio of PBCH DMRS to SSS  |   | dB          |                   |  |           |           |           |
| EPRE ratio of PBCH to PBCH DMRS   |   | dB          |                   |  |           |           |           |
| EPRE ratio of PSS to SSS  |   | dB          |                   |  |           |           |           |
| EPRE ratio of PDSCH DMRS to SSS   |   | dB          |                   |  |           |           |           |
| EPRE ratio of PDSCH to PDSCH DMRS   |   | dB          |                   |  |           |           |           |
| EPRE ratio of OCNB DMRS to SSS  |   | dB          |                   |  |           |           |           |
| EPRE ratio of OCNB to OCNB DMRS   |   | dB          |                   |  |           |           |           |
| SNR_SSB of set $q_0$  | Config 1, 2   | dB          | 5                 | -3   | -12       | -12       | -12       |
| SNR_SSB of set $q_1$  | Config 1, 2   | dB          | -10               | -10  | 10        | 10        | 10        |
| SSB_RP of set $q_1$   | Config 1, 2   | dBm/SCS kHz | -105              | -105   | -85       | -85       | -85       |
| $N_{oc}$  | Config 1, 2   | dBm/15 KHz  | -98               |  |           |           |           |
| Propagation condition   |   |             | TDL-C 300ns 100Hz |  |           |           |           |
| <p>Note 1: OCNB shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNB is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNB.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT window.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6A.</p> <p>Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> <p>Note 12: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> <p>Note 13: As defined in Table 8.5A.5.2-1, where <math>L_{CBD,max}=3</math> for <math>T_{DRX} &gt; 320</math>.</p> |   |             |                   |  |           |           |           |



**Figure A.10.3.4.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.10.3.4.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 3850$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.10.3.5 Active BWP switching

#### A.10.3.5.1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC

##### A.10.3.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the UL BWP switch delay requirement defined in clause 8.6.4.

The supported test configurations are shown in Table A.10.3.5.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in A.10.3.5.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.10.3.5.1.1-2. SRS configuration used in the test is specified in Table A.10.3.5.1.1-4.

The UE shall be configured with PRACH configuration on UL BWP on which the UE shall switch after the consistent UL LBT failure detection.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1 and Cell 2 on radio channel 2.

- UE is configured with 2 different UE-specific downlink and uplink bandwidth parts on Cell 2: DL BWP-1, DL BWP-2, UL BWP-1 and UL BWP-2 before starting the test. DL BWP-1 and DL BWP-2 always include bandwidth of the initial DL BWP and SSB. UL BWP-1 and UL BWP-2 always include bandwidth of the SRS.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is DL BWP-1.
- UE is indicated in *firstActiveUplinkBWP-Id* that the active UL BWP is UL BWP-1.
- UE is configured with *LBT-FailureRecoveryConfig* parameters for Cell 2.

The cell has constant signal levels throughout the test. The test consists of 2 successive time periods, with durations of T1 and T2, respectively.

During T1,

- Time period T1 starts when the UE has received the SRS configuration for periodic SRS transmission on active UL BWP-1.
- The UE shall perform UL CCA before SRS transmission.
- The parameter UL CCA probability  $P_{CCA}$  is set to 0 during T1. This requires the test system to set energy level above the detection level during portion of the UL slot where the UE performs UL CCA. This in turn forces the UE to fail the UL CCA. The UE consistently fails UL CCA during T1 and is therefore unable to transmit SRS.

During T2,

- T2 starts when the UE detects consistent UL LBT failures i.e. when total number of UL LBT failures in Cell 2 on active UL BWP-1 exceeds *lbt-FailureInstanceMaxCount* during *lbt-FailureDetectionTimer*.
- The UE upon detected consistent UL LBT failure starts the LBT recovery mechanism, which requires the UE to switch to active UL BWP-2 in Cell 2 and to send PRACH in the active UL BWP-2.
- Starting from T2, the UE shall be able to send PRACH in the active UL BWP-2 within the delay specified in clause 8.6.4.

**Table A.10.3.5.1.1-1: Supported test configurations for UL BWP switch test in EN-DC**

| Config | Description  |
|--------|--|
| 1      | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2      | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

Note 1: The UE is only required to be tested in one of the supported test configurations.

**Table A.10.3.5.1.1-2: General test parameters for UL BWP switch in EN-DC**

| Parameter                              | Unit | Value  | Comment  |
|--|------|--------|--|
| E-UTRA RF Channel Number               |      | 1      | One E-UTRA radio channel is used for this test                   |
| NR RF Channel Number                   |      | 2      | One NR radio channel is used for this test                       |
| Active PCell                           |      | Cell 1 | PCell on RF channel number 1.                                    |
| Active PSCell                          |      | Cell 2 | PSCell on RF channel number 2.                                   |
| CP length                              |      | Normal |  |
| DRX                                    |      | OFF    |  |
| <i>lbt-FailureDetectionTimer</i> [2]   | ms   | 80     | Parameter configured by IE: <i>LBT-FailureRecoveryConfig</i> [1] |
| <i>lbt-FailureInstanceMaxCount</i> [2] |      | 4      | Parameter configured by IE: <i>LBT-FailureRecoveryConfig</i> [1] |
| T1                                     | s    | 0.1    | During T1 consistent LBT failure is detected on active UL BWP-1  |
| T2                                     | s    | 0.1    | During T2 UE sends PRACH on active UL BWP-2                      |

**Table A.10.3.5.1.1-3: NR Cell specific test parameters for UL BWP switch test in EN-DC**

| Parameter  |                            | Unit         | Cell 2                            |                                       |
|--|----------------------------|--------------|-----------------------------------|---------------------------------------|
|  |                            |              | T1                                | T2                                    |
| TDD configuration  |                            | Config 1, 2  | TDDConf.1.1 CCA                   |                                       |
| BW <sub>channel</sub>  |                            | Config 1, 2  | 40 MHz: N <sub>RB,c</sub> = 106   |                                       |
| DL CCA model   |                            | Config 1, 2  | As specified in clause A.3.20.2.1 |                                       |
| UL CCA model   |                            | Config 1, 2  | As specified in clause A.3.20.2.2 |                                       |
| Active BWP ID  |                            | Config 1, 2  | 1, 2                              |                                       |
| Initial DL BWP Configuration   |                            | Config 1, 2  | DLBWP.0.2 <sup>Note 4</sup>       |                                       |
| Active DL BWP-1 Configuration  |                            | Config 1, 2  | DLBWP.1.1 <sup>Note 4</sup>       |                                       |
| Active DL BWP-2 Configuration  |                            | Config 1, 2  | DLBWP.1.3 <sup>Note 4</sup>       |                                       |
| Initial UL BWP Configuration   |                            | Config 1, 2  | ULBWP.0.2 <sup>Note 4</sup>       |                                       |
| Active UL BWP-1 Configuration  |                            | Config 1, 2  | ULBWP.1.1 <sup>Note 4</sup>       |                                       |
| Active UL BWP-2 Configuration  |                            | Config 1, 2  | ULBWP.1.3 <sup>Note 4</sup>       |                                       |
| PDSCH Reference measurement channel  |                            | Config 1, 2  | SR.1.1 CCA                        |                                       |
| RMSI CORESET parameters  |                            | Config 1, 2  | CR.1.1 CCA                        |                                       |
| Dedicated CORESET parameters   |                            | Config 1, 2  | CCR.1.1 CCA                       |                                       |
| OCNG Patterns  |                            | Config 1, 2  | OP.1                              |                                       |
| SSB Configuration  | Semi- static channel acces | Config 1, 2  | SSB.1 CCA                         |                                       |
|  | Dynamic channel acces      | Config 1, 2  | SSB.2 CCA                         |                                       |
| SMTTC Configuration  |                            | Config 1, 2  | SMTTC.1 FR1                       |                                       |
| Correlation Matrix and Antenna Configuration   |                            | Config 1, 2  | 1x2 Low                           |                                       |
| TRS Configuration  |                            | Config 1, 2  | TRS.1.2 TDD                       |                                       |
| DL CCA probability for semi-static channel access (P <sub>CCA_DL</sub> )   |                            | Config 1, 2  | 1                                 | 1                                     |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_1</sub> )  |                            | Config 1, 2  | 1                                 | 1                                     |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_2</sub> )  |                            | Config 1, 2  | 1                                 | 1                                     |
| UL CCA probability (P <sub>CCA_UL</sub> )  |                            | Config 1, 2  | 0                                 | 1                                     |
| PRACH configuration  |                            | Config 1, 2  | N/A                               | Configuration #1 in Table A.3.8.2.1-1 |
| EPRE ratio of PSS to SSS   |                            | dB           | 0                                 |                                       |
| EPRE ratio of PBCH DMRS to SSS   |                            |              |                                   |                                       |
| EPRE ratio of PBCH to PBCH DMRS  |                            |              |                                   |                                       |
| EPRE ratio of PDCCH DMRS to SSS  |                            |              |                                   |                                       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                            |              |                                   |                                       |
| EPRE ratio of PDSCH DMRS to SSS  |                            |              |                                   |                                       |
| EPRE ratio of PDSCH to PDSCH   |                            |              |                                   |                                       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                            |              |                                   |                                       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                            |              |                                   |                                       |
| N <sub>oc</sub> <sup>Note 2</sup>  | Config 1, 2                | dBm/SCS      | -101                              |                                       |
| SS-RSRP <sup>Note 3</sup>  | Config 1, 2                | dBm/SCS      | -84                               |                                       |
| $\bar{E}_s/I_{ot}$   | Config 1, 2                | dB           | 17                                |                                       |
| $\bar{E}_s/N_{oc}$   | Config 1, 2                | dB           | 17                                |                                       |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1, 2                | dBm/38.16MHz | -52.86                            |                                       |
| Propagation Condition  |                            |              | AWGN                              |                                       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> <p>Note 5: Parameters P<sub>CCA_DL</sub>, P<sub>CCA_DL_1</sub>, P<sub>CCA_DL_2</sub> and P<sub>CCA_UL</sub> are defined in clause A.3.20.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                            |              |                                   |                                       |

**Table A.10.3.5.1.1-4: Sounding Reference Symbol Configuration for UL BWP Switch Test in EN-DC**

| Field                    | Value  | Comment  |
|--------------------------|--|--|
| c-SRS                    | 24   | Frequency hopping is disabled  |
| b-SRS                    | 0  |  |
| b-hop                    | 0  |  |
| freqDomainPosition       | 0  | Frequency domain position of SRS   |
| freqDomainShift          | 0  |  |
| groupOrSequenceHopping   | neither  | No group or sequence hopping   |
| SRS-PeriodicityAndOffset | sl5=4 for SCS<br>30kHz                                     | Once every 5 slots   |
| pathlossReferenceRS      | ssb-Index=0  | SSB #0 is used for SRS path loss estimation  |
| usage                    | Codebook   | Codebook based UL transmission   |
| startPosition            | 0  | resourceMapping setting: SRS on last symbol of slot, and 1 symbols for SRS without repetition. |
| nrofSymbols              | n1   |  |
| repetitionFactor         | n1   |  |
| combOffset-n2            | 0  | transmissionComb setting   |
| cyclicShift-n2           | 0  |  |
| nrofSRS-Ports            | port1  | Number of antenna ports used for SRS transmission  |
| Note:                    | For further information see clause 6.3.2 in TS 38.331 [2]. |  |

#### A.10.3.5.1.2 Test Requirements

The UE capable of *bwp-SwitchingDelay type1* [2] shall start to transmit the PRACH on active UL BWP-2 of Cell 2 (PSCell) less than 21.5 ms from the beginning of time period T1.

The UE capable of *bwp-SwitchingDelay type2* [2] shall start to transmit the PRACH on active UL BWP-2 of Cell 2 (PSCell) less than 23 ms from the beginning of time period T1.

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

NOTE: The above delay is calculated as follows:’

The active UL BWP switch delay from UL BWP-1 to UL BWP-2 can be expressed as:

$$T_{\text{BWPswitchDelay}} * T_{\text{slot}} + 1 * T_{\text{slot}} + (1 + L_3) * T_{\text{SSB,RO}} + 10 \text{ ms}$$

Where:

$T_{\text{BWPswitchDelay}} = 1 \text{ ms}$  (2 slots) and  $2.5 \text{ ms}$  (5 slots) for *bwp-SwitchingDelay* [2] *type1* and *type2* UE capabilities according to clause 8.6.4.

$T_{\text{slot}} =$  It is the slot length. It is 0.5 ms for 30 kHz.

$L_3 =$  It is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure.  $L_3 = 0$  during T2 since  $P_{\text{CCA}} = 1$ .

$T_{\text{SSB,RO}} = 10 \text{ ms}$  according to FR1 PRACH configuration 1.

This gives a total of 21.5 ms and 23 ms for *type1* and *type2* UE respectively.



## A.10.3.5.2 DCI-based and Timer-based Active BWP Switch

### A.10.3.5.2.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

#### A.10.3.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.32.2.7. Supported test configurations are shown in Table A.10.3.5.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.10.3.5.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.10.3.5.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after DL slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after DL slot ( $i+T_{BWPswitchDelay}$ ).

The starting time of PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after DL slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after DL slot ( $j+T_{BWPswitchDelay}$ ).

The starting time of PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

**Table A.10.3.5.2.1.1-1: DL BWP switch supported test configurations**

| Config   | Description  |
|--|--|
| 1  | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations.                      |  |
| Note 2: A UE which fulfils the requirements in test case A.10.3.5.2.2 can skip the test cases in A.10.3.5.2.1. |  |
| Note 3: The UE supporting EN-DC with only NR band(s) with shared spectrum access is required to be test.       |  |

**Table A.10.3.5.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value                             | Comment  |
|---|------|-----------------------------------|--|
| E-UTRA RF Channel Number                                |      | 1                                 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2                                 | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1                            | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2                            | PSCell on RF channel number 2.                 |
| CP length   |      | Normal                            |  |
| DRX   |      | OFF                               | For both PCell and PSCell                      |
| DL CCA model  |      | As specified in clause A.3.26.2.1 |  |
| UL CCA model  |      | As specified in clause A.3.26.2.2 |  |
| <i>bwp-InactivityTimer</i>                              | ms   | 200                               |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0                                 | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0                                 | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3                                 | Synchronous EN-DC                              |
| T1  | s    | 0.2                               |  |
| T2  | s    | 0.2                               |  |
| T3  | s    | 0.2                               |  |

Table A.10.3.5.2.1.1-3.: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter   |                            | Unit         | Cell 2                      |
|---|----------------------------|--------------|-----------------------------|
| Frequency Range   |                            |              | FR1                         |
| Duplex mode   | Config 1,2                 |              | TDD                         |
| TDD configuration   | Config 1,2                 |              | TDDConf.1.1 CCA             |
| $BW_{channel}$  | Config 1,2                 |              | 40 MHz: $N_{RB,c} = 106$    |
| Active BWP ID   |                            |              | 1, 2                        |
| Initial DL BWP Configuration  | Config 1,2                 |              | DLBWP.0.2 <sup>Note 4</sup> |
| Active DL BWP-1 Configuration   | Config 1,2                 |              | DLBWP.1.1 <sup>Note 4</sup> |
| Active DL BWP-2 Configuration   | Config 1,2                 |              | DLBWP.1.3 <sup>Note 4</sup> |
| Initial UL BWP Configuration  | Config 1,2                 |              | ULBWP.0.2 <sup>Note 4</sup> |
| Active UL BWP-1 Configuration   | Config 1,2                 |              | ULBWP.1.1 <sup>Note 4</sup> |
| Active UL BWP-2 Configuration   | Config 1,2                 |              | ULBWP.1.3 <sup>Note 4</sup> |
| PDSCH Reference measurement channel   |                            |              | SR.1.1 CCA                  |
| RMSI CORESET parameters   |                            |              | CR.1.1 CCA                  |
| Dedicated CORESET parameters  |                            |              | CCR.1.1 CCA                 |
| OCNG Patterns   |                            |              | OP.1                        |
| SSB Configuration   | Semi- static channel acces | Config 1,2   | SSB.1 CCA                   |
|   | Dynamic channel acces      | Config 1,2   | SSB.2 CCA                   |
| SMTC Configuration  |                            |              | SMTC.1                      |
| TRS Configuration   |                            |              | TRS.1.2 TDD                 |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )   |                            | Config 1,2   | 1                           |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_1}$ )   |                            | Config 1,2   | 1                           |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_2}$ )   |                            | Config 1,2   | 1                           |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )   |                            | Config 1,2   | 1                           |
| Correlation Matrix and Antenna Configuration  |                            |              | 1x2 Low                     |
| EPRE ratio of PSS to SSS  |                            | dB           | 0                           |
| EPRE ratio of PBCH DMRS to SSS  |                            |              |                             |
| EPRE ratio of PBCH to PBCH DMRS   |                            |              |                             |
| EPRE ratio of PDCCH DMRS to SSS   |                            |              |                             |
| EPRE ratio of PDCCH to PDCCH DMRS   |                            |              |                             |
| EPRE ratio of PDSCH DMRS to SSS   |                            |              |                             |
| EPRE ratio of PDSCH to PDSCH  |                            |              |                             |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |                            |              |                             |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                            |              |                             |
| $N_{oc}$ <sup>Note 2</sup>  | Config 1,2                 | dBm/SCS      | -101                        |
| SS-RSRP <sup>Note 3</sup>   | Config 1,2                 | dBm/SCS      | -84                         |
| $\hat{E}_s/I_{ot}$  | Config 1,2                 | dB           | 17                          |
| $\hat{E}_s/N_{oc}$  | Config 1,2                 | dB           | 17                          |
| $I_o$ <sup>Note 3</sup>   | Config 1,2                 | dBm/38.16MHz | -59                         |
| Propagation Condition   |                            |              | AWGN                        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> <p>Note 5: Parameters <math>P_{CCA\_DL}</math>, <math>P_{CCA\_DL\_1}</math>, <math>P_{CCA\_DL\_2}</math> and <math>P_{CCA\_UL}</math> are defined in clause A.3.26.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                            |              |                             |

## A.10.3.5.2.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot ( $i + T_{BWPswitchDelay} + kI$ ).

During T3, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.10.3.5.2.2 E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC

##### A.10.3.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirements for NR victim cell defined in clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [15]. Supported test configurations are shown in Table A.10.3.5.2.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.10.3.5.2.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.10.3.5.2.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for SCell, BWP-0 in Cell 3 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in SCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot ( $i+T_{BWPswitchDelay}$ ).

PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ( $j+T_{BWPswitchDelay}$ ).

PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell and NR SCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell and SCell during BWP switch of PSCell, respectively.

**Table A.10.3.5.2.2.1-1: DL BWP switch supported test configurations**

| Config  | Description  |
|---------|--|
| 1       | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                               |
| 2       | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz                               |
| Note 1: | The UE is only required to be tested in one of the supported test configurations                       |
| Note 2: | A UE which fulfils the requirements in test case A.10.3.5.2.2 can skip the test cases in A.10.3.5.2.1. |
| Note 3: | NR configuration is the same for PSCell and SCells.  |
| Note 4: | The UE supporting EN-DC with only NR band(s) with shared spectrum access is required to be tested.     |

**Table A.10.3.5.2.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value                             | Comment  |
|---|------|-----------------------------------|--|
| E-UTRA RF Channel Number                                |      | 1                                 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2, 3                              | Two NR radio channel is used for this test     |
| Active PCell  |      | Cell 1                            | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2                            | PSCell on RF channel number 2.                 |
| Active SCell  |      | Cell 3                            | SCell on RF channel number 3.                  |
| CP length   |      | Normal                            |  |
| DRX   |      | OFF                               |  |
| DL CCA model  |      | As specified in clause A.3.26.2.1 |  |
| UL CCA model  |      | As specified in clause A.3.26.2.2 |  |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0                                 | Individual offset for cells on PSCC.           |
| Cell-individual offset for cells on RF channel number 3 | dB   | 0                                 | Individual offset for cells on SCC.            |
| Cell2 timing offset to cell1                            | μs   | 3                                 | Synchronous EN-DC                              |
| Cell3 timing offset to cell2                            | μs   | 3                                 | Synchronous cells                              |
| T1  | s    | 0.2                               |  |
| T2  | s    | 0.2                               |  |
| T3  | s    | 0.2                               |  |

Table A.10.3.5.2.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter   |                            | Unit          | Cell 2                          | Cell 3    |
|---|----------------------------|---------------|---------------------------------|-----------|
| Frequency Range   |                            |               | FR1                             |           |
| Duplex mode   | Config 1,2                 |               | TDD                             |           |
| TDD configuration   | Config 1,2                 |               | TDDConf.1.1 CCA                 |           |
| BW <sub>channel</sub>   | Config 1,2                 |               | 40 MHz: N <sub>RB,c</sub> = 106 |           |
| Active BWP ID   |                            |               | 1, 2                            | 0         |
| Initial BWP Configuration   | Config 1,2                 |               | DLBWP.0.2                       | DLBWP.0.2 |
| Active BWP-0 Configuration  | Config 1,2                 |               | NA                              | DLBWP.0.2 |
| Active BWP-1 Configuration  | Config 1,2                 |               | DLBWP.1.3                       | NA        |
| Active BWP-2 Configuration  | Config 1,2                 |               | DLBWP.1.1                       | NA        |
| PDSCH Reference measurement channel   | Config 1,2                 |               | SR.1.1 CCA                      |           |
| RMSI CORESET parameters   | Config 1,2                 |               | CR.1.1 CCA                      |           |
| Dedicated CORESET parameters  | Config 1,2                 |               | CCR.1.1 CCA                     |           |
| OCNG Patterns   | Config 1,2                 |               | OP.1                            |           |
| SSB Configuration   | Semi- static channel acces | Config 1,2    | SSB.1 CCA                       |           |
|   | Dymamic channel acces      | Config 1,2    | SSB.2 CCA                       |           |
| SMTC Configuration  | Config 1,2                 |               | SMTC.1                          |           |
| TRS Configuration   | Config 1,2                 |               | TRS.1.2 TDD                     |           |
| DL CCA probability for semi-static channel access (P <sub>CCA_DL</sub> )  | Config 1,2                 |               | 1                               | 1         |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_1</sub> )   | Config 1,2                 |               | 1                               | 1         |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_2</sub> )   | Config 1,2                 |               | 1                               | 1         |
| DL CCA probability for semi-static channel access (P <sub>CCA_DL</sub> )  | Config 1,2                 |               | 1                               | 1         |
| Correlation Matrix and Antenna Configuration  |                            |               | 1x2                             |           |
| Propagation Condition   |                            |               | AWGN                            |           |
| EPRE ratio of PSS to SSS  |                            | dB            | 0                               | 0         |
| EPRE ratio of PBCH DMRS to SSS  |                            |               |                                 |           |
| EPRE ratio of PBCH to PBCH DMRS   |                            |               |                                 |           |
| EPRE ratio of PDCCH DMRS to SSS   |                            |               |                                 |           |
| EPRE ratio of PDCCH to PDCCH DMRS   |                            |               |                                 |           |
| EPRE ratio of PDSCH DMRS to SSS   |                            |               |                                 |           |
| EPRE ratio of PDSCH to PDSCH  |                            |               |                                 |           |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                            |               |                                 |           |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |                            |               |                                 |           |
| N <sub>oc</sub> <sup>Note 2</sup>   | Config 1,2                 | dBm/SCS kHz   | -101                            | -101      |
| SS-RSRP <sup>Note 3</sup>   | Config 1,2                 | dBm/SCS kHz   | -84                             | -84       |
| $\frac{\bar{E}_s}{I_{ot}}$  | Config 1,2                 | dB            | 17                              | 17        |
| $\frac{\bar{E}_s}{N_{oc}}$  | Config 1,2                 | dB            | 17                              | 17        |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1,2                 | dBm/38.16M Hz | -59                             | -59       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> <p>Note 5: Parameters P<sub>CCA_DL</sub>, P<sub>CCA_DL_1</sub>, P<sub>CCA_DL_2</sub> and P<sub>CCA_UL</sub> are defined in clause A.3.26.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                            |               |                                 |           |

## A.10.3.5.2.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot ( $i + T_{BWPswitchDelay} + kI$ ).

During T3, the UE shall start to send the ACK for PSCell from the first UL slot that occurs after the beginning of DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [15].

During T1, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

*Editor's note: FFS value of k1 for type 1 and type 2 UE.*

### A.10.3.5.3 RRC-based Active BWP Switch

#### A.10.3.5.3.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

##### A.10.3.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.10.3.5.3.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.10.3.5.3.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.10.3.5.3.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PSCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,



Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ).

$T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.10.3.5.3.1.1-1: DL BWP switch supported test configurations**

| Config   | Description  |
|--|--|
| 1  | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations.                  |  |
| Note 2: The UE supporting EN-DC with only NR band(s) with shared spectrum access is required to be tested. |  |

**Table A.10.3.5.3.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter   | Unit | Value                             | Comment  |
|---|------|-----------------------------------|--|
| E-UTRA RF Channel Number                                |      | 1                                 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number                                    |      | 2                                 | One NR radio channel is used for this test     |
| Active PCell  |      | Cell 1                            | PCell on RF channel number 1.                  |
| Active PSCell   |      | Cell 2                            | PSCell on RF channel number 2.                 |
| CP length   |      | Normal                            |  |
| DRX   |      | OFF                               |  |
| DL CCA model  |      | As specified in clause A.3.26.2.1 |  |
| UL CCA model  |      | As specified in clause A.3.26.2.2 |  |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0                                 | Individual offset for cells on PCC.            |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0                                 | Individual offset for cells on PSCC.           |
| Cell2 timing offset to cell1                            | μs   | 3                                 | Synchronous EN-DC                              |
| T1  | s    | 0.2                               |  |

Table A.10.3.5.3.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

| Parameter  |                               | Unit         | Cell 2                   |
|--|-------------------------------|--------------|--------------------------|
| Frequency Range  |                               |              | FR1                      |
| Duplex mode  | Config 1,2                    |              | TDD                      |
| TDD configuration  | Config 1,2                    |              | TDDConf.1.1 CCA          |
| $BW_{channel}$   | Config 1,2                    |              | 40 MHz: $N_{RB,C} = 106$ |
| Active DL BWP ID   |                               |              | 1, 2                     |
| Initial DL BWP Configuration   | Config 1,2                    |              | DLBWP.0.2                |
| Initial UL BWP Configuration   | Config 1,2                    |              | ULBWP.0.2                |
| Initial Condition  | Active DL BWP-1 Configuration | Config 1,2   | DLBWP.1.3                |
| Final Condition  | Active DL BWP-1 Configuration | Config 1,2   | DLBWP.1.1                |
| Initial UL BWP Configuration   | Config 1,2                    |              | ULBWP.0.2                |
| Active UL BWP-1 Configuration  | Config 1,2                    |              | ULBWP.1.3                |
| Active UL BWP-2 Configuration  | Config 1,2                    |              | ULBWP.1.1                |
| PDSCH Reference measurement channel  | Config 1,2                    |              | SR.1.1 CCA               |
| RMSI CORESET parameters  | Config 1,2                    |              | CR.1.1 CCA               |
| Dedicated CORESET parameters   | Config 1,2                    |              | CCR.1.1 CCA              |
| OCNG Patterns  | Config 1,2                    |              | OP.1                     |
| SSB Configuration  | Semi- static channel acces    | Config 1,2   | SSB.1 CCA                |
|  | Dymamic channel acces         | Config 1,2   | SSB.2 CCA                |
| SMTC Configuration   | Config 1,2                    |              | SMTC.1                   |
| TRS Configuration  | Config 1,2                    |              | TRS.1.2 TDD              |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )  | Config 1,2                    |              | 1                        |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_1}$ )  | Config 1,2                    |              | 1                        |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_2}$ )  | Config 1,2                    |              | 1                        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )  | Config 1,2                    |              | 1                        |
| Antenna Configuration  |                               |              | 1x2                      |
| Propagation Condition  |                               |              | AWGN                     |
| EPRE ratio of PSS to SSS   |                               | dB           | 0                        |
| EPRE ratio of PBCH DMRS to SSS   |                               |              |                          |
| EPRE ratio of PBCH to PBCH DMRS  |                               |              |                          |
| EPRE ratio of PDCCH DMRS to SSS  |                               |              |                          |
| EPRE ratio of PDCCH to PDCCH DMRS  |                               |              |                          |
| EPRE ratio of PDSCH DMRS to SSS  |                               |              |                          |
| EPRE ratio of PDSCH to PDSCH   |                               |              |                          |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                               |              |                          |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                               |              |                          |
| $N_{oc}$ Note 2  | Config 1,2                    | dBm/SCS kHz  | -101                     |
| SS-RSRP Note 3   | Config 1,2                    | dBm/SCS kHz  | -84]                     |
| $\bar{E}_s/I_{ot}$   | Config 1,2                    | dB           | 17                       |
| $\bar{E}_s/N_{oc}$   | Config 1,2                    | dB           | 17                       |
| $I_o$ Note3  | Config 1,2                    | dBm/38.16MHz | -59                      |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                               |              |                          |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                               |              |                          |
| Note 3: SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |              |                          |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].    |                               |              |                          |
| Note 5: Parameters $P_{CCA\_DL}$ , $P_{CCA\_DL\_1}$ , $P_{CCA\_DL\_2}$ and $P_{CCA\_UL}$ are defined in clause A.3.26.2.   |                               |              |                          |
| Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.   |                               |              |                          |

## A.10.3.5.3.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ).

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

## A.10.3.6 PSCell addition and release delay

### A.10.3.6.1 Addition and Release Delay of known NR PSCell on the carrier under CCA

#### A.10.3.6.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays on the carrier under CCA under EN-DC are within the requirements stated in clause 7.31A.2 [15] for the case when the PSCell is known by the UE at the time of addition.

Supported test configurations are shown in A.10.3.6.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.10.3.6.1.1-2 and cell-specific parameters in A.10.3.6.1.1-3 below. The test consists of five successive time periods with duration of T1, T2, T3, T4 and T5 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event B1 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event B1. After receiving the Event B1, the test system shall send a RRC message to the UE to release the measurement gaps.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T2, after the measurement gaps are released by the test system. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T3.

The test system shall observe the periodic reporting of CSI for PSCell during T4. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T4.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T4, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T5.

**Table A.10.3.6.1.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD, NR SCS 30 kHz, BW 40 MHz, TDD   |
| 2             | LTE TDD, NR SCS 30 kHz, BW 40 MHz, TDD   |
| Note:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.10.3.6.1.1-2: General Test Parameters for PSCell Addition and Release**

| Parameter         | Unit           | Value | Comment  |
|-------------------|----------------|-------|--|
| RF Channel Number |                | 1, 2  | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell on the carrier under CCA |
| Initial           | Active PCell   | Cell1 | PCell on RF channel number 1.  |
|                   | Neighbour cell | Cell2 | Neighbour cell on RF channel number 2.   |

|  |   |     |   |  |
|--|---|-----|---|--|
| Final Condition  | Active PCell                                    |     | Cell1   | PCell on RF channel number 1.  |
|  | Neighbour Cell                                  |     | Cell2   | PSCell released on RF channel number 2.  |
| B1   | Hysteresis                                      | dB  | 0   | Hysteresis for evaluation of event B1.   |
|  | Threshold RSRP                                  | dBm | -93   | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin.   |
|  | Time to Trigger                                 | S   | 0   |  |
| DRX  |   |     | OFF   | Continuous monitoring of primary cell  |
| DL CCA model   | Dynamic channel access <sup>Note 1, 3</sup>     |     |   | As specified in clause A.3.20.2.1  |
|  | Semi-static channel access <sup>Note 2, 3</sup> |     |   |  |
| UL CCA model   | Dynamic channel access <sup>Note 1, 3</sup>     |     |   | As specified in clause A.3.20.2.2  |
|  | Semi-static channel access <sup>Note 2,3</sup>  |     |   |  |
| Measurement gap pattern Id   |   |     | 0   | Gaps are configured before T2 and released before T3.  |
| PRACH configuration on cell2   |   |     | FR1 PRACH configuration 2                             | Captured in A.3.8.2.1  |
| CQI/PMI periodicity and offset configuration index on cell2  |   |     | 2ms   | CQI reporting for PSCell every uplink subframe   |
| Cell-individual offset for cells on RF channel number 1  |   | dB  | 0   | Individual offset for cells on primary component carrier.  |
| Cell-individual offset for cells on RF channel number 2  |   | dB  | 0   | Individual offset for cells on carrier frequency of cell2.   |
| T304   |   | ms  | 500   |  |
| LCCA_DL  |   |     | 5   |  |
| T1   |   | s   | 1   | During this time the PCell shall be known and cell2 shall be unknown.  |
| T2   |   | s   | $\geq T_{\text{identify\_irat\_cca\_without\_index}}$ | $T_{\text{identify\_irat\_cca\_without\_index}}$ is defined in clause 8.1.2.4.21A and 8.1.2.4.22A in TS 36.133<br>During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3   |   | s   | $\geq T_{\text{config\_PSCell\_withCCA}}$             | During this time the UE adds the PSCell.<br>$T_{\text{config\_PSCell\_withCCA}}$ is defined in clause 7.31A.2  |
| T4   |   | s   | 0.5   | During this time the UE sends CSI reports for PSCell.  |
| T5   |   | s   | 0.5   | During this time the UE releases the PSCell.   |
| <p>NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |   |     |   |  |

**Table A.10.3.6.1.1-3: Cell Specific Parameters for PSCell Addition and Release**

| Parameter   | Unit | Config   | Test |    |  |    |    |
|---|------|--|------|----|--|----|----|
|   |      |  | T1   | T2 | T3   | T4 | T5 |
| $P_{\text{CCA\_DL}}$ for dynamic channel access <sup>Note 5,7</sup>     | -    | $P_{\text{CCA\_DL\_1}}=0.75$<br>$P_{\text{CCA\_DL\_2}}=0.75$ |      |    | $P_{\text{CCA\_DL\_1}}=0.75$<br>$P_{\text{CCA\_DL\_2}}=0.75$ |    |    |
| $P_{\text{CCA\_DL}}$ for semi-static channel access <sup>Note 6,7</sup> | -    | $P_{\text{CCA\_DL}}=0.9375$                                  |      |    | $P_{\text{CCA\_DL}}=0.9375$                                  |    |    |
| $P_{\text{CCA\_UL}}$ for dynamic channel access <sup>Note 5,7</sup>     | -    | 1  |      |    | 1  |    |    |

|  |             |      |                             |     |
|--|-------------|------|-----------------------------|-----|
| P <sub>CCA_UL</sub> for semi-static channel access <sup>Note 6,7</sup>   | -           | 1    | 1                           |     |
| E-UTRA RF Channel Number   |             | 1,2  | 1                           |     |
| NR RF Channel Number   |             | 1,2  | 2                           |     |
| TDD configuration  |             | 1,2  | TDDConf.1.1 CCA             |     |
| BW <sub>channel</sub>  |             | 1,2  | 40: N <sub>RB,c</sub> = 106 |     |
| Initial BWP Configuration  |             | 1,2  | DLBWP.0.1<br>ULBWP.0.1      |     |
| Dedicated BWP Configuration  |             | 1,2  | DLBWP.1.1<br>ULBWP.1.1      |     |
| PDSCH Reference  |             | 1,2  | SR1.1 CCA                   |     |
| RMSI CORESET Reference   |             | 1,2  | CR1.1 CCA                   |     |
| Dedicated CORESET Reference  |             | 1,2  | CCR1.1 CCA                  |     |
| OCNG Patterns  |             | 1,2  | OP.1                        |     |
| DBT window configuration   |             | 1, 2 | DBT.1                       |     |
| SSB configuration for semi-static channel access   |             | 1, 2 | SSB.1 CCA                   |     |
| SSB configuration for dynamic channel access   |             | 1, 2 | SSB.2 CCA                   |     |
| SMTC configuration   |             | 1,2  | SMTC.1                      |     |
| TRS Configuration  |             | 1,2  | TRS.1.2 TDD                 |     |
| EPRE ratio of PSS to SSS   | dB          | 1,2  | 0                           |     |
| EPRE ratio of PBCH DMRS to SSS   |             |      |                             |     |
| EPRE ratio of PBCH to PBCH DMRS  |             |      |                             |     |
| EPRE ratio of PDCCH DMRS to SSS  |             |      |                             |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |             |      |                             |     |
| EPRE ratio of PDSCH DMRS to SSS  |             |      |                             |     |
| EPRE ratio of PDSCH to PDSCH   |             |      |                             |     |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |             |      |                             |     |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |             |      |                             |     |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz  | 1,2  | N/A                         | -85 |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS     | 1,2  | N/A                         | -82 |
| $\hat{E}_s/I_{ot}$   |             | 1,2  | -infinity                   | 0   |
| $\hat{E}_s/N_{oc}$   |             | 1,2  | -infinity                   | 0   |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS     | 1,2  | -infinity                   | -82 |
| $I_o$ <sup>Note3</sup>   | dBm/38.1MHz | 1,2  | N/A                         | -51 |
| Propagation condition  |             | 1,2  | AWGN                        |     |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |             |      |                             |     |

### A.10.3.6.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest  $T_{\text{config\_PSCell\_withCCA}}$  <sup>Note1</sup> into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest 20 ms into T5.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31A.2 [15]:

$$T_{\text{config\_PSCell\_withCCA}} = T_{\text{RRC\_delay}} + T_{\text{processing}} + T_{\text{search\_withCCA}} + T_{\Delta\_withCCA} + T_{\text{PSCell\_DU\_withCCA}} + 2 \text{ ms}$$

Where:

$$T_{\text{RRC\_delay}} = 20 \text{ ms}$$

$$T_{\text{processing}} = 20 \text{ ms}$$

$$T_{\text{search\_withCCA}} = 0$$

$$T_{\Delta\_withCCA} = (1 + L_2) * 20 \text{ ms}$$

$$T_{\text{PSCell\_DU\_withCCA}} = 20 \text{ ms.}$$

$L_2$  is the number of SMTC occasions not available at the UE for fine time tracking and acquiring full timing information, where  $L_2 \leq L_{\text{CCA\_DL}}$ .

### A.10.3.7 Void

## A.10.4 Measurement procedure

### A.10.4.1 Intra-frequency measurements

#### A.10.4.1.1 Event-triggered reporting tests on PSCC without gaps under non-DRX

##### A.10.4.1.1.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

##### A.10.4.1.1.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and two cells on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.10.4.1.1.2-1 and A.10.4.1.1.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.10.4.1.1.2-1: Supported test configurations**

| Configuration   | Description  |
|---|--|
| 1   | LTE FDD; NR: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | LTE TDD; NR: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |  |

**Table A.10.4.1.1.2-2: General test parameters for intra-frequency event triggered reporting without gaps**

Editor's note: Table TBD

**Table A.10.4.1.1.2-3: Cell-specific test parameters for intra-frequency event-triggered reporting without gaps**

Editor's note: Table TBD

### A.10.4.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.10.4.1.2 Event-triggered reporting tests on PSCC without gaps under DRX

#### A.10.4.1.2.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

#### A.10.4.1.2.2 Test parameters

#### A.10.4.1.2.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.10.4.1.3 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX

#### A.10.4.1.3.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

#### A.10.4.1.3.2 Test parameters

#### A.10.4.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.10.4.1.4 Event-triggered reporting tests on PSCC with per-UE gaps under DRX

#### A.10.4.1.4.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

#### A.10.4.1.4.2 Test parameters

#### A.10.4.1.4.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.10.4.1.5 Event-triggered reporting tests on SCC without gaps under non-DRX

#### A.10.4.1.5.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

#### A.10.4.1.5.2 Test parameters

#### A.10.4.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*



The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.1.6 Event-triggered reporting tests on SCC without gaps under DRX

##### A.10.4.1.6.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

##### A.10.4.1.6.2 Test parameters

##### A.10.4.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.1.7 Event-triggered reporting tests on SCC with per-UE gaps under non-DRX

##### A.10.4.1.7.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

##### A.10.4.1.7.2 Test parameters

##### A.10.4.1.7.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.10.4.1.8 Event-triggered reporting tests on SCC with per-UE gaps under DRX

### A.10.4.1.8.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

### A.10.4.1.8.2 Test parameters

### A.10.4.1.8.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.10.4.1.9 RSSI measurement reporting on PSCC

### A.10.4.1.9.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the intra-frequency RSSI measurement reporting requirements in Section 9.2A.7.1.

### A.10.4.1.9.2 Test parameters

In the test, the UE is configured to perform intra-frequency RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.10.4.1.9.2-1. There are two cells in the test: Cell 1 is E-UTRAN PCell on a licensed band, and Cell 2 is PSCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.4.1.9.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.4.1.9.2-2: General test parameters.**

Editor's note: Table TBD

## A.10.4.1.10 Channel occupancy measurement reporting on PSCC

### A.10.4.1.10.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the intra-frequency channel occupancy measurement reporting requirements in Section 9.2A.7.2.

### A.10.4.1.10.2 Test parameters

In the test, the UE is configured to perform intra-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.10.4.1.10.2-1. There are two cells in the test: Cell 1 is E-UTRAN PCell on a licensed band, and Cell 2 is PSCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.4.1.10.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.4.1.10.2-2: General test parameters.**

Editor's note: Table is TBD

### A.10.4.1.11 RSSI measurement reporting on SCC

#### A.10.4.1.11.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the intra-frequency RSSI measurement reporting requirements in Section 9.2A.7.1.

#### A.10.4.1.11.2 Test parameters

In the test, the UE is configured to perform intra-frequency RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.10.4.1.11.2-1. There are three cells in the test: Cell 1 is E-UTRAN PCell on a licensed band, Cell 2 is PSCell operating on a carrier frequency under CCA, Cell 3 is SCell on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1, Cell 2, and Cell 3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.4.1.11.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.4.1.11.2-2: General test parameters.**

Editor's note: Table TBD

### A.10.4.1.12 Channel occupancy measurement reporting on SCC

#### A.10.4.1.12.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the intra-frequency channel occupancy measurement reporting requirements in Section 9.2A.7.2.

#### A.10.4.1.12.2 Test parameters

In the test, the UE is configured to perform intra-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.10.4.1.12.2-1. There are three cells in the test: Cell 1 is E-UTRAN PCell on a licensed band, Cell 2 is PSCell operating on a carrier frequency under CCA, and Cell 3 is SCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1, Cell 2, Cell 3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.4.1.12.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.4.1.12.2-2: General test parameters.**

Editor's note: Table is TBD

## A.10.4.2 Inter-frequency measurements

### A.10.4.2.1 RSSI measurement reporting

#### A.10.4.2.1.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the inter-frequency RSSI measurement reporting requirements in Section 9.3A.8.

#### A.10.4.2.1.2 Test parameters

In the test, the UE is configured to perform inter-frequency RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.10.4.2.1.2-1. There are two cells in the test: Cell 1 is E-UTRAN PCell on a licensed band, and Cell 2 is PSCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2. The RSSI measurement is performed on an inter-frequency under CCA. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.4.2.1.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.4.2.1.2-2: General test parameters.**

Editor's note: Table TBD

### A.10.4.2.2 Channel occupancy measurement reporting

#### A.10.4.2.2.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the inter-frequency channel occupancy measurement reporting requirements in Section 9.3A.9.

#### A.10.4.2.2.2 Test parameters

In the test, the UE is configured to perform inter-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.10.4.2.2.2-1. There are two cells in the test: Cell 1 is E-UTRAN PCell on a licensed band, and Cell 2 is PSCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2. The channel occupancy measurement is performed on an inter-frequency under CCA. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.4.2.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.4.2.2-2: General test parameters.**

Editor's note: Table is TBD

### A.10.4.2.3 EN-DC event triggered reporting tests for FR1 with CCA cell without SSB time index detection when DRX is not used

#### A.10.4.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.3.1-1, A.10.4.2.3.1-2, and A.10.4.2.3.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.3.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.10.4.2.3.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.3.1-1.

**Table A.10.4.2.3.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.4.2.3.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value  |        | Comment  |
|---|------|--------------------|--|--------|--|
|   |      |                    | Test 1   | Test 2 |  |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1  |        | One E-UTRAN carrier frequency is used.   |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2   |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA.                          |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 with CCA (PScell) |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3  |        | NR cell 3 is on NR RF channel number 2 with CCA.   |
| DL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.1                  |        |  |
| UL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.2                  |        |  |
| Gap Pattern Id                                  |      | Config 1,2         | 0  | 4      | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2         | 9  | 9      |  |
| A3-Offset                                       | dB   | Config 1,2         | -6   |        |  |
| Hysteresis                                      | dB   | Config 1,2         | 0  |        |  |
| CP length                                       |      | Config 1,2         | Normal   |        |  |
| TimeToTrigger                                   | s    | Config 1,2         | 0  |        |  |
| Filter coefficient                              |      | Config 1,2         | 0  |        | L3 filtering is not used   |
| DRX   |      | Config 1,2         | OFF  |        | DRX is not used  |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 $\mu$ s  |        | Synchronous EN-DC  |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3 $\mu$ s  |        | Synchronous cells.   |
| T1  | s    | Config 1,2         | 5  |        |  |
| T2  | s    | Config 1,2         | 1.7  | 1.7    |  |

**Table A.10.4.2.3.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 |  | Unit       | Test configuration | Cell 2   |    | Cell 3   |    |
|---|--|------------|--------------------|--|----|--|----|
|   |  |            |                    | T1   | T2 | T1   | T2 |
| NR RF Channel Number                      |  |            | Config 1,2         | 1  |    | 2  |    |
| Duplex mode                               |  |            | Config 1,2         | TDD  |    |  |    |
| BW <sub>channel</sub>                     |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| BWP BW                                    |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| TDD configuration                         |  |            | Config 1,2         | TDDConf.1.1 CCA  |    | TDDConf.1.1 CCA  |    |
| Initial DL BWP                            |  |            | Config 1,2         | DLBWP.0.1  |    | NA   |    |
| Initial UL BWP                            |  |            | Config 1,2         | ULBWP.0.1  |    | NA   |    |
| Dedicated DL BWP                          |  |            | Config 1,2         | DLBWP.1.1  |    | NA   |    |
| Dedicated UL BWP                          |  |            | Config 1,2         | ULBWP.1.1  |    | NA   |    |
| TRS configuration                         |  |            | Config 1,2         | TRS.1.2 TDD  |    | NA   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |            | Config 1,2         | OP.1   |    | OP.1   |    |
| PDSCH Reference measurement channel       |  |            | Config 1,2         | SR.1.1 CCA   |    | -  |    |
| CORESET Reference Channel                 |  |            | Config 1,2         | CR.1.1 CCA   |    | -  |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | SSB.1 CCA  |    | SSB.1 CCA  |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | SSB.2 CCA  |    | SSB.2 CCA  |    |
| DBT window configuration                  |  |            | Config 1,2         | As defined in A.3.28.1                                     |    | As defined in A.3.28.1                                     |    |
| SMTC configuration                        |  |            | Config 1,2         | SMTC.1   |    | SMTC.4   |    |
| PDSCH/PDCCH                               |  | kHz        | Config 1,2         | 30   |    | 30   |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_DL</sub> =0.9375                                |    | P <sub>CCA_DL</sub> =0.9375                                |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
| L <sub>CCA_DL</sub>                       |  |            | Config 1,2         | 12   |    | 12   |    |
| W <sub>CCA_DL</sub>                       |  | ms         | Config 1,2         | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |
| EPRE ratio of PSS to SSS                  |  |            | Config 1,2         | 0  |    | 0  |    |
| EPRE ratio of PBCH DMRS to SSS            |  |            |                    |  |    |  |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |            |                    |  |    |  |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |            |                    |  |    |  |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |            |                    |  |    |  |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |            |                    |  |    |  |    |
| EPRE ratio of PDSCH to PDSCH              |  |            |                    |  |    |  |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |  |            |                    |  |    |  |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |  |            |                    |  |    |  |    |
| N <sub>oc</sub> <sup>Note2</sup>          |  | dBm/15k Hz | Config 1,2         | -104   |    | -104   |    |



|                           |  |            |        |        |           |        |
|---------------------------|--|------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup> | dBm/SC<br>S  | Config 1,2 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup> | dBm/SC<br>S  | Config 1,2 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>    | dBm/38.1<br>6MHz   | Config 1,2 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition     |  | Config 1,2 | AWGN   |        |           |        |
| Note 1:                   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |            |        |        |           |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |            |        |        |           |        |
| Note 3:                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |            |        |        |           |        |
| Note 4:                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |            |        |        |           |        |
| Note 5:                   | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |            |        |        |           |        |
| Note 6:                   | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |            |        |        |           |        |
| Note 7:                   | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.   |            |        |        |           |        |

#### A.10.4.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.2.4 EN-DC event triggered reporting tests for FR1 cell with CCA without SSB time index detection when DRX is used

##### A.10.4.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.4.1-1, A.10.4.2.4.1-2, and A.10.4.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.10.4.2.4.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.4.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.10.4.2.4.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.4.2.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value  |        |        |        | Comment  |
|---|------|--------------------|--|--------|--------|--------|--|
|   |      |                    | Test 1   | Test 2 | Test 3 | Test 4 |  |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1  |        |        |        | One E-UTRAN carrier frequency is used.   |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2   |        |        |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA.                          |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 with CCA (PScell) |        |        |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3  |        |        |        | NR cell 3 is on NR RF channel number 2 with CCA.   |
| DL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.1                  |        |        |        |  |
| UL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.2                  |        |        |        |  |
| Gap Pattern Id                                  |      | Config 1,2         | 0  |        | 4      |        | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2         | 9  |        | 9      |        |  |
| A3-Offset                                       | dB   | Config 1,2         | -6   |        |        |        |  |
| Hysteresis                                      | dB   | Config 1,2         | 0  |        |        |        |  |
| CP length                                       |      | Config 1,2         | Normal   |        |        |        |  |
| TimeToTrigger                                   | s    | Config 1,2         | 0  |        |        |        |  |
| Filter coefficient                              |      | Config 1,2         | 0  |        |        |        | L3 filtering is not used   |
| DRX   |      | Config 1,2         | DRX .1   | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3   |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 $\mu$ s  |        |        |        | Synchronous EN-DC  |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3 $\mu$ s  |        |        |        | Synchronous cells.   |
| T1  | s    | Config 1,2         | 5  |        |        |        |  |
| T2  | s    | Config 1,2         | 2.5  | 17     | 2.5    | 17     |  |

**Table A.10.4.2.4.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 |  | Unit       | Test configuration | Cell 2   |    |    |    | Cell 3   |    |    |    |
|---|--|------------|--------------------|--|----|----|----|--|----|----|----|
|   |  |            |                    | T1   | T2 | T3 | T4 | T1   | T2 | T3 | T4 |
| NR RF Channel Number                      |  |            | Config 1,2         | 1  |    |    |    | 2  |    |    |    |
| Duplex mode                               |  |            | Config 1,2         | TDD  |    |    |    |  |    |    |    |
| BW <sub>channel</sub>                     |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| BWP BW                                    |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| TDD configuration                         |  |            | Config 1,2         | TDDConf.1.1 CCA  |    |    |    | TDDConf.1.1 CCA  |    |    |    |
| Initial DL BWP                            |  |            | Config 1,2         | DLBWP.0.1  |    |    |    | NA   |    |    |    |
| Initial UL BWP                            |  |            | Config 1,2         | ULBWP.0.1  |    |    |    | NA   |    |    |    |
| Dedicated DL BWP                          |  |            | Config 1,2         | DLBWP.1.1  |    |    |    | NA   |    |    |    |
| Dedicated UL BWP                          |  |            | Config 1,2         | ULBWP.1.1  |    |    |    | NA   |    |    |    |
| TRS configuration                         |  |            | Config 1,2         | TRS.1.2 TDD  |    |    |    | NA   |    |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |            | Config 1,2         | OP.1   |    |    |    | OP.1   |    |    |    |
| PDSCH Reference                           |  |            | Config 1,2         | SR.1.1 CCA   |    |    |    | -  |    |    |    |
| CORESET Reference Channel                 |  |            | Config 1,2         | CR.1.1 CCA   |    |    |    | -  |    |    |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | SSB.1 CCA  |    |    |    | SSB.1 CCA  |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | SSB.2 CCA  |    |    |    | SSB.2 CCA  |    |    |    |
| DBT window configuration                  |  |            | Config 1,2         | As defined in A.3.28.1                                     |    |    |    | As defined in A.3.28.1                                     |    |    |    |
| SMTC configuration                        |  |            | Config 1,2         | SMTC.1   |    |    |    | SMTC.4   |    |    |    |
| PDSCH/PDCCH                               |  | kHz        | Config 1,2         | 30   |    |    |    | 30   |    |    |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_DL</sub> =0.9375                                |    |    |    | P <sub>CCA_DL</sub> =0.9375                                |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
| L <sub>CCA_DL</sub>                       |  |            | Config 1,2         | 5  |    |    |    | 5  |    |    |    |
| W <sub>CCA_DL</sub>                       |  | ms         | Config 1,2         | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    |
| EPRE ratio of PSS to SSS                  |  |            | Config 1,2         | 0  |    |    |    | 0  |    |    |    |
| EPRE ratio of PBCH DMRS to SSS            |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH to PDSCH              |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |  |            |                    |  |    |    |    |  |    |    |    |
| N <sub>oc</sub> <sup>Note2</sup>          |  | dBm/15k Hz | Config 1,2         | -104   |    |    |    | -104   |    |    |    |

|                           |  |            |        |        |           |        |
|---------------------------|--|------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup> | dBm/SC<br>S  | Config 1,2 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup> | dBm/SC<br>S  | Config 1,2 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>    | dBm/38.1<br>6MHz   | Config 1,2 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition     |  | Config 1,2 | AWGN   |        |           |        |
| Note 1:                   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |            |        |        |           |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |            |        |        |           |        |
| Note 3:                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |            |        |        |           |        |
| Note 4:                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |            |        |        |           |        |
| Note 5:                   | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |            |        |        |           |        |
| Note 6:                   | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |            |        |        |           |        |
| Note 7:                   | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.   |            |        |        |           |        |

**Table A.10.4.2.4.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.10.4.2.4.1-5: TimeAlignmentTimer-Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.10.4.2.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.2.5 EN-DC event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is not used

##### A.10.4.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.5.1-1, A.10.4.2.5.1-2, and A.10.4.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.10.4.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.5.1-1.

**Table A.10.4.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.4.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value  |        | Comment  |
|---|------|--------------------|--|--------|--|
|   |      |                    | Test 1   | Test 2 |  |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1  |        | One E-UTRAN carrier frequency is used.   |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2   |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA.                          |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 with CCA (PScell) |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3  |        | NR cell 3 is on NR RF channel number 2 with CCA.   |
| DL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.1                  |        |  |
| UL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.2                  |        |  |
| Gap Pattern Id                                  |      | Config 1,2         | 0  | 4      | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2         | 9  | 9      |  |
| A3-Offset                                       | dB   | Config 1,2         | -6   |        |  |
| Hysteresis                                      | dB   | Config 1,2         | 0  |        |  |
| CP length                                       |      | Config 1,2         | Normal   |        |  |
| TimeToTrigger                                   | s    | Config 1,2         | 0  |        |  |
| Filter coefficient                              |      | Config 1,2         | 0  |        | L3 filtering is not used   |
| DRX   |      | Config 1,2         | OFF  |        | DRX is not used  |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 $\mu$ s  |        | Synchronous EN-DC  |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3 $\mu$ s  |        | Synchronous cells.   |
| T1  | s    | Config 1,2         | 5  |        |  |
| T2  | s    | Config 1,2         | 2  | 2      |  |



**Table A.10.4.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 |  | Unit       | Test configuration | Cell 2   |    | Cell 3   |    |
|---|--|------------|--------------------|--|----|--|----|
|   |  |            |                    | T1   | T2 | T1   | T2 |
| NR RF Channel Number                      |  |            | Config 1,2         | 1  |    | 2  |    |
| Duplex mode                               |  |            | Config 1,2         | TDD  |    |  |    |
| BW <sub>channel</sub>                     |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| BWP BW                                    |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| TDD configuration                         |  |            | Config 1,2         | TDDConf.1.1 CCA  |    | TDDConf.1.1 CCA  |    |
| Initial DL BWP                            |  |            | Config 1,2         | DLBWP.0.1  |    | NA   |    |
| Initial UL BWP                            |  |            | Config 1,2         | ULBWP.0.1  |    | NA   |    |
| Dedicated DL BWP                          |  |            | Config 1,2         | DLBWP.1.1  |    | NA   |    |
| Dedicated UL BWP                          |  |            | Config 1,2         | ULBWP.1.1  |    | NA   |    |
| TRS configuration                         |  |            | Config 1,2         | TRS.1.2 TDD  |    | NA   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |            | Config 1,2         | OP.1   |    | OP.1   |    |
| PDSCH Reference                           |  |            | Config 1,2         | SR.1.1 CCA   |    | -  |    |
| CORESET Reference Channel                 |  |            | Config 1,2         | CR.1.1 CCA   |    | -  |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | SSB.1 CCA  |    | SSB.1 CCA  |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | SSB.2 CCA  |    | SSB.2 CCA  |    |
| DBT window configuration                  |  |            | Config 1,2         | As defined in A.3.28.1                                     |    | As defined in A.3.28.1                                     |    |
| SMTC configuration                        |  |            | Config 1,2         | SMTC.1   |    | SMTC.4   |    |
| PDSCH/PDCCH                               |  | kHz        | Config 1,2         | 30   |    | 30   |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_DL</sub> =0.9375                                |    | P <sub>CCA_DL</sub> =0.9375                                |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
| L <sub>CCA_DL</sub>                       |  |            | Config 1,2         | 5  |    | 5  |    |
| W <sub>CCA_DL</sub>                       |  | ms         | Config 1,2         | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |
| EPRE ratio of PSS to SSS                  |  |            | Config 1,2         | 0  |    | 0  |    |
| EPRE ratio of PBCH DMRS to SSS            |  |            |                    |  |    |  |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |            |                    |  |    |  |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |            |                    |  |    |  |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |            |                    |  |    |  |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |            |                    |  |    |  |    |
| EPRE ratio of PDSCH to PDSCH              |  |            |                    |  |    |  |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |  |            |                    |  |    |  |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |  |            |                    |  |    |  |    |
| N <sub>oc</sub> <sup>Note2</sup>          |  | dBm/15k Hz | Config 1,2         | -104   |    | -104   |    |

|                           |  |            |        |        |           |        |
|---------------------------|--|------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup> | dBm/SC<br>S  | Config 1,2 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup> | dBm/SC<br>S  | Config 1,2 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>    | dBm/38.1<br>6MHz   | Config 1,2 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition     |  | Config 1,2 | AWGN   |        |           |        |
| Note 1:                   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |            |        |        |           |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |            |        |        |           |        |
| Note 3:                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |            |        |        |           |        |
| Note 4:                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |            |        |        |           |        |
| Note 5:                   | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |            |        |        |           |        |
| Note 6:                   | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |            |        |        |           |        |
| Note 7:                   | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.   |            |        |        |           |        |

#### A.10.4.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.2.6 EN-DC event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is used

##### A.10.4.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.6.1-1, A.10.4.2.6.1-2, and A.10.4.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.10.4.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.6.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.10.4.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.4.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value  |        |        |        | Comment  |
|---|------|--------------------|--|--------|--------|--------|--|
|   |      |                    | Test 1   | Test 2 | Test 3 | Test 4 |  |
| E-UTRA RF Channel Number                        |      | Config 1,2         | 1  |        |        |        | One E-UTRAN carrier frequency is used.   |
| NR RF Channel Number                            |      | Config 1,2         | 1, 2   |        |        |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA.                          |
| Active cell                                     |      | Config 1,2         | LTE Cell 1 (PCell) and NR cell 2 with CCA (PScell) |        |        |        | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |
| Neighbour cell                                  |      | Config 1,2         | NR cell 3  |        |        |        | NR cell 3 is on NR RF channel number 2 with CCA.   |
| DL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.1                  |        |        |        |  |
| UL CCA model                                    |      | Config 1,2         | As specified in clause A.3.26.2.2                  |        |        |        |  |
| Gap Pattern Id                                  |      | Config 1,2         | 0  |        | 4      |        | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2         | 9  |        | 9      |        |  |
| A3-Offset                                       | dB   | Config 1,2         | -6   |        |        |        |  |
| Hysteresis                                      | dB   | Config 1,2         | 0  |        |        |        |  |
| CP length                                       |      | Config 1,2         | Normal   |        |        |        |  |
| TimeToTrigger                                   | s    | Config 1,2         | 0  |        |        |        |  |
| Filter coefficient                              |      | Config 1,2         | 0  |        |        |        | L3 filtering is not used   |
| DRX   |      | Config 1,2         | DRX .1   | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3<br>DRX is not used  |
| Time offset between PCell and PScell            |      | Config 1,2         | 3 $\mu$ s  |        |        |        | Synchronous EN-DC  |
| Time offset between serving and neighbour cells |      | Config 1,2         | 3 $\mu$ s  |        |        |        | Synchronous cells.   |
| T1  | s    | Config 1,2         | 5  |        |        |        |  |
| T2  | s    | Config 1,2         | 3  | 20     | 3      | 20     |  |

**Table A.10.4.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 |  | Unit       | Test configuration | Cell 2   |    |    |    | Cell 3   |    |    |    |
|---|--|------------|--------------------|--|----|----|----|--|----|----|----|
|   |  |            |                    | T1   | T2 | T3 | T4 | T1   | T2 | T3 | T4 |
| NR RF Channel Number                      |  |            | Config 1,2         | 1  |    |    |    | 2  |    |    |    |
| Duplex mode                               |  |            | Config 1,2         | TDD  |    |    |    |  |    |    |    |
| BW <sub>channel</sub>                     |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| BWP BW                                    |  | MHz        | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| TDD configuration                         |  |            | Config 1,2         | TDDConf.1.1 CCA  |    |    |    | TDDConf.1.1 CCA  |    |    |    |
| Initial DL BWP                            |  |            | Config 1,2         | DLBWP.0.1  |    |    |    | NA   |    |    |    |
| Initial UL BWP                            |  |            | Config 1,2         | ULBWP.0.1  |    |    |    | NA   |    |    |    |
| Dedicated DL BWP                          |  |            | Config 1,2         | DLBWP.1.1  |    |    |    | NA   |    |    |    |
| Dedicated UL BWP                          |  |            | Config 1,2         | ULBWP.1.1  |    |    |    | NA   |    |    |    |
| TRS configuration                         |  |            | Config 1,2         | TRS.1.2 TDD  |    |    |    | NA   |    |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |            | Config 1,2         | OP.1   |    |    |    | OP.1   |    |    |    |
| PDSCH Reference                           |  |            | Config 1,2         | SR.1.1 CCA   |    |    |    | -  |    |    |    |
| CORESET Reference Channel                 |  |            | Config 1,2         | CR.1.1 CCA   |    |    |    | -  |    |    |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | SSB.1 CCA  |    |    |    | SSB.1 CCA  |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | SSB.2 CCA  |    |    |    | SSB.2 CCA  |    |    |    |
| DBT window configuration                  |  |            | Config 1,2         | As defined in A.3.28.1                                     |    |    |    | As defined in A.3.28.1                                     |    |    |    |
| SMTC configuration                        |  |            | Config 1,2         | SMTC.1   |    |    |    | SMTC.4   |    |    |    |
| PDSCH/PDCCH                               |  | kHz        | Config 1,2         | 30   |    |    |    | 30   |    |    |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_DL</sub> =0.9375                                |    |    |    | P <sub>CCA_DL</sub> =0.9375                                |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |            | Config 1,2         | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
| L <sub>CCA_DL</sub>                       |  |            | Config 1,2         | 2  |    |    |    | 2  |    |    |    |
| W <sub>CCA_DL</sub>                       |  | ms         | Config 1,2         | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    |
| EPRE ratio of PSS to SSS                  |  |            | Config 1,2         | 0  |    |    |    | 0  |    |    |    |
| EPRE ratio of PBCH DMRS to SSS            |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH to PDSCH              |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |  |            |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |  |            |                    |  |    |    |    |  |    |    |    |
| N <sub>oc</sub> <sup>Note2</sup>          |  | dBm/15k Hz | Config 1,2         | -104   |    |    |    | -104   |    |    |    |

|                           |  |            |        |        |           |        |
|---------------------------|--|------------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup> | dBm/SC<br>S  | Config 1,2 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup> | dBm/SC<br>S  | Config 1,2 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$      | dB   | Config 1,2 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>    | dBm/38.1<br>6MHz   | Config 1,2 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition     |  | Config 1,2 | AWGN   |        |           |        |
| Note 1:                   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |            |        |        |           |        |
| Note 2:                   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |            |        |        |           |        |
| Note 3:                   | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |            |        |        |           |        |
| Note 4:                   | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |            |        |        |           |        |
| Note 5:                   | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |            |        |        |           |        |
| Note 6:                   | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |            |        |        |           |        |
| Note 7:                   | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.   |            |        |        |           |        |

**Table A.10.4.2.6.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.10.4.2.6.1-5: TimeAlignmentTimer -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.10.4.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.



In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.2.7 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used

##### A.10.4.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.7.1-1, A.10.4.2.7.1-2, and A.10.4.2.7.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.10.4.2.7.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.7.1-1.

**Table A.10.4.2.7.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description   |
|--|---|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 2  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 3  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 4  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| 5  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.10.4.2.7.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        | Comment   |
|---|------|--------------------|---|--------|---|
|   |      |                    | Test 1                                    | Test 2 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        | One E-UTRAN carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA.                         |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        | LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        | NR cell 3 is on NR RF channel number 2.   |
| DL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.1         |        |   |
| UL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.2         |        |   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   | 9      |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | OFF                                       |        | DRX is not used   |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2,3,4,5,6 | 3 ms                                      |        | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.              |
|   |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 1.7                                       | 1.7    |   |

**Table A.10.4.2.7.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 |  | Unit | Test configuration | Cell 2   |    | Cell 3                              |    |
|---|--|------|--------------------|--|----|-------------------------------------|----|
|   |  |      |                    | T1   | T2 | T1                                  | T2 |
| NR RF Channel Number                      |  |      | Config 1,2,3,4,5,6 | 1  |    | 2                                   |    |
| Duplex mode                               |  |      | Config 1,4         | TDD  |    | FDD                                 |    |
|   |  |      | Config 2,3,5,6     | TDD  |    | TDD                                 |    |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2,4,5     | 40: N <sub>RB,c</sub> = 106                                |    | 10: N <sub>RB,c</sub> = 52          |    |
|   |  |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106         |    |
| BWP BW                                    |  | MHz  | Config 1,2,4,5     | 40: N <sub>RB,c</sub> = 106                                |    | 10: N <sub>RB,c</sub> = 52          |    |
|   |  |      | Config 3,6         | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106         |    |
| TDD configuration                         |  |      | Config 1,4         | TDDConf.1.1 CCA  |    | NA                                  |    |
|   |  |      | Config 2,5         | TDDConf.1.1 CCA  |    | TDDConf.1.1                         |    |
|   |  |      | Config 3,6         | TDDConf.1.1 CCA  |    | TDDConf.2.1                         |    |
| Initial DL BWP                            |  |      | Config 1,2,3,4,5,6 | DLBWP.0.1  |    | NA                                  |    |
| Initial UL BWP                            |  |      | Config 1,2,3,4,5,6 | ULBWP.0.1  |    | NA                                  |    |
| Dedicated DL BWP                          |  |      | Config 1,2,3,4,5,6 | DLBWP.1.1  |    | NA                                  |    |
| Dedicated UL BWP                          |  |      | Config 1,2,3,4,5,6 | ULBWP.1.1  |    | NA                                  |    |
| TRS configuration                         |  |      | Config 1,2,3,4,5,6 | TRS.1.2 TDD  |    | NA                                  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |      | Config 1,2,3,4,5,6 | OP.1   |    | OP.1                                |    |
| PDSCH Reference measurement channel       |  |      | Config 1,4         | SR.1.1 CCA   |    | SR.1.1 FDD                          |    |
|   |  |      | Config 2,5         | SR.1.1 CCA   |    | SR.1.1 TDD                          |    |
|   |  |      | Config 3,6         | SR.1.1 CCA   |    | SR.2.1 TDD                          |    |
| CORESET Reference Channel                 |  |      | Config 1,4         | CR.1.1 CCA   |    | CR.1.1 FDD                          |    |
|   |  |      | Config 2,5         | CR.1.1 CCA   |    | CR.1.1 TDD                          |    |
|   |  |      | Config 3,6         | CR.1.1 CCA   |    | CR.2.1 TDD                          |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,4         | SSB.1 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 2,5         | SSB.1 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 3,6         | SSB.1 CCA  |    | SSB.2 FR1                           |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,4         | SSB.2 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 2,5         | SSB.2 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 3,6         | SSB.2 CCA  |    | SSB.2 FR1                           |    |
| DBT window configuration                  |  |      | Config 1,2,3,4,5,6 | As defined in A.3.28.1                                     |    | Not applicable                      |    |
| SMTC configuration defined in A.3.11      |  |      | Config 1,4         | SMTC.2   |    | SMTC.5                              |    |
|   |  |      | Config 2,3,5,6     | SMTC.1   |    | SMTC.4                              |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz  | Config 1,2,4,5     | 30   |    | 15                                  |    |
|   |  |      | Config 3,6         | 30   |    | 30                                  |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3,4,5,6 | P <sub>CCA_DL</sub> =0.9375                                |    | Not applicable                      |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3,4,5,6 | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | Not applicable                      |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3,4,5,6 | P <sub>CCA_UL</sub> =1                                     |    | Not applicable                      |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3,4,5,6 | P <sub>CCA_UL</sub> =1                                     |    | Not applicable                      |    |
| L <sub>CCA_DL</sub>                       |  |      | Config 1,2,3,4,5,6 | 12   |    | 12                                  |    |
| W <sub>CCA_DL</sub>                       |  | ms   | Config 1,2,3,4,5,6 | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    | T <sub>PSS/SSS_sync_inter_cca</sub> |    |

|  |               |                       |        |        |           |        |
|--|---------------|-----------------------|--------|--------|-----------|--------|
| EPRE ratio of PSS to SSS   |               | Config<br>1,2,3,4,5,6 | 0      | 0      |           |        |
| EPRE ratio of PBCH DMRS to SSS   |               |                       |        |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS  |               |                       |        |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS  |               |                       |        |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |               |                       |        |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS  |               |                       |        |        |           |        |
| EPRE ratio of PDSCH to PDSCH   |               |                       |        |        |           |        |
| EPRE ratio of OCNB DMRS to SSS(Note 1)   |               |                       |        |        |           |        |
| EPRE ratio of OCNB to OCNB DMRS (Note 1)   |               |                       |        |        |           |        |
| $N_{oc}^{Note2}$   | dBm/15k Hz    | Config 1,2,3,4,5,6    | -104   | -98    |           |        |
| $N_{oc}^{Note2}$   | dBm/SC S      | Config 1,2,4,5        | -101   | -98    |           |        |
|  |               | Config 3,6            | -101   | -95    |           |        |
| SS-RSRP Note 3   | dBm/SC S      | Config 1,2,4,5        | -94    | -94    | -Infinity | -91    |
|  |               | Config 3,6            | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s / I_{ot}$   | dB            | Config 1,2,3,4,5,6    | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s / N_{oc}$   | dB            | Config 1,2,3,4,5,6    | 4      | 4      | -Infinity | 7      |
| $I_o^{Note3}$  | dBm/9.36 MHz  | NR Config 1,2,4,5     | -58.49 | -58.49 | -70.05    | -62.26 |
|  | dBm/38.1 6MHz | NR Config 3,6         | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |               | Config 1,2,3,4,5,6    | AWGN   |        |           |        |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |               |                       |        |        |           |        |

A.10.4.2.7.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_inter\_cca\_without\_index}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_inter\_cca\_without\_index}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

$T_{identify\_inter\_cca\_without\_index} = (T_{PSS/SSS\_sync\_inter\_cca} + T_{SSB\_measurement\_period\_inter\_cca})$  ms, where

$T_{PSS/SSS\_sync\_inter\_cca}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{SSB\_measurement\_period\_inter\_cca}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.2.8 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used

##### A.10.4.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.8.1-1, A.10.4.2.8.1-2, and A.10.4.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.10.4.2.8.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.8.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.10.4.2.8.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 5  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mod |
| 6  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.4.2.8.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        |        |        | Comment   |
|---|------|--------------------|---|--------|--------|--------|---|
|   |      |                    | Test 1                                    | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        |        |        | One E-UTRAN carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        |        |        | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA.                         |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        |        |        | LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        |        |        | NR cell 3 is on NR RF channel number 2.   |
| DL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.1         |        |        |        |   |
| UL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.2         |        |        |        |   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   |        | 4      |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   |        | 9      |        |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |        |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        |        |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | DRX .1                                    | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3  |
| Time offset between PCell and PScell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        |        |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2,3,4,5,6 | 3 ms                                      |        |        |        | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.              |
|   |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |        |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 2.5                                       | 17     | 2.5    | 17     |   |



**Table A.10.4.2.8.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter                                 |  | Unit   | Test configuration                         | Cell 2                      |  |    |    | Cell 3                      |                |    |    |
|---|--|--|--|-----------------------------|--|----|----|-----------------------------|----------------|----|----|
|   |  |  |  | T1                          | T2   | T3 | T4 | T1                          | T2             | T3 | T4 |
| NR RF Channel Number                      |  |  | Config 1,2,3,4,5,6                         | 1                           |  |    |    | 2                           |                |    |    |
| Duplex mode                               |  |  | Config 1,4                                 | TDD                         |  |    |    | FDD                         |                |    |    |
|   |  |  | Config 2,3,5,6                             | TDD                         |  |    |    | TDD                         |                |    |    |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2,4,5                             | 40: N <sub>RB,c</sub> = 106 |  |    |    | 10: N <sub>RB,c</sub> = 52  |                |    |    |
|   |  |  | Config 3,6                                 | 40: N <sub>RB,c</sub> = 106 |  |    |    | 40: N <sub>RB,c</sub> = 106 |                |    |    |
| BWP BW                                    |  | MHz  | Config 1,2,4,5                             | 40: N <sub>RB,c</sub> = 106 |  |    |    | 10: N <sub>RB,c</sub> = 52  |                |    |    |
|   |  |  | Config 3,6                                 | 40: N <sub>RB,c</sub> = 106 |  |    |    | 40: N <sub>RB,c</sub> = 106 |                |    |    |
| TDD configuration                         |  |  | Config 1,4                                 | TDDConf.1.1 CCA             |  |    |    | NA                          |                |    |    |
|   |  |  | Config 2,5                                 | TDDConf.1.1 CCA             |  |    |    | TDDConf.1.1                 |                |    |    |
|   |  |  | Config 3,6                                 | TDDConf.1.1 CCA             |  |    |    | TDDConf.2.1                 |                |    |    |
| Initial DL BWP                            |  |  | Config 1,2,3,4,5,6                         | DLBWP.0.1                   |  |    |    | NA                          |                |    |    |
| Initial UL BWP                            |  |  | Config 1,2,3,4,5,6                         | ULBWP.0.1                   |  |    |    | NA                          |                |    |    |
| Dedicated DL BWP                          |  |  | Config 1,2,3,4,5,6                         | DLBWP.1.1                   |  |    |    | NA                          |                |    |    |
| Dedicated UL BWP                          |  |  | Config 1,2,3,4,5,6                         | ULBWP.1.1                   |  |    |    | NA                          |                |    |    |
| TRS configuration                         |  |  | Config 1,2,3,4,5,6                         | TRS.1.2 TDD                 |  |    |    | NA                          |                |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |  | Config 1,2,3,4,5,6                         | OP.1                        |  |    |    | OP.1                        |                |    |    |
| PDSCH Reference measurement channel       |  |  | Config 1,4                                 | SR.1.1 CCA                  |  |    |    | SR.1.1 FDD                  |                |    |    |
|   |  |  | Config 2,5                                 | SR.1.1 CCA                  |  |    |    | SR.1.1 TDD                  |                |    |    |
|   |  |  | Config 3,6                                 | SR.1.1 CCA                  |  |    |    | SR.2.1 TDD                  |                |    |    |
| CORESET Reference Channel                 |  |  | Config 1,4                                 | CR.1.1 CCA                  |  |    |    | CR.1.1 FDD                  |                |    |    |
|   |  |  | Config 2,5                                 | CR.1.1 CCA                  |  |    |    | CR.1.1 TDD                  |                |    |    |
|   |  |  | Config 3,6                                 | CR.1.1 CCA                  |  |    |    | CR.2.1 TDD                  |                |    |    |
| SSB parameters                            |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,4                                 | SSB.1 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|   |  |  | Config 2,5                                 | SSB.1 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|   |  |  | Config 3,6                                 | SSB.1 CCA                   |  |    |    | SSB.2 FR1                   |                |    |    |
|   |  | Dynamic channel access <sup>Note 6,7</sup>     | Config 1,4                                 | SSB.2 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|   |  |  | Config 2,5                                 | SSB.2 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|   |  |  | Config 3,6                                 | SSB.2 CCA                   |  |    |    | SSB.2 FR1                   |                |    |    |
| DBT window configuration                  |  |  | Config 1,2,3,4,5,6                         | As defined in A.3.28.1      |  |    |    | Not applicable              |                |    |    |
| SMTC configuration defined in A.3.11      |  |  | Config 1,4                                 | SMTC.2                      |  |    |    | SMTC.5                      |                |    |    |
|   |  |  | Config 2,3,5,6                             | SMTC.1                      |  |    |    | SMTC.4                      |                |    |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz  | Config 1,2,4,5                             | 30                          |  |    |    | 15                          |                |    |    |
|   |  |  | Config 3,6                                 | 30                          |  |    |    | 30                          |                |    |    |
| DL CCA probability P <sub>CCA_DL</sub>    |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,2,3,4,5,6                         | P <sub>CCA_DL</sub> =0.9375 |  |    |    | Not applicable              |                |    |    |
|   |  |  | Dynamic channel access <sup>Note 6,7</sup> | Config 1,2,3,4,5,6          | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |                             | Not applicable |    |    |
| UL CCA probability P <sub>CCA_UL</sub>    |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,2,3,4,5,6                         | P <sub>CCA_UL</sub> =1      |  |    |    | Not applicable              |                |    |    |
|   |  |  | Dynamic channel access <sup>Note 6,7</sup> | Config 1,2,3,4,5,6          | P <sub>CCA_UL</sub> =1                                     |    |    |                             | Not applicable |    |    |

|   |               |                    |                                     |        |                                     |        |
|---|---------------|--------------------|-------------------------------------|--------|-------------------------------------|--------|
| LCCA_DL   |               | Config 1,2,3,4,5,6 | 5                                   |        | 5                                   |        |
| WCCA_DL   | ms            | Config 1,2,3,4,5,6 | T <sub>PSS/SSS_sync_inter_cca</sub> |        | T <sub>PSS/SSS_sync_inter_cca</sub> |        |
| EPRE ratio of PSS to SSS  |               | Config 1,2,3,4,5,6 | 0                                   |        | 0                                   |        |
| EPRE ratio of PBCH DMRS to SSS  |               |                    |                                     |        |                                     |        |
| EPRE ratio of PBCH to PBCH DMRS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDCCH DMRS to SSS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDSCH DMRS to SSS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDSCH to PDSCH  |               |                    |                                     |        |                                     |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |               |                    |                                     |        |                                     |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |               |                    |                                     |        |                                     |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/15k Hz    | Config 1,2,3,4,5,6 | -104                                |        | -98                                 |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/SC S      | Config 1,2,4,5     | -101                                |        | -98                                 |        |
|   |               | Config 3,6         | -101                                |        | -95                                 |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SC S      | Config 1,2,4,5     | -94                                 | -94    | -Infinity                           | -91    |
|   |               | Config 3,6         | -91                                 | -91    | -Infinity                           | -88    |
| $\hat{E}_s / I_{ot}$  | dB            | Config 1,2,3,4,5,6 | 4                                   | 4      | -Infinity                           | 7      |
| $\hat{E}_s / N_{oc}$  | dB            | Config 1,2,3,4,5,6 | 4                                   | 4      | -Infinity                           | 7      |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/9.36 MHz  | NR Config 1,2,4,5  | -58.49                              | -58.49 | -70.05                              | -62.26 |
|   | dBm/38.1 6MHz | NR Config 3,6      | -58.49                              | -58.49 | -63.94                              | -56.15 |
| Propagation Condition   |               | Config 1,2,3,4,5,6 | AWGN                                |        |                                     |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |               |                    |                                     |        |                                     |        |

**Table A.10.4.2.8.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.10.4.2.8.1-5: TimeAlignmentTimer -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.10.4.2.8.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.10.4.2.9 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used

#### A.10.4.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.9.1-1, A.10.4.2.9.1-2, and A.10.4.2.9.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.9.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.10.4.2.9.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.9.1-1.

**Table A.10.4.2.9.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 5  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mod |
| 6  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.4.2.9.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        | Comment   |
|---|------|--------------------|---|--------|---|
|   |      |                    | Test 1                                    | Test 2 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        | One E-UTRAN carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA.                         |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        | LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        | NR cell 3 is on NR RF channel number 2.   |
| DL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.1         |        |   |
| UL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.2         |        |   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   | 9      |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | OFF                                       |        | DRX is not used   |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2,3,4,5,6 | 3 ms                                      |        | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.              |
|   |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 2   | 2      |   |

**Table A.10.4.2.9.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                 |  | Unit   | Test configuration                         | Cell 2                      |  | Cell 3                      |                |
|---|--|--|--|-----------------------------|--|-----------------------------|----------------|
|   |  |  |  | T1                          | T2   | T1                          | T2             |
| NR RF Channel Number                      |  |  | Config 1,2,3,4,5,6                         | 1                           |  | 2                           |                |
| Duplex mode                               |  |  | Config 1,4                                 | TDD                         |  | FDD                         |                |
|   |  |  | Config 2,3,5,6                             | TDD                         |  | TDD                         |                |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2,4,5                             | 40: N <sub>RB,c</sub> = 106 |  | 10: N <sub>RB,c</sub> = 52  |                |
|   |  |  | Config 3,6                                 | 40: N <sub>RB,c</sub> = 106 |  | 40: N <sub>RB,c</sub> = 106 |                |
| BWP BW                                    |  | MHz  | Config 1,2,4,5                             | 40: N <sub>RB,c</sub> = 106 |  | 10: N <sub>RB,c</sub> = 52  |                |
|   |  |  | Config 3,6                                 | 40: N <sub>RB,c</sub> = 106 |  | 40: N <sub>RB,c</sub> = 106 |                |
| TDD configuration                         |  |  | Config 1,4                                 | TDDConf.1.1 CCA             |  | NA                          |                |
|   |  |  | Config 2,5                                 | TDDConf.1.1 CCA             |  | TDDConf.1.1                 |                |
|   |  |  | Config 3,6                                 | TDDConf.1.1 CCA             |  | TDDConf.2.1                 |                |
| Initial DL BWP                            |  |  | Config 1,2,3,4,5,6                         | DLBWP.0.1                   |  | NA                          |                |
| Initial UL BWP                            |  |  | Config 1,2,3,4,5,6                         | ULBWP.0.1                   |  | NA                          |                |
| Dedicated DL BWP                          |  |  | Config 1,2,3,4,5,6                         | DLBWP.1.1                   |  | NA                          |                |
| Dedicated UL BWP                          |  |  | Config 1,2,3,4,5,6                         | ULBWP.1.1                   |  | NA                          |                |
| TRS configuration                         |  |  | Config 1,2,3,4,5,6                         | TRS.1.2 TDD                 |  | NA                          |                |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |  | Config 1,2,3,4,5,6                         | OP.1                        |  | OP.1                        |                |
| PDSCH Reference measurement channel       |  |  | Config 1,4                                 | SR.1.1 CCA                  |  | SR.1.1 FDD                  |                |
|   |  |  | Config 2,5                                 | SR.1.1 CCA                  |  | SR.1.1 TDD                  |                |
|   |  |  | Config 3,6                                 | SR.1.1 CCA                  |  | SR.2.1 TDD                  |                |
| CORESET Reference Channel                 |  |  | Config 1,4                                 | CR.1.1 CCA                  |  | CR.1.1 FDD                  |                |
|   |  |  | Config 2,5                                 | CR.1.1 CCA                  |  | CR.1.1 TDD                  |                |
|   |  |  | Config 3,6                                 | CR.1.1 CCA                  |  | CR.2.1 TDD                  |                |
| SSB parameters                            |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,4                                 | SSB.1 CCA                   |  | SSB.1 FR1                   |                |
|   |  |  | Config 2,5                                 | SSB.1 CCA                   |  | SSB.1 FR1                   |                |
|   |  |  | Config 3,6                                 | SSB.1 CCA                   |  | SSB.2 FR1                   |                |
|   |  | Dynamic channel access <sup>Note 6,7</sup>     | Config 1,4                                 | SSB.2 CCA                   |  | SSB.1 FR1                   |                |
|   |  |  | Config 2,5                                 | SSB.2 CCA                   |  | SSB.1 FR1                   |                |
|   |  |  | Config 3,6                                 | SSB.2 CCA                   |  | SSB.2 FR1                   |                |
| DBT window configuration                  |  |  | Config 1,2,3,4,5,6                         | As defined in A.3.28.1      |  | Not applicable              |                |
| SMTC configuration defined in A.3.11      |  |  | Config 1,4                                 | SMTC.2                      |  | SMTC.5                      |                |
|   |  |  | Config 2,3,5,6                             | SMTC.1                      |  | SMTC.4                      |                |
| PDSCH/PDCCH subcarrier spacing            |  | kHz  | Config 1,2,4,5                             | 30                          |  | 15                          |                |
|   |  |  | Config 3,6                                 | 30                          |  | 30                          |                |
| DL CCA probability P <sub>CCA_DL</sub>    |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,2,3,4,5,6                         | P <sub>CCA_DL</sub> =0.9375 |  | Not applicable              |                |
|   |  |  | Dynamic channel access <sup>Note 6,7</sup> | Config 1,2,3,4,5,6          | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |                             | Not applicable |
| UL CCA probability P <sub>CCA_UL</sub>    |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,2,3,4,5,6                         | P <sub>CCA_UL</sub> =1      |  | Not applicable              |                |
|   |  |  | Dynamic channel access <sup>Note 6,7</sup> | Config 1,2,3,4,5,6          | P <sub>CCA_UL</sub> =1                                     |                             | Not applicable |



|   |               |                    |                                     |        |                                     |        |
|---|---------------|--------------------|-------------------------------------|--------|-------------------------------------|--------|
| LCCA_DL   |               | Config 1,2,3,4,5,6 | 5                                   |        | 5                                   |        |
| WCCA_DL   | ms            | Config 1,2,3,4,5,6 | T <sub>PSS/SSS_sync_inter_cca</sub> |        | T <sub>PSS/SSS_sync_inter_cca</sub> |        |
| EPRE ratio of PSS to SSS  |               | Config 1,2,3,4,5,6 | 0                                   |        | 0                                   |        |
| EPRE ratio of PBCH DMRS to SSS  |               |                    |                                     |        |                                     |        |
| EPRE ratio of PBCH to PBCH DMRS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDCCH DMRS to SSS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDSCH DMRS to SSS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDSCH to PDSCH  |               |                    |                                     |        |                                     |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |               |                    |                                     |        |                                     |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |               |                    |                                     |        |                                     |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/15k Hz    |                    |                                     |        |                                     |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/SC S      | Config 1,2,4,5     | -101                                |        | -98                                 |        |
|   |               | Config 3,6         | -101                                |        | -95                                 |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SC S      | Config 1,2,4,5     | -94                                 | -94    | -Infinity                           | -91    |
|   |               | Config 3,6         | -91                                 | -91    | -Infinity                           | -88    |
| $\hat{E}_s / I_{ot}$  | dB            | Config 1,2,3,4,5,6 | 4                                   | 4      | -Infinity                           | 7      |
| $\hat{E}_s / N_{oc}$  | dB            | Config 1,2,3,4,5,6 | 4                                   | 4      | -Infinity                           | 7      |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/9.36 MHz  | NR Config 1,2,4,5  | -58.49                              | -58.49 | -70.05                              | -62.26 |
|   | dBm/38.1 6MHz | NR Config 3,6      | -58.49                              | -58.49 | -63.94                              | -56.15 |
| Propagation Condition   |               | Config 1,2,3,4,5,6 | AWGN                                |        |                                     |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |               |                    |                                     |        |                                     |        |

#### A.10.4.2.9.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.2.10 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used

##### A.10.4.2.10.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.10.4.2.10.1-1, A.10.4.2.10.1-2, and A.10.4.2.10.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.10.4.2.10.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.10.4.2.10.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.10.4.2.10.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.10.4.2.10.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1**

| Config   | Description  |
|--|--|
| 1  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3  | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 5  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mod |
| 6  | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.10.4.2.10.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                                     |        |        |        | Comment   |
|---|------|--------------------|---|--------|--------|--------|---|
|   |      |                    | Test 1                                    | Test 2 | Test 3 | Test 4 |   |
| E-UTRA RF Channel Number                        |      | Config 1,2,3,4,5,6 | 1   |        |        |        | One E-UTRAN carrier frequency is used.  |
| NR RF Channel Number                            |      | Config 1,2,3,4,5,6 | 1, 2                                      |        |        |        | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA.                         |
| Active cell                                     |      | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) |        |        |        | LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3,4,5,6 | NR cell 3                                 |        |        |        | NR cell 3 is on NR RF channel number 2.   |
| DL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.1         |        |        |        |   |
| UL CCA model                                    |      | Config 1,2,3,4,5,6 | As specified in clause A.3.26.2.2         |        |        |        |   |
| Gap Pattern Id                                  |      | Config 1,2,3,4,5,6 | 0   |        | 4      |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1,2,3,4,5,6 | 9   |        | 9      |        |   |
| A3-Offset                                       | dB   | Config 1,2,3,4,5,6 | -6  |        |        |        |   |
| Hysteresis                                      | dB   | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| CP length                                       |      | Config 1,2,3,4,5,6 | Normal                                    |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1,2,3,4,5,6 | 0   |        |        |        |   |
| Filter coefficient                              |      | Config 1,2,3,4,5,6 | 0   |        |        |        | L3 filtering is not used  |
| DRX   |      | Config 1,2,3,4,5,6 | DRX .1                                    | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3  |
| Time offset between PCell and PSCell            |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        |        |        | Synchronous EN-DC   |
| Time offset between serving and neighbour cells |      | Config 1,2,3,4,5,6 | 3 ms                                      |        |        |        | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.              |
|   |      | Config 1,2,3,4,5,6 | 3 $\mu$ s                                 |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1,2,3,4,5,6 | 5   |        |        |        |   |
| T2  | s    | Config 1,2,3,4,5,6 | 3   | 20     | 3      | 20     |   |

**Table A.10.4.2.10.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter                                  |  | Unit   | Test configuration                         | Cell 2                      |  |    |    | Cell 3                      |                |    |    |
|--|--|--|--|-----------------------------|--|----|----|-----------------------------|----------------|----|----|
|  |  |  |  | T1                          | T2   | T3 | T4 | T1                          | T2             | T3 | T4 |
| NR RF Channel Number                       |  |  | Config 1,2,3,4,5,6                         | 1                           |  |    |    | 2                           |                |    |    |
| Duplex mode                                |  |  | Config 1,4                                 | TDD                         |  |    |    | FDD                         |                |    |    |
|  |  |  | Config 2,3,5,6                             | TDD                         |  |    |    | TDD                         |                |    |    |
| BW <sub>channel</sub>                      |  | MHz  | Config 1,2,4,5                             | 40: N <sub>RB,c</sub> = 106 |  |    |    | 10: N <sub>RB,c</sub> = 52  |                |    |    |
|  |  |  | Config 3,6                                 | 40: N <sub>RB,c</sub> = 106 |  |    |    | 40: N <sub>RB,c</sub> = 106 |                |    |    |
| BWP BW                                     |  | MHz  | Config 1,2,4,5                             | 40: N <sub>RB,c</sub> = 106 |  |    |    | 10: N <sub>RB,c</sub> = 52  |                |    |    |
|  |  |  | Config 3,6                                 | 40: N <sub>RB,c</sub> = 106 |  |    |    | 40: N <sub>RB,c</sub> = 106 |                |    |    |
| TDD configuration                          |  |  | Config 1,4                                 | TDDConf.1.1 CCA             |  |    |    | NA                          |                |    |    |
|  |  |  | Config 2,5                                 | TDDConf.1.1 CCA             |  |    |    | TDDConf.1.1                 |                |    |    |
|  |  |  | Config 3,6                                 | TDDConf.1.1 CCA             |  |    |    | TDDConf.2.1                 |                |    |    |
| Initial DL BWP                             |  |  | Config 1,2,3,4,5,6                         | DLBWP.0.1                   |  |    |    | NA                          |                |    |    |
| Initial UL BWP                             |  |  | Config 1,2,3,4,5,6                         | ULBWP.0.1                   |  |    |    | NA                          |                |    |    |
| Dedicated DL BWP                           |  |  | Config 1,2,3,4,5,6                         | DLBWP.1.1                   |  |    |    | NA                          |                |    |    |
| Dedicated UL BWP                           |  |  | Config 1,2,3,4,5,6                         | ULBWP.1.1                   |  |    |    | NA                          |                |    |    |
| TRS configuration                          |  |  | Config 1,2,3,4,5,6                         | TRS.1.2 TDD                 |  |    |    | NA                          |                |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |  |  | Config 1,2,3,4,5,6                         | OP.1                        |  |    |    | OP.1                        |                |    |    |
| PDSCH Reference measurement channel        |  |  | Config 1,4                                 | SR.1.1 CCA                  |  |    |    | SR.1.1 FDD                  |                |    |    |
|  |  |  | Config 2,5                                 | SR.1.1 CCA                  |  |    |    | SR.1.1 TDD                  |                |    |    |
|  |  |  | Config 3,6                                 | SR.1.1 CCA                  |  |    |    | SR.2.1 TDD                  |                |    |    |
| CORESET Reference Channel                  |  |  | Config 1,4                                 | CR.1.1 CCA                  |  |    |    | CR.1.1 FDD                  |                |    |    |
|  |  |  | Config 2,5                                 | CR.1.1 CCA                  |  |    |    | CR.1.1 TDD                  |                |    |    |
|  |  |  | Config 3,6                                 | CR.1.1 CCA                  |  |    |    | CR.2.1 TDD                  |                |    |    |
| SSB parameters                             |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,4                                 | SSB.1 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|  |  |  | Config 2,5                                 | SSB.1 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|  |  |  | Config 3,6                                 | SSB.1 CCA                   |  |    |    | SSB.2 FR1                   |                |    |    |
| Dynamic channel access <sup>Note 6,7</sup> |  |  | Config 1,4                                 | SSB.2 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|  |  |  | Config 2,5                                 | SSB.2 CCA                   |  |    |    | SSB.1 FR1                   |                |    |    |
|  |  |  | Config 3,6                                 | SSB.2 CCA                   |  |    |    | SSB.2 FR1                   |                |    |    |
| DBT window configuration                   |  |  | Config 1,2,3,4,5,6                         | As defined in A.3.28.1      |  |    |    | Not applicable              |                |    |    |
| SMTC configuration defined in A.3.11       |  |  | Config 1,4                                 | SMTC.2                      |  |    |    | SMTC.5                      |                |    |    |
|  |  |  | Config 2,3,5,6                             | SMTC.1                      |  |    |    | SMTC.4                      |                |    |    |
| PDSCH/PDCCH subcarrier spacing             |  | kHz  | Config 1,2,4,5                             | 30                          |  |    |    | 15                          |                |    |    |
|  |  |  | Config 3,6                                 | 30                          |  |    |    | 30                          |                |    |    |
| DL CCA probability P <sub>CCA_DL</sub>     |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,2,3,4,5,6                         | P <sub>CCA_DL</sub> =0.9375 |  |    |    | Not applicable              |                |    |    |
|  |  |  | Dynamic channel access <sup>Note 6,7</sup> | Config 1,2,3,4,5,6          | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |                             | Not applicable |    |    |
| UL CCA probability P <sub>CCA_UL</sub>     |  | Semi-static channel access <sup>Note 5,7</sup> | Config 1,2,3,4,5,6                         | P <sub>CCA_UL</sub> =1      |  |    |    | Not applicable              |                |    |    |
|  |  |  | Dynamic channel access <sup>Note 6,7</sup> | Config 1,2,3,4,5,6          | P <sub>CCA_UL</sub> =1                                     |    |    |                             | Not applicable |    |    |

|   |               |                    |                                     |        |                                     |        |
|---|---------------|--------------------|-------------------------------------|--------|-------------------------------------|--------|
| LCCA_DL   |               | Config 1,2,3,4,5,6 | 2                                   | 2      |                                     |        |
| W <sub>CCA_DL</sub>   | ms            | Config 1,2,3,4,5,6 | T <sub>PSS/SSS_sync_inter_cca</sub> |        | T <sub>PSS/SSS_sync_inter_cca</sub> |        |
| EPRE ratio of PSS to SSS  |               | Config 1,2,3,4,5,6 | 0                                   | 0      |                                     |        |
| EPRE ratio of PBCH DMRS to SSS  |               |                    |                                     |        |                                     |        |
| EPRE ratio of PBCH to PBCH DMRS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDCCH DMRS to SSS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDSCH DMRS to SSS   |               |                    |                                     |        |                                     |        |
| EPRE ratio of PDSCH to PDSCH  |               |                    |                                     |        |                                     |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |               |                    |                                     |        |                                     |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |               |                    |                                     |        |                                     |        |
| $N_{oc}^{Note2}$  | dBm/15k Hz    | Config 1,2,3,4,5,6 | -104                                | -98    |                                     |        |
| $N_{oc}^{Note2}$  | dBm/SC S      | Config 1,2,4,5     | -101                                | -98    |                                     |        |
|   |               | Config 3,6         | -101                                | -95    |                                     |        |
| SS-RSRP <sup>Note 3</sup>   | dBm/SC S      | Config 1,2,4,5     | -94                                 | -94    | -Infinity                           | -91    |
|   |               | Config 3,6         | -91                                 | -91    | -Infinity                           | -88    |
| $\hat{E}_s / I_{ot}$  | dB            | Config 1,2,3,4,5,6 | 4                                   | 4      | -Infinity                           | 7      |
| $\hat{E}_s / N_{oc}$  | dB            | Config 1,2,3,4,5,6 | 4                                   | 4      | -Infinity                           | 7      |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/9.36 MHz  | NR Config 1,2,4,5  | -58.49                              | -58.49 | -70.05                              | -62.26 |
|   | dBm/38.1 6MHz | NR Config 3,6      | -58.49                              | -58.49 | -63.94                              | -56.15 |
| Propagation Condition   |               | Config 1,2,3,4,5,6 | AWGN                                |        |                                     |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |               |                    |                                     |        |                                     |        |

**Table A.10.4.2.10.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.10.4.2.10.1-5: TimeAlignmentTimer -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.10.4.2.10.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.10.4.3 L1-RSRP measurements for beam reporting

#### A.10.4.3.1 SSB based L1-RSRP measurement on PSCC when DRX is not used

##### A.10.4.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.1.1-1.



**Table A.10.4.3.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| 2      | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.10.4.3.1.2 Test parameters

There are two cells in the test, E-UTRAN Pcell (Cell 1) and FR1 PSCell (Cell 2) which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 are given in Table A.10.4.3.1.2-1 and Table A.10.4.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.1.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1,2    |      | freq1  |
| DL CCA model  | 1,2    |      | As specified in A.3.20.2.1   |
| UL CCA model  | 1,2    |      | As specified in A.3.20.2.2   |
| Duplex mode   | 1,2    |      | TDD  |
| TDD Configuration   | 1,2    |      | TDDConf.1.1 CCA  |
| BW <sub>channel</sub>   | 1,2    | MHz  | 40: N <sub>RB,c</sub> = 106  |
| PDSCH Reference measurement channel   | 1,2    |      | SR.1.1 CCA   |
| RMSI CORESET Reference Channel  | 1,2    |      | CR.1.1 CCA   |
| Dedicated CORESET Reference Channel   | 1,2    |      | CCR.1.1 CCA  |
| SSB configuration   | 1,2    |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns   | 1,2    |      | OP.1   |
| Initial BWP Configuration   | 1,2    |      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration   | 1,2    |      | DLBWP.1.1<br>ULBWP.1.1   |
| DBT Window Configuration  | 1,2    |      | DBT.1  |
| TRS Configuration   | 1,2    |      | TRS.1.2 TDD  |
| DRX configuration   | 1,2    |      | Off  |
| reportConfigType  | 1,2    |      | periodic   |
| reportQuantity  | 1,2    |      | ssb-Index-RSRP   |
| Number of reported RS   | 1,2    |      | 2  |
| L1-RSRP reporting period  | 1,2    | slot | 80   |
| T1  | 1,2    | s    | 5  |
| T2  | 1,2    | s    | 1  |
| EPRE ratio of PSS to SSS  | 1,2    | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS  |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |  |
| Propagation condition   | 1,2    |      | AWGN   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.</p> |        |      |  |

Table A.10.4.3.1.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1,2    |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1,2    |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1,2    |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1,2    | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1,2    | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s / I_{ot}$  | 1,2    | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1,2    | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1,2    | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s / N_{oc}$  | 1,2    | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

### A.10.4.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.10.4.3.2 SSB based L1-RSRP measurement on PSCC when DRX is used

#### A.10.4.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.1.1-1.

**Table A.10.4.3.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| 2      | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.10.4.3.2.2 Test parameters

There are two cells in the test, E-UTRAN Pcell (Cell 1) and FR1 PSCell (Cell 2) which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 are given in Table A.10.4.3.2.2-1 and Table A.10.4.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.2.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1,2    |      | freq1  |
| DL CCA model  | 1,2    |      | As specified in A.3.20.2.1   |
| UL CCA model  | 1,2    |      | As specified in A.3.20.2.2   |
| Duplex mode   | 1,2    |      | TDD  |
| TDD Configuration   | 1,2    |      | TDDConf.1.1 CCA  |
| BW <sub>channel</sub>   | 1,2    | MHz  | 40: N <sub>RB,c</sub> = 106  |
| PDSCH Reference measurement channel   | 1,2    |      | SR.1.1 CCA   |
| RMSI CORESET Reference Channel  | 1,2    |      | CR.1.1 CCA   |
| Dedicated CORESET Reference Channel   | 1,2    |      | CCR.1.1 CCA  |
| SSB configuration   | 1,2    |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns   | 1,2    |      | OP.1   |
| Initial BWP Configuration   | 1,2    |      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration   | 1,2    |      | DLBWP.1.1<br>ULBWP.1.1   |
| DBT Window Configuration  | 1,2    |      | DBT.1  |
| TRS Configuration   | 1,2    |      | TRS.1.2 TDD  |
| DRX configuration   | 1,2    |      | DRX.3  |
| reportConfigType  | 1,2    |      | periodic   |
| reportQuantity  | 1,2    |      | ssb-Index-RSRP   |
| Number of reported RS   | 1,2    |      | 2  |
| L1-RSRP reporting period  | 1,2    | slot | 80   |
| T1  | 1,2    | s    | 5  |
| T2  | 1,2    | s    | 1  |
| EPRE ratio of PSS to SSS  | 1,2    | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS  |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |  |
| Propagation condition   | 1,2    |      | AWGN   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.</p> |        |      |  |

Table A.10.4.3.2.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1,2    |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1,2    |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1,2    |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1,2    | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1,2    | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s / I_{ot}$  | 1,2    | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1,2    | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1,2    | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s / N_{oc}$  | 1,2    | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

### A.10.4.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.10.4.3.3 SSB based L1-RSRP measurement on SCC when DRX is not used

#### A.10.4.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.1.1-1.

**Table A.10.4.3.3.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| 2      | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.10.4.3.3.2 Test parameters

There are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2), and FR1 SCell (Cell 3). Cell 2 and Cell 3 operate on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.10.4.3.3.2-1 and Table A.10.4.3.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.3.2-1: General test parameters

| Parameter   | Config   | Unit | Value  |
|---|--|------|--|
| Active PScell                                     | 1,2  |      | Cell 2   |
| Active Scell                                      | 1,2  |      | Cell 3   |
| RF Channel Number                                 | 1,2  |      | 1: Cell 2<br>2: Cell 3   |
| DL CCA model                                      | 1,2  |      | As specified in A.3.20.2.1   |
| UL CCA model                                      | 1,2  |      | As specified in A.3.20.2.2   |
| Duplex mode                                       | 1,2  |      | TDD  |
| TDD Configuration                                 | 1,2  |      | TDDConf.1.1 CCA  |
| BW <sub>channel</sub>                             | 1,2  | MHz  | 40: N <sub>RB,c</sub> = 106  |
| PDSCH Reference measurement channel               | 1,2  |      | SR.1.1 CCA   |
| RMSI CORESET Reference Channel                    | 1,2  |      | CR.1.1 CCA   |
| Dedicated CORESET Reference Channel               | 1,2  |      | CCR.1.1 CCA  |
| SSB configuration                                 | 1,2  |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns                                     | 1,2  |      | OP.1   |
| Initial BWP Configuration                         | 1,2  |      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration                       | 1,2  |      | DLBWP.1.1<br>ULBWP.1.1   |
| DBT Window Configuration                          | 1,2  |      | DBT.1  |
| TRS Configuration                                 | 1,2  |      | TRS.1.2 TDD  |
| DRX configuration                                 | 1,2  |      | Off  |
| reportConfigType                                  | 1,2  |      | periodic   |
| reportQuantity                                    | 1,2  |      | ssb-Index-RSRP   |
| Number of reported RS                             | 1,2  |      | 2  |
| L1-RSRP reporting period                          | 1,2  | slot | 80   |
| T1  | 1,2  | s    | 5  |
| T2  | 1,2  | s    | 1  |
| EPRE ratio of PSS to SSS                          | 1,2  | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |  |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |  |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |  |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |  |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |  |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |      |  |
| Propagation condition                             | 1,2  |      | AWGN   |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |      |  |



Table A.10.4.3.3.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1, 2   |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1, 2   |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1, 2   |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1, 2   | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1, 2   | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s / I_{ot}$  | 1, 2   | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1, 2   | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1, 2   | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s / N_{oc}$  | 1, 2   | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

### A.10.4.3.3.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 3.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

### A.10.4.3.4 SSB based L1-RSRP measurement on SCC when DRX is used

#### A.10.4.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.4.1-1.

**Table A.10.4.3.4.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| 2      | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode        |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.10.4.3.4.2 Test parameters

There are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2), and FR1 SCell (Cell 3). Cell 2 and Cell 3 operate on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.10.4.3.4.2-1 and Table A.10.4.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.4.2-1: General test parameters

| Parameter   | Config   | Unit | Value  |
|---|--|------|--|
| Active PScell                                     | 1,2  |      | Cell 2   |
| Active Scell                                      | 1,2  |      | Cell 3   |
| RF Channel Number                                 | 1,2  |      | 1: Cell 2<br>2: Cell 3   |
| DL CCA model                                      | 1,2  |      | As specified in A.3.20.2.1   |
| UL CCA model                                      | 1,2  |      | As specified in A.3.20.2.2   |
| Duplex mode                                       | 1,2  |      | TDD  |
| TDD Configuration                                 | 1,2  |      | TDDConf.1.1 CCA  |
| BW <sub>channel</sub>                             | 1,2  | MHz  | 40: N <sub>RB,c</sub> = 106  |
| PDSCH Reference measurement channel               | 1,2  |      | SR.1.1 CCA   |
| RMSI CORESET Reference Channel                    | 1,2  |      | CR.1.1 CCA   |
| Dedicated CORESET Reference Channel               | 1,2  |      | CCR.1.1 CCA  |
| SSB configuration                                 | 1,2  |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns                                     | 1,2  |      | OP.1   |
| Initial BWP Configuration                         | 1,2  |      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration                       | 1,2  |      | DLBWP.1.1<br>ULBWP.1.1   |
| DBT Window Configuration                          | 1,2  |      | DBT.1  |
| TRS Configuration                                 | 1,2  |      | TRS.1.2 TDD  |
| DRX configuration                                 | 1,2  |      | DRX.3  |
| reportConfigType                                  | 1,2  |      | periodic   |
| reportQuantity                                    | 1,2  |      | ssb-Index-RSRP   |
| Number of reported RS                             | 1,2  |      | 2  |
| L1-RSRP reporting period                          | 1,2  | slot | 80   |
| T1  | 1,2  | s    | 5  |
| T2  | 1,2  | s    | 1  |
| EPRE ratio of PSS to SSS                          | 1,2  | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |  |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |  |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |  |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |  |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |  |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |  |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |  |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |  |      |  |
| Propagation condition                             | 1,2  |      | AWGN   |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |      |  |

Table A.10.4.3.4.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1, 2   |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1, 2   |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1, 2   |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1, 2   | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1, 2   | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s / I_{ot}$  | 1, 2   | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1, 2   | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1, 2   | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s / N_{oc}$  | 1, 2   | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

#### A.10.4.3.4.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 3.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

## A.10.4.4 E-UTRAN–NR inter-RAT measurements on NR carrier frequency under CCA

### A.10.4.4.1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

#### A.10.4.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21A of TS 36.133 [15] for E-UTRAN FDD-NR measurements under CCA and clause 8.1.2.4.22A of TS 36.133 [15] for E-UTRAN TDD-NR measurements under CCA.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.10.4.4.1.1-1, A.10.4.4.1.1-2, A.10.4.4.1.1-3 and A.10.4.4.1.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.10.4.4.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.10.4.4.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The UE is tested when MeasTriggerQuantity is configured as RSRP, RSRQ and SINR for each test. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.10.4.4.1.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| 2             | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| NOTE:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.10.4.4.1.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  |   | Unit | Test configuration | Value   |  | Comment   |
|--|---|------|--------------------|---|--|---|
|  |   |      |                    | Test 1  | Test 2   |   |
| E-UTRA RF Channel Number   |   |      | 1, 2               | 1   |  | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number   |   |      | 1, 2               | 1,2   |  | Two FR1 NR carrier frequency under CCA is used.   |
| DL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.1                     |  |   |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |  |   |
| UL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.2                     |  |   |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |  |   |
| Active cell  |   |      | 1, 2               | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) |  | E-UTRA cell 1 is on E-UTRA RF channel number 1.   |
| Neighbour cell   |   |      | 1, 2               | NR cell 3   |  | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id   |   |      | 1, 2               | 0   | 4  | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].   |
| Measurement gap offset   |   |      | 1, 2               | 39  | 19   | As specified in TS 36.331 [16].   |
| b2-Threshold1  |   | dBm  | 1, 2               | Note 1  |  | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                     |
| b2-Threshold2NR  |   | dBm  | 1, 2               | Note 2  |  | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 3 for event B2 [16]                                 |
| Hysteresis   |   | dB   | 1, 2               | 0   |  |   |
| CP length  |   |      | 1, 2               | Normal  |  |   |
| TimeToTrigger  |   | s    | 1, 2               | 0   |  |   |
| Filter coefficient   |   |      | 1, 2               | 0   |  | L3 filtering is not used  |
| DRX  |   |      | 1, 2               | OFF   |  | DRX is not used   |
| Time offset between serving and neighbour cells  |   |      | 1, 2               | 3µs   |  | Synchronous cells.  |
| T1   |   | s    | 1, 2               | 5   |  |   |
| T2   |   | s    | 1, 2               | $\geq T_{identify\_irat\_cca\_without\_index}$        | $\geq T_{identify\_irat\_cca\_without\_index}$ | $T_{identify\_irat\_cca\_without\_index}$ is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| <p>NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.1.1-3</p> <p>NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.1.1-4</p> <p>NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |   |      |                    |   |  |   |

**Table A.10.4.4.1.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter | Unit | Configuration | Cell 1 |
|-----------|------|---------------|--------|
|-----------|------|---------------|--------|

|   |           |      | T1   | T2                                   |           |      |      |    |
|---|-----------|------|--|--------------------------------------|-----------|------|------|----|
| RF channel number   |           | 1, 2 | 1  |                                      |           |      |      |    |
| Duplex mode   |           | 1    | FDD  |                                      |           |      |      |    |
|   |           | 2    | TDD  |                                      |           |      |      |    |
| TDD special subframe configuration <sup>Note1</sup>                                 |           | 2    | 6  |                                      |           |      |      |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |           | 2    | 1  |                                      |           |      |      |    |
| BW <sub>channel</sub>   | MHz       | 1, 2 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                                      |           |      |      |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |           | 1    | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |                                      |           |      |      |    |
|   |           | 2    | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |                                      |           |      |      |    |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |           | 1    | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                                      |           |      |      |    |
|   |           | 2    | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                                      |           |      |      |    |
| OCNG Patterns <sup>Note2</sup>  |           | 1    | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |                                      |           |      |      |    |
|   |           | 2    | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |                                      |           |      |      |    |
| b2-Threshold1   | dBm       | 1, 2 | -77 for RSRP   |                                      |           |      |      |    |
|   |           | 1, 2 | 77 for RSRQ  |                                      |           |      |      |    |
|   |           | 1, 2 | 90 for SINR  |                                      |           |      |      |    |
| PBCH_RA   | dB        | 1, 2 | 0  |                                      |           |      |      |    |
| PBCH_RB   |           |      |  |                                      |           |      |      |    |
| PSS_RA  |           |      |  |                                      |           |      |      |    |
| SSS_RA  |           |      |  |                                      |           |      |      |    |
| PCFICH_RB   |           |      |  |                                      |           |      |      |    |
| PHICH_RA  |           |      |  |                                      |           |      |      |    |
| PHICH_RB  |           |      |  |                                      |           |      |      |    |
| PDCCH_RA  |           |      |  |                                      |           |      |      |    |
| PDCCH_RB  |           |      |  |                                      |           |      |      |    |
| PDSCH_RA  |           |      |  |                                      |           |      |      |    |
| PDSCH_RB  |           |      |  |                                      |           |      |      |    |
| OCNG_RA <sup>Note3</sup>  |           |      |  |                                      |           |      |      |    |
| OCNG_RB <sup>Note3</sup>  |           |      |  |                                      |           |      |      |    |
| N <sub>oc</sub> <sup>Note4</sup>  |           |      |  |                                      | dBm/15kHz | 1, 2 | -104 |    |
| $\hat{E}_s/N_{oc}$  |           |      |  |                                      | dB        | 1, 2 | 17   | 17 |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>   | dB        | 1, 2 | 17   | 17                                   |           |      |      |    |
| RSRP <sup>Note5</sup>   | dBm/15kHz | 1, 2 | -87  | -87                                  |           |      |      |    |
| SCH_RP <sup>Note5</sup>   | dBm/15kHz | 1, 2 | -87  | -87                                  |           |      |      |    |
| I <sub>o</sub> <sup>Note5</sup>   | dBm/9MHz  | 1, 2 | -59.13+10log (N <sub>RB,c</sub> /50)   | -59.13+10log (N <sub>RB,c</sub> /50) |           |      |      |    |
| Propagation Condition <sup>Note6</sup>  |           | 1, 2 | ETU70  |                                      |           |      |      |    |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>                       |           | 1, 2 | 1x2 Low  |                                      |           |      |      |    |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

**Table A.10.4.4.1.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit | Test configuration | Cell 2   |    | Cell 3   |    |
|--|------|--------------------|--|----|--|----|
|  |      |                    | T1   | T2 | T2   | T2 |
| NR RF Channel Number   |      | 1, 2               | 2  |    | 3  |    |
| TDD configuration  |      | 1, 2               | TDDConf.1.1 CCA  |    | TDDConf.1.1 CCA  |    |
| BW <sub>channel</sub>  | MHz  | 1, 2               | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106                                |    |
| P <sub>CCA_DL</sub> for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |
| P <sub>CCA_DL</sub> for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | P <sub>CCA_DL</sub> =0.9375                                |    | P <sub>CCA_DL</sub> =0.9375                                |    |
| P <sub>CCA_UL</sub> for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | 1  |    | 1  |    |
| P <sub>CCA_UL</sub> for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | 1  |    | 1  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)                                  |      | 1, 2               | OP.1   |    | OP.1   |    |
| SMTc configuration defined in A.3.11.1 and A.3.11.2                        |      | 1, 2               | SMTc.1   |    | SMTc.1   |    |
| DBT window configuration   |      | 1, 2               | DBT.1  |    | DBT.1  |    |
| SSB configuration for semi-static channel access                           |      | 1, 2               | SSB.1 CCA  |    | SSB.1 CCA  |    |
| SSB configuration for dynamic channel access                               |      | 1, 2               | SSB.2 CCA  |    | SSB.2 CCA  |    |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 1, 2               | 30   |    | 30   |    |
| b2-Threshold2NR  | dBm  | 1, 2               | NA   |    | -98 for SS-RSRP  |    |
|  | dB   | 1, 2               | NA   |    | 55 for SS-RSRQ   |    |
|  |      | 1, 2               | NA   |    | 50 for SS-SINR   |    |



|   |              |       |         |        |           |        |
|---|--------------|-------|---------|--------|-----------|--------|
| EPRE ratio of PSS to SSS  |              | 1, 2  | 0       |        | 0         |        |
| EPRE ratio of PBCH DMRS to SSS  |              |       |         |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS   |              |       |         |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS   |              |       |         |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |       |         |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS   |              |       |         |        |           |        |
| EPRE ratio of PDSCH to PDSCH  |              |       |         |        |           |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |       |         |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |       |         |        |           |        |
| $N_{oc}$ Note2  | dBm/15kHz    | 1, 2  | -98     |        | -98       |        |
| $N_{oc}$ Note2  | dBm/SCS      | 1, 2  | -95     |        | -95       |        |
| SS-RSRP Note 3,5  | dBm/SCS      | 1, 2  | -91     | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$ Note 5   | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$ Note 5   | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $I_o$ Note3   | dBm/38.16MHz | 1, 2  | -58.49  | -58.49 | -63.95    | -56.16 |
| Propagation Condition   |              | 1, 2  | ETU70   |        | ETU70     |        |
| Antenna Configuration and Correlation Matrix  |              | 1, 2, | 1x2 Low |        | 1x2 Low   |        |
| <p>NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>NOTE 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |              |       |         |        |           |        |

#### A.10.4.4.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.  $T_{\text{identify\_irat\_cca\_without\_index}}$  is defined in defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.4.2 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used

##### A.10.4.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.10.4.4.2.1-1, A.10.4.4.2.1-2, A.10.4.4.2.1-3 and A.10.4.4.2.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.10.4.4.2.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.10.4.4.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The UE is tested when MeasTriggerQuantity is configured as RSRP, RSRQ and SINR for each test. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.10.4.4.2.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| 2             | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| NOTE:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.10.4.4.2.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  |   | Unit | Test configuration | Value   |        |        |        | Comment  |
|--|---|------|--------------------|---|--------|--------|--------|--|
|  |   |      |                    | Test 1  | Test 2 | Test 3 | Test 4 |  |
| E-UTRA RF Channel Number   |   |      | 1, 2               | 1   |        |        |        | One E-UTRA carrier frequency is used.  |
| NR RF Channel Number   |   |      | 1, 2               | 1,2   |        |        |        | Two FR1 NR carrier frequency under CCA is used.  |
| Active cell  |   |      | 1, 2               | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) |        |        |        | E-UTRA cell 1 is on E-UTRA RF channel number 1.  |
| DL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.1                     |        |        |        |  |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |        |        |        |  |
| UL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.2                     |        |        |        |  |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |        |        |        |  |
| Neighbour cell   |   |      | 1, 2               | NR cell 3   |        |        |        | NR cell 3 is on NR RF channel number 2.  |
| Gap Pattern Id   |   |      | 1, 2               | 0   | 4      |        |        | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].  |
| Measurement gap offset   |   |      | 1, 2               | 39  | 19     |        |        | As specified in TS 36.331 [16].  |
| b2-Threshold1  |   | dBm  | 1, 2               | Note 1  |        |        |        | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                        |
| b2-Threshold2NR  |   | dBm  | 1, 2               | Note 2  |        |        |        | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 3 for event B2 [16]                                    |
| Hysteresis   |   | dB   | 1, 2               | 0   |        |        |        |  |
| CP length  |   |      | 1, 2               | Normal  |        |        |        |  |
| TimeToTrigger  |   | s    | 1, 2               | 0   |        |        |        |  |
| Filter coefficient   |   |      | 1, 2               | 0   |        |        |        | L3 filtering is not used   |
| DRX  |   |      | 1, 2               | DR X.9  | DR X.1 | DR X.9 | DR X.1 | As specified in clause A.3.3   |
| Time offset between serving and neighbour cells  |   |      | 1, 2               | 3μs   |        |        |        | Synchronous cells.   |
| T1   |   | s    | 1, 2               | 5   |        |        |        |  |
| T2   |   | s    | 1, 2               | ≥T <sub>identify_irat_cca_without_index</sub>         |        |        |        | T <sub>identify_irat_cca_without_index</sub> is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| <p>NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.1.1-3</p> <p>NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.1.1-4</p> <p>NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |   |      |                    |   |        |        |        |  |

**Table A.10.4.4.2.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter  | Unit      | Configuration | Cell 1   |                                      |
|--|-----------|---------------|--|--------------------------------------|
|  |           |               | T1   | T2                                   |
| RF channel number  |           | 1, 2          | 1  |                                      |
| Duplex mode  |           | 1             | FDD  |                                      |
|  |           | 2             | TDD  |                                      |
| TDD special subframe configuration <sup>Note1</sup>  |           | 2             | 6  |                                      |
| TDD uplink-downlink configuration <sup>Note1</sup>   |           | 2             | 1  |                                      |
| BW <sub>channel</sub>  | MHz       | 1, 2          | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                                      |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1             | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |                                      |
|  |           | 2             | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |                                      |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1             | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                                      |
|  |           | 2             | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                                      |
| OCNG Patterns <sup>Note2</sup>   |           | 1             | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |                                      |
|  |           | 2             | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |                                      |
| b2-Threshold1  | dBm       | 1, 2          | -77 for RSRP   |                                      |
|  | dB        | 1, 2          | 77 for RSRQ  |                                      |
|  | dB        | 1, 2          | 90 for SINR  |                                      |
| PBCH_RA  | dB        | 1, 2          | 0  |                                      |
| PBCH_RB  |           |               |  |                                      |
| PSS_RA   |           |               |  |                                      |
| SSS_RA   |           |               |  |                                      |
| PCFICH_RB  |           |               |  |                                      |
| PHICH_RA   |           |               |  |                                      |
| PHICH_RB   |           |               |  |                                      |
| PDCCH_RA   |           |               |  |                                      |
| PDCCH_RB   |           |               |  |                                      |
| PDSCH_RA   |           |               |  |                                      |
| PDSCH_RB   |           |               |  |                                      |
| OCNG_RA <sup>Note3</sup>   |           |               |  |                                      |
| OCNG_RB <sup>Note3</sup>   |           |               |  |                                      |
| N <sub>oc</sub> <sup>Note4</sup>   |           |               |  |                                      |
| E <sub>s</sub> /N <sub>oc</sub>  | dB        | 1, 2          | 17   | 17                                   |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note5</sup>   | dB        | 1, 2          | 17   | 17                                   |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2          | -87  | -87                                  |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2          | -87  | -87                                  |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/9MHz  | 1, 2          | -59.13+10log (N <sub>RB,c</sub> /50)   | -59.13+10log (N <sub>RB,c</sub> /50) |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2          | ETU70  |                                      |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2          | 1x2 Low  |                                      |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> |           |               |  |                                      |

Note 5:  $\bar{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

**Table A.10.4.4.2.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit | Test configuration | Cell 2   |    | Cell 3   |    |
|--|------|--------------------|--|----|--|----|
|  |      |                    | T1   | T2 | T2   | T2 |
| NR RF Channel Number   |      | 1, 2               | 2  |    | 3  |    |
| TDD configuration  |      | 1, 2               | TDDConf.1.1 CCA                                |    | TDDConf.1.1 CCA                                |    |
| $BW_{channel}$   | MHz  | 1, 2               | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
| $P_{CCA\_DL}$ for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    |
| $P_{CCA\_DL}$ for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | $P_{CCA\_DL}=0.9375$                           |    | $P_{CCA\_DL}=0.9375$                           |    |
| $P_{CCA\_UL}$ for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | 1  |    | 1  |    |
| $P_{CCA\_UL}$ for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | 1  |    | 1  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)                            |      | 1, 2               | OP.1   |    | OP.1   |    |
| SMTC configuration defined in A.3.11.1 and A.3.11.2                  |      | 1, 2               | SMTC.1   |    | SMTC.1   |    |
| DBT window configuration   |      | 1, 2               | DBT.1  |    | DBT.1  |    |
| SSB configuration for semi-static channel access                     |      | 1, 2               | SSB.1 CCA                                      |    | SSB.1 CCA                                      |    |
| SSB configuration for dynamic channel access                         |      | 1, 2               | SSB.2 CCA                                      |    | SSB.2 CCA                                      |    |
| PDSCH/PDCCH subcarrier spacing                                       | kHz  | 1, 2               | 30   |    | 30   |    |
| b2-Threshold2NR  | dBm  | 1, 2               | NA   |    | -98 for SS-RSRP                                |    |
|  | dB   | 1, 2               | NA   |    | 55 for SS-RSRQ                                 |    |
|  |      | 1, 2               | NA   |    | 50 for SS-SINR                                 |    |

|   |              |       |         |        |           |        |
|---|--------------|-------|---------|--------|-----------|--------|
| EPRE ratio of PSS to SSS  |              | 1, 2  | 0       |        | 0         |        |
| EPRE ratio of PBCH DMRS to SSS  |              |       |         |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS   |              |       |         |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS   |              |       |         |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |       |         |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS   |              |       |         |        |           |        |
| EPRE ratio of PDSCH to PDSCH  |              |       |         |        |           |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |       |         |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |       |         |        |           |        |
| $N_{oc}$ Note2  | dBm/15kHz    | 1, 2  | -98     |        | -98       |        |
| $N_{oc}$ Note2  | dBm/SCS      | 1, 2  | -95     |        | -95       |        |
| SS-RSRP Note 3,5  | dBm/SCS      | 1, 2  | -91     | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$ Note 5   | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$ Note 5   | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $I_o$ Note3   | dBm/38.16MHz | 1, 2  | -58.49  | -58.49 | -63.95    | -56.16 |
| Propagation Condition   |              | 1, 2  | ETU70   |        | ETU70     |        |
| Antenna Configuration and Correlation Matrix  |              | 1, 2, | 1x2 Low |        | 1x2 Low   |        |
| <p>NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>NOTE 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |              |       |         |        |           |        |

#### A.10.4.4.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.4.3 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

##### A.10.4.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.10.4.4.3.1-1, A.10.4.4.3.1-2, A.10.4.4.3.1-3 and A.10.4.4.3.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.10.4.4.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.10.4.4.3.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The UE is tested when MeasTriggerQuantity is configured as RSRP, RSRQ and SINR for each test. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.10.4.4.3.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR1**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| 2             | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| NOTE:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.10.4.4.3.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter  |   | Unit | Test configuration | Value   |  | Comment   |
|--|---|------|--------------------|---|--|---|
|  |   |      |                    | Test 1  | Test 2   |   |
| E-UTRA RF Channel Number   |   |      | 1, 2               | 1   |  | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number   |   |      | 1, 2               | 1,2   |  | Two FR1 NR carrier frequency under CCA is used.   |
| DL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.1                     |  |   |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |  |   |
| UL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.2                     |  |   |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |  |   |
| Active cell  |   |      | 1, 2               | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) |  | E-UTRA cell 1 is on E-UTRA RF channel number 1.   |
| Neighbour cell   |   |      | 1, 2               | NR cell 3   |  | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id   |   |      | 1, 2               | 0   | 4  | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].   |
| Measurement gap offset   |   |      | 1, 2               | 39  | 19   | As specified in TS 36.331 [16].   |
| b2-Threshold1  |   | dBm  | 1, 2               | Note 1  |  | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                         |
| b2-Threshold2NR  |   | dBm  | 1, 2               | Note 2  |  | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 3 for event B2 [16]                                     |
| Hysteresis   |   | dB   | 1, 2               | 0   |  |   |
| CP length  |   |      | 1, 2               | Normal  |  |   |
| TimeToTrigger  |   | s    | 1, 2               | 0   |  |   |
| Filter coefficient   |   |      | 1, 2               | 0   |  | L3 filtering is not used  |
| DRX  |   |      | 1, 2               | OFF   |  | DRX is not used   |
| Time offset between serving and neighbour cells  |   |      | 1, 2               | 3µs   |  | Synchronous cells.  |
| T1   |   | s    | 1, 2               | 5   |  |   |
| T2   |   | s    | 1, 2               | $\geq T_{\text{identify\_irat\_cca\_with\_index}}$    | $\geq T_{\text{identify\_irat\_cca\_with\_index}}$ | $T_{\text{identify\_irat\_cca\_with\_index}}$ is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| <p>NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.3.1-3</p> <p>NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.3.1-4</p> <p>NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |   |      |                    |   |  |   |

**Table A.10.4.4.3.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 with SSB time index detection**

| Parameter | Unit | Configuration | Cell 1 |
|-----------|------|---------------|--------|
|-----------|------|---------------|--------|



|   |           |      | T1   | T2                                   |           |      |      |    |
|---|-----------|------|--|--------------------------------------|-----------|------|------|----|
| RF channel number   |           | 1, 2 | 1  |                                      |           |      |      |    |
| Duplex mode   |           | 1    | FDD  |                                      |           |      |      |    |
|   |           | 2    | TDD  |                                      |           |      |      |    |
| TDD special subframe configuration <sup>Note1</sup>                                 |           | 2    | 6  |                                      |           |      |      |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |           | 2    | 1  |                                      |           |      |      |    |
| BW <sub>channel</sub>   | MHz       | 1, 2 | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                                      |           |      |      |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |           | 1    | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |                                      |           |      |      |    |
|   |           | 2    | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |                                      |           |      |      |    |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |           | 1    | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                                      |           |      |      |    |
|   |           | 2    | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                                      |           |      |      |    |
| OCNG Patterns <sup>Note2</sup>  |           | 1    | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |                                      |           |      |      |    |
|   |           | 2    | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |                                      |           |      |      |    |
| b2-Threshold1   | dBm       | 1, 2 | -77 for RSRP   |                                      |           |      |      |    |
|   |           | 1, 2 | 77 for RSRQ  |                                      |           |      |      |    |
|   |           | 1, 2 | 90 for SINR  |                                      |           |      |      |    |
| PBCH_RA   | dB        | 1, 2 | 0  |                                      |           |      |      |    |
| PBCH_RB   |           |      |  |                                      |           |      |      |    |
| PSS_RA  |           |      |  |                                      |           |      |      |    |
| SSS_RA  |           |      |  |                                      |           |      |      |    |
| PCFICH_RB   |           |      |  |                                      |           |      |      |    |
| PHICH_RA  |           |      |  |                                      |           |      |      |    |
| PHICH_RB  |           |      |  |                                      |           |      |      |    |
| PDCCH_RA  |           |      |  |                                      |           |      |      |    |
| PDCCH_RB  |           |      |  |                                      |           |      |      |    |
| PDSCH_RA  |           |      |  |                                      |           |      |      |    |
| PDSCH_RB  |           |      |  |                                      |           |      |      |    |
| OCNG_RA <sup>Note3</sup>  |           |      |  |                                      |           |      |      |    |
| OCNG_RB <sup>Note3</sup>  |           |      |  |                                      |           |      |      |    |
| N <sub>oc</sub> <sup>Note4</sup>  |           |      |  |                                      | dBm/15kHz | 1, 2 | -104 |    |
| $\hat{E}_s/N_{oc}$  |           |      |  |                                      | dB        | 1, 2 | 17   | 17 |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>   | dB        | 1, 2 | 17   | 17                                   |           |      |      |    |
| RSRP <sup>Note5</sup>   | dBm/15kHz | 1, 2 | -87  | -87                                  |           |      |      |    |
| SCH_RP <sup>Note5</sup>   | dBm/15kHz | 1, 2 | -87  | -87                                  |           |      |      |    |
| I <sub>o</sub> <sup>Note5</sup>   | dBm/9MHz  | 1, 2 | -59.13+10log (N <sub>RB,c</sub> /50)   | -59.13+10log (N <sub>RB,c</sub> /50) |           |      |      |    |
| Propagation Condition <sup>Note6</sup>  |           | 1, 2 | ETU70  |                                      |           |      |      |    |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>                       |           | 1, 2 | 1x2 Low  |                                      |           |      |      |    |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].  
 Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  
 Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  
 Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.  
 Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  
 Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

**Table A.10.4.4.3.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter  | Unit | Test configuration | Cell 2   |    | Cell 3   |    |
|--|------|--------------------|--|----|--|----|
|  |      |                    | T1   | T2 | T2   | T2 |
| NR RF Channel Number   |      | 1, 2               | 2  |    | 3  |    |
| TDD configuration  |      | 1, 2               | TDDConf.1.1 CCA  |    | TDDConf.1.1 CCA  |    |
| BW <sub>channel</sub>  | MHz  | 1, 2               | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106                                |    |
| P <sub>CCA_DL</sub> for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |
| P <sub>CCA_DL</sub> for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | P <sub>CCA_DL</sub> =0.9375                                |    | P <sub>CCA_DL</sub> =0.9375                                |    |
| P <sub>CCA_UL</sub> for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | 1  |    | 1  |    |
| P <sub>CCA_UL</sub> for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | 1  |    | 1  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)                                  |      | 1, 2               | OP.1   |    | OP.1   |    |
| SMTC configuration defined in A.3.11.1 and A.3.11.2                        |      | 1, 2               | SMTC.1   |    | SMTC.1   |    |
| DBT window configuration   |      | 1, 2               | DBT.1  |    | DBT.1  |    |
| SSB configuration for semi-static channel access                           |      | 1, 2               | SSB.1 CCA  |    | SSB.1 CCA  |    |
| SSB configuration for dynamic channel access                               |      | 1, 2               | SSB.2 CCA  |    | SSB.2 CCA  |    |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 1, 2               | 30   |    | 30   |    |
| b2-Threshold2NR  | dBm  | 1, 2               | NA   |    | -98 for SS-RSRP  |    |
|  | dB   | 1, 2               | NA   |    | 55 for SS-RSRQ   |    |
|  |      | 1, 2               | NA   |    | 50 for SS-SINR   |    |

|   |              |       |         |        |           |        |
|---|--------------|-------|---------|--------|-----------|--------|
| EPRE ratio of PSS to SSS  |              | 1, 2  | 0       |        | 0         |        |
| EPRE ratio of PBCH DMRS to SSS  |              |       |         |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS   |              |       |         |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS   |              |       |         |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS   |              |       |         |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS   |              |       |         |        |           |        |
| EPRE ratio of PDSCH to PDSCH  |              |       |         |        |           |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |              |       |         |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |              |       |         |        |           |        |
| $N_{oc}$ Note2  | dBm/15kHz    | 1, 2  | -98     |        | -98       |        |
| $N_{oc}$ Note2  | dBm/SCS      | 1, 2  | -95     |        | -95       |        |
| SS-RSRP Note 3,5  | dBm/SCS      | 1, 2  | -91     | -91    | -Infinity | -88    |
| $\hat{E}_{s/I_{ot}}$ Note 5   | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$ Note 5   | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $I_o$ Note3   | dBm/38.16MHz | 1, 2  | -58.49  | -58.49 | -63.95    | -56.16 |
| Propagation Condition   |              | 1, 2  | ETU70   |        | ETU70     |        |
| Antenna Configuration and Correlation Matrix  |              | 1, 2, | 1x2 Low |        | 1x2 Low   |        |
| <p>NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>NOTE 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |              |       |         |        |           |        |

#### A.10.4.4.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.10.4.4.4 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

##### A.10.4.4.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.10.4.4.4.1-1, A.10.4.4.4.1-2, A.10.4.4.4.1-3 and A.10.4.4.4.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.10.4.4.4.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.10.4.4.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.10.4.4.4.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR1**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| 2             | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| NOTE:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.10.4.4.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter  |   | Unit | Test configuration | Value   |         |        |         | Comment   |
|--|---|------|--------------------|---|---------|--------|---------|---|
|  |   |      |                    | Test 1  | Test 2  | Test 3 | Test 4  |   |
| E-UTRA RF Channel Number   |   |      | 1, 2               | 1   |         |        |         | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number   |   |      | 1, 2               | 1,2   |         |        |         | Two FR1 NR carrier frequency under CCA is used.   |
| DL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.1                     |         |        |         |   |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |         |        |         |   |
| UL CCA model   | Dynamic channel access <sup>Note 3, 5</sup>     |      |                    | As specified in clause A.3.26.2.2                     |         |        |         |   |
|  | Semi-static channel access <sup>Note 4, 5</sup> |      |                    |   |         |        |         |   |
| Active cell  |   |      | 1, 2               | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) |         |        |         | E-UTRA cell 1 is on E-UTRA RF channel number 1.   |
| Neighbour cell   |   |      | 1, 2               | NR cell 3   |         |        |         | NR cell 3 is on NR RF channel number 2.   |
| Gap Pattern Id   |   |      | 1, 2               | 0   | 4       |        |         | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].   |
| Measurement gap offset   |   |      | 1, 2               | 39  | 19      |        |         | As specified in TS 36.331 [16].   |
| b2-Threshold1  |   | dBm  | 1, 2               | Note 1  |         |        |         | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                     |
| b2-Threshold2NR  |   | dBm  | 1, 2               | Note 2  |         |        |         | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 3 for event B2 [16]                                 |
| Hysteresis   |   | dB   | 1, 2               | 0   |         |        |         |   |
| CP length  |   |      | 1, 2               | Normal  |         |        |         |   |
| TimeToTrigger  |   | s    | 1, 2               | 0   |         |        |         |   |
| Filter coefficient   |   |      | 1, 2               | 0   |         |        |         | L3 filtering is not used  |
| DRX  |   |      | 1, 2               | DRX. 9  | DRX. 12 | DRX. 9 | DRX. 12 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells  |   |      | 1, 2               | 3μs   |         |        |         | Synchronous cells.  |
| T1   |   | s    | 1, 2               | 5   |         |        |         |   |
| T2   |   | s    | 1, 2               | ≥T <sub>identify_irat_cca_with_index</sub>            |         |        |         | T <sub>identify_irat_cca_with_index</sub> is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| <p>NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.1-3</p> <p>NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.1-4</p> <p>NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |   |      |                    |   |         |        |         |   |

**Table A.10.4.4.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 with SSB time index detection**

| Parameter  | Unit      | Configuration | Cell 1   |                                     |
|--|-----------|---------------|--|-------------------------------------|
|  |           |               | T1   | T2                                  |
| RF channel number  |           | 1, 2          | 1  |                                     |
| Duplex mode  |           | 1             | FDD  |                                     |
|  |           | 2             | TDD  |                                     |
| TDD special subframe configuration <sup>Note1</sup>  |           | 2             | 6  |                                     |
| TDD uplink-downlink configuration <sup>Note1</sup>   |           | 2             | 1  |                                     |
| BW <sub>channel</sub>  | MHz       | 1, 2          | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |                                     |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1             | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |                                     |
|  |           | 2             | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |                                     |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1             | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |                                     |
|  |           | 2             | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |                                     |
| OCNG Patterns <sup>Note2</sup>   |           | 1             | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |                                     |
|  |           | 2             | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD  |                                     |
| b2-Threshold1  | dBm       | 1, 2          | -77 for RSRP   |                                     |
|  | dB        | 1, 2          | 77 for RSRQ  |                                     |
|  | dB        | 1, 2          | 90 for SINR  |                                     |
| PBCH_RA  | dB        | 1, 2          | 0  |                                     |
| PBCH_RB  |           |               |  |                                     |
| PSS_RA   |           |               |  |                                     |
| SSS_RA   |           |               |  |                                     |
| PCFICH_RB  |           |               |  |                                     |
| PHICH_RA   |           |               |  |                                     |
| PHICH_RB   |           |               |  |                                     |
| PDCCH_RA   |           |               |  |                                     |
| PDCCH_RB   |           |               |  |                                     |
| PDSCH_RA   |           |               |  |                                     |
| PDSCH_RB   |           |               |  |                                     |
| OCNG_RA <sup>Note3</sup>   |           |               |  |                                     |
| OCNG_RB <sup>Note3</sup>   |           |               |  |                                     |
| N <sub>oc</sub> <sup>Note4</sup>   |           |               |  |                                     |
| E <sub>s</sub> /N <sub>oc</sub>  | dB        | 1, 2          | 17   | 17                                  |
| E <sub>s</sub> /I <sub>ot</sub> <sup>Note5</sup>   | dB        | 1, 2          | 17   | 17                                  |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2          | -87  | -87                                 |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2          | -87  | -87                                 |
| I <sub>o</sub> <sup>Note5</sup>  | dBm/9MHz  | 1, 2          | -59.13+10log(N <sub>RB,c</sub> /50)  | -59.13+10log(N <sub>RB,c</sub> /50) |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2          | ETU70  |                                     |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2          | 1x2 Low  |                                     |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> |           |               |  |                                     |

Note 5:  $\bar{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

**Table A.10.4.4.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter  | Unit | Test configuration | Cell 2   |    | Cell 3   |    |
|--|------|--------------------|--|----|--|----|
|  |      |                    | T1   | T2 | T2   | T2 |
| NR RF Channel Number   |      | 1, 2               | 2  |    | 3  |    |
| TDD configuration  |      | 1, 2               | TDDConf.1.1 CCA  |    | TDDConf.1.1 CCA  |    |
| BW <sub>channel</sub>  | MHz  | 1, 2               | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106                                |    |
| P <sub>CCA_DL</sub> for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |
| P <sub>CCA_DL</sub> for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | P <sub>CCA_DL</sub> =0.9375                                |    | P <sub>CCA_DL</sub> =0.9375                                |    |
| P <sub>CCA_UL</sub> for dynamic channel access <small>Note 6,8</small>     |      | 1, 2               | 1  |    | 1  |    |
| P <sub>CCA_UL</sub> for semi-static channel access <small>Note 7,8</small> |      | 1, 2               | 1  |    | 1  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)                                  |      | 1, 2               | OP.1   |    | OP.1   |    |
| SMTTC configuration defined in A.3.11.1 and A.3.11.2                       |      | 1, 2               | SMTTC.1  |    | SMTTC.1  |    |
| DBT window configuration   |      | 1, 2               | DBT.1  |    | DBT.1  |    |
| SSB configuration for semi-static channel access                           |      | 1, 2               | SSB.1 CCA  |    | SSB.1 CCA  |    |
| SSB configuration for dynamic channel access                               |      | 1, 2               | SSB.2 CCA  |    | SSB.2 CCA  |    |
| PDSCH/PDCCH subcarrier spacing   | kHz  | 1, 2               | 30   |    | 30   |    |
| b2-Threshold2NR  | dBm  | 1, 2               | NA   |    | -98 for SS-RSRP  |    |
|  | dB   | 1, 2               | NA   |    | 55 for SS-RSRQ   |    |
|  |      | 1, 2               | NA   |    | 50 for SS-SINR   |    |

|  |              |       |         |        |           |        |
|--|--------------|-------|---------|--------|-----------|--------|
| EPRE ratio of PSS to SSS   |              | 1, 2  | 0       |        | 0         |        |
| EPRE ratio of PBCH DMRS to SSS   |              |       |         |        |           |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |       |         |        |           |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |       |         |        |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |       |         |        |           |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |       |         |        |           |        |
| EPRE ratio of PDSCH to PDSCH   |              |       |         |        |           |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |              |       |         |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |       |         |        |           |        |
| $N_{oc}$ Note2   | dBm/15kHz    | 1, 2  | -98     |        | -98       |        |
| $N_{oc}$ Note2   | dBm/SCS      | 1, 2  | -95     |        | -95       |        |
| SS-RSRP Note 3,5   | dBm/SCS      | 1, 2  | -91     | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$ Note 5  | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$ Note 5  | dB           | 1, 2  | 4       | 4      | -Infinity | 7      |
| $I_o$ Note3  | dBm/38.16MHz | 1, 2  | -58.49  | -58.49 | -63.95    | -56.16 |
| Propagation Condition  |              | 1, 2  | ETU70   |        | ETU70     |        |
| Antenna Configuration and Correlation Matrix   |              | 1, 2, | 1x2 Low |        | 1x2 Low   |        |
| <p>NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>NOTE 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> |              |       |         |        |           |        |

#### A.10.4.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.



NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCC.

## A.10.5 Measurement performance

### A.10.5.1 SS-RSRP

#### A.10.5.1.1 Intra-frequency measurement accuracy on a CCA serving cell

##### A.10.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.36.1.1 and 10.1.36.1.2 when the serving cell is subject to CCA.

##### A.10.5.1.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell under CCA (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. Supported test configurations are shown in Table A.10.5.1.1.1-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.10.5.1.1.1-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7A.2.1. In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell.

**Table A.10.5.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations for each supported band

**Table A.10.5.1.1.2-2: SS-RSRP Intra frequency test parameters**

| Parameter  |                            | Unit         | Test 1   |  | Test 2   |  |
|--|----------------------------|--------------|--|--|--|--|
|  |                            |              | Cell 2   | Cell 3   | Cell 2   | Cell 3   |
| Physical cell ID   |                            |              | 489  | 0  | 489  | 0  |
| SSB ARFCN  |                            |              | freq1  |  |  |  |
| Duplex mode  | Config 1, 2                |              | TDD  |  |  |  |
| TDD configuration  | Config 1, 2                |              | TDDConf.1.1 CCA  |  |  |  |
| BW <sub>channel</sub>  | Config 1, 2                | MHz          | 40: N <sub>RB,c</sub> = 106                              |  |  |  |
| Downlink initial BWP configuration                                     |                            |              | DLBWP.0.1  |  |  |  |
| Downlink dedicated BWP configuration                                   |                            |              | DLBWP.1.1  |  |  |  |
| Uplink initial BWP configuration                                       |                            |              | ULBWP.0.1  |  |  |  |
| Uplink dedicated BWP configuration                                     |                            |              | ULBWP.1.1  |  |  |  |
| TRS configuration  | Config 1, 2                |              | TRS.1.2 TDD  | NA   | TRS.1.2 TDD  | NA   |
| DRX Cycle  |                            | ms           | Not Applicable   |  |  |  |
| PDSCH Reference measurement channel                                    | Config 1, 2                |              | SR.1.1 CCA   |  | SR.1.1 CCA   |  |
| RMSI CORESET Reference Channel   | Config 1, 2                |              | CR.1.1 CCA   |  | CR.1.1 CCA   |  |
| Control Channel RMC  | Config 1, 2                |              | CCR.1.1 CCA  |  | CCR.1.1 CCA  |  |
| DL CCA model   |                            |              | As specified in clause A.3.26.2.1                        |  |  |  |
| UL CCA model   |                            |              | As specified in clause A.3.26.2.2                        |  |  |  |
| P <sub>CCA_DL</sub> for dynamic channel access <sup>Note 7,8</sup>     | Config 1, 2                |              | P <sub>CCA_DL1</sub> =0.75<br>P <sub>CCA_DL2</sub> =0.75 | P <sub>CCA_DL1</sub> =0.75<br>P <sub>CCA_DL2</sub> =0.75 | P <sub>CCA_DL1</sub> =0.75<br>P <sub>CCA_DL2</sub> =0.75 | P <sub>CCA_DL1</sub> =0.75<br>P <sub>CCA_DL2</sub> =0.75 |
| P <sub>CCA_DL</sub> for semi-static channel access <sup>Note 6.8</sup> | Config 1, 2                |              | P <sub>CCA_DL</sub> =0.937<br>5                          | P <sub>CCA_DL</sub> =0.937<br>5                          | P <sub>CCA_DL</sub> =0.937<br>5                          | P <sub>CCA_DL</sub> =0.937<br>5                          |
| P <sub>CCA_UL</sub>  | Config 1, 2                |              | 1  | 1  | 1  | 1  |
| SSB configuration  | Semi-static channel access | Config 1, 2  | SSB.1 CCA<br>(As defined in A.3.10A)                     | SSB.1 CCA<br>(As defined in A.3.10A)                     | SSB.1 CCA<br>(As defined in A.3.10A)                     | SSB.1 CCA<br>(As defined in A.3.10A)                     |
|  | Dynamic channel access     |              | SSB.2 CCA<br>(As defined in A.3.10A)                     | SSB.2 CCA<br>(As defined in A.3.10A)                     | SSB.2 CCA<br>(As defined in A.3.10A)                     | SSB.2 CCA<br>(As defined in A.3.10A)                     |
| Time offset with Cell 2  | Config 1, 2                | µs           | -  | 3  | -  | 3  |
| SMTc configuration   | Config 1, 2                |              | SMTc.1   |  |  |  |
| DBT Window Configuration   | Config 1, 2                |              | As defined in A.3.28.1                                   |  |  |  |
| DL CCA model   | Config 1, 2                |              | As specified in clause A.3.26.2.1                        |  |  |  |
| UL CCA model   | Config 1, 2                |              | As specified in clause A.3.26.2.2                        |  |  |  |
| OCNG Patterns  |                            |              | OP.1   |  |  |  |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2                | kHz          | 30kHz  |  |  |  |
| EPRE ratio of PSS to SSS   |                            | dB           | 0  | 0  | 0  | 0  |
| EPRE ratio of PBCH DMRS to SSS   |                            |              |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS  |                            |              |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS  |                            |              |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |                            |              |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS  |                            |              |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH   |                            |              |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                 |                            |              |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                               |                            |              |  |  |  |  |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1, 2                | NR_CCA_FR1_I | dBm/15KHz  | -94  |  | -110   |
|  |                            | NR_CCA_FR1_J |  |  |  | -109.5   |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1, 2                | NR_CCA_FR1_I | dBm/SCS  | -91  |  | -107.0   |
|  |                            | NR_CCA_FR1_J |  |  |  | -106.5   |
| $\hat{E}_s/I_{ot}$   |                            | dB           | 2.46   | -5.97  | -2.01  | -3.54  |
| $\hat{E}_s/N_{oc}$   |                            | dB           | 6  | 1  | 1  | 0  |
| SS-RSRP <sup>Note3</sup>   | Config 1, 2                | NR_CCA_FR1_I | dBm/SCS  | -85  | -90  | -106.00  |
|  |                            | NR_CCA_FR1_J |  |  |  | -105.50  |

|                                 |  |              |                  |        |        |
|---------------------------------|--|--------------|------------------|--------|--------|
| I <sub>o</sub> <sup>Note3</sup> | Config<br>1, 2   | NR_CCA_FR1_I | dBm/<br>38.16MHz | -51.99 | -70.82 |
|                                 |  | NR_CCA_FR1_J |                  |        | -70.32 |
| Propagation condition           |  |              | -                | AWGN   |        |
| Antenna configuration           |  |              |                  | 1x2    |        |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |              |                  |        |        |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                  |        |        |
| Note 3:                         | SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |              |                  |        |        |
| Note 4:                         | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |              |                  |        |        |
| Note 5:                         | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |              |                  |        |        |
| Note 6:                         | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |              |                  |        |        |
| Note 7:                         | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |              |                  |        |        |
| Note 8:                         | For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.  |              |                  |        |        |

A.10.5.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 2 and cell 3 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.36.1.1 and 10.1.36.1.2.

A.10.5.1.2 Inter-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell

A.10.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.37.1.1 and 10.1.37.1.2 for inter-frequency measurements with the testing configurations in Table A.10.5.1.2.1-1.

**Table A.10.5.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| 2      | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations on each supported band |

A.10.5.1.2.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7A.2.1. The test parameters for the Cell 2 and Cell 3 are given in Table A.10.5.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.10.5.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.10.5.1.2.2-1: SS-RSRP inter-frequency test parameters**

| Parameter   |                            | Config | Unit         | Test 1                            |        | Test 2                            |         |
|---|----------------------------|--------|--------------|-----------------------------------|--------|-----------------------------------|---------|
|   |                            |        |              | Cell 2                            | Cell 3 | Cell 2                            | Cell 3  |
| SSB ARFCN   |                            | 1, 2   |              | freq1                             | freq2  | freq1                             | freq2   |
| $BW_{channel}$                                    |                            | 1, 2   | MHz          | 40: $N_{RB,c} = 106$              |        | 40: $N_{RB,c} = 106$              |         |
| Gap pattern ID                                    |                            |        |              | 0                                 |        | 0                                 |         |
| Duplex mode                                       |                            | 1, 2   |              | TDD                               |        | TDD                               |         |
| TDD configuration                                 |                            | 1, 2   |              | TDDConf.1.1 CCA                   |        | TDDConf.1.1 CCA                   |         |
| PDSCH Reference measurement channel               |                            | 1, 2   |              | SR.1.1 CCA                        |        | SR.1.1 CCA                        |         |
| RMSI CORESET Reference Channel                    |                            | 1, 2   |              | CR.1.1 CCA                        | -      | CR.1.1 CCA                        | -       |
| Dedicated CORESET Reference Channel               |                            | 1, 2   |              | CCR.1.1 CCA                       | -      | CCR.1.1 CCA                       | -       |
| SSB configuration                                 | Semi-static channel access | 1, 2   |              | SSB.1 CCA (As defined in A.3.10A) |        | SSB.1 CCA (As defined in A.3.10A) |         |
|   | Dynamic channel access     |        |              | SSB.2 CCA (As defined in A.3.10A) |        | SSB.2 CCA (As defined in A.3.10A) |         |
| OCNG Patterns                                     |                            | 1, 2   |              | OP.1                              |        | OP.1                              |         |
| TRS configuration                                 |                            | 1, 2   |              | TRS.1.2 TDD                       |        | TRS.1.2 TDD                       |         |
| Initial BWP Configuration                         |                            | 1, 2   |              | DLBWP.0.1<br>ULBWP.0.1            |        | DLBWP.0.1<br>ULBWP.0.1            |         |
| Dedicated BWP configuration                       |                            | 1, 2   |              | DLBWP.1.1<br>ULBWP.1.1            |        | DLBWP.1.1<br>ULBWP.1.1            |         |
| Time offset with Cell 2                           |                            | 1, 2   | $\mu s$      | -                                 | 3      | -                                 | 3       |
| SMTC configuration                                |                            | 1, 2   |              | TBD                               |        | TBD                               |         |
| DBT Window Configuration                          |                            | 1, 2   |              | As defined in A.3.28.1            |        | As defined in A.3.28.1            |         |
| DL CCA model                                      |                            |        |              | As specified in clause A.3.20.2.1 |        |                                   |         |
| UL CCA model                                      |                            |        |              | As specified in clause A.3.20.2.2 |        |                                   |         |
| EPRE ratio of PSS to SSS                          |                            | 1, 2   | dB           | 0                                 | 0      | 0                                 | 0       |
| EPRE ratio of PBCH DMRS to SSS                    |                            |        |              |                                   |        |                                   |         |
| EPRE ratio of PBCH to PBCH DMRS                   |                            |        |              |                                   |        |                                   |         |
| EPRE ratio of PDCCH DMRS to SSS                   |                            |        |              |                                   |        |                                   |         |
| EPRE ratio of PDCCH to PDCCH DMRS                 |                            |        |              |                                   |        |                                   |         |
| EPRE ratio of PDSCH DMRS to SSS                   |                            |        |              |                                   |        |                                   |         |
| EPRE ratio of PDSCH to PDSCH DMRS                 |                            |        |              |                                   |        |                                   |         |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                            |        |              |                                   |        |                                   |         |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |                            |        |              |                                   |        |                                   |         |
| $N_{oc}$ <sup>Note2</sup>                         | NR_CCA_FR1_I               | 1, 2   | dBm/15kHz    | -94.65                            |        | $(N_{oc}$ for Cell 3 +8dB)        | -111    |
|   | NR_CCA_FR1_J               |        |              |                                   |        |                                   | -110.5  |
| $N_{oc}$ <sup>Note2</sup>                         | NR_CCA_FR1_I               | 1, 2   | dBm/SSB SCS  | -91.65                            |        | $(N_{oc}$ for C 3 +8dB)           | -109.00 |
|   | NR_CCA_FR1_J               |        |              |                                   |        |                                   | -108.50 |
| $\hat{E}_s / I_{ot}$                              |                            | 1, 2   | dB           | 10                                | 10     | 13                                | -3      |
| SS-RSRP <sup>Note3</sup>                          | NR_CCA_FR1_I               | 1, 2   | dBm/SCS      | -81.65                            |        | (RSRP for Cell 3 +25dB)           | -111.00 |
|   | NR_CCA_FR1_J               |        |              |                                   |        |                                   | -110.50 |
| $I_o$ <sup>Note3</sup>                            | R_CCA_FR1_I                | 1, 2   | dBm/38.16MHz | -50.19                            |        | $(I_o$ for Channel 3 +19.75dB)    | -75.19  |
|   | NR_CCA_FR1_J               |        |              |                                   |        |                                   | -74.69  |
| $\hat{E}_s / N_{oc}$                              |                            | 1, 2   | dB           | 10                                | 10     | 13                                | -3      |

|                       |  |   |      |      |
|-----------------------|--|---|------|------|
| Propagation condition | 1, 2   | - | AWGN | AWGN |
| Antenna configuration |  |   | 1x2  | 1x2  |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |   |      |      |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |   |      |      |
| Note 3:               | RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |   |      |      |
| Note 4:               | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |   |      |      |
| Note 5:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |   |      |      |

### A.10.5.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the Absolute requirement in clause 10.1.4.1.1 and Relative requirement in clause 10.1.37.1.1 and 10.1.37.1.2.

## A.10.5.2 SS-RSRQ

### A.10.5.2.1 Intra-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell

#### A.10.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.29.1.1.

#### A.10.5.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.10.5.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is tested by using the parameters in Table A.10.5.2.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7A.2.1. In all test cases, Cell 2 is the PCell and Cell 3 is the target cell.

**Table A.10.5.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode   |
| 2      | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

**Table A.10.5.2.1.2-2: SS-RSRQ Intra frequency test parameters**



| Parameter                                |                            | Unit         | Test 1                                |        | Test 3      |        |
|--|----------------------------|--------------|---------------------------------------|--------|-------------|--------|
|  |                            |              | Cell 2                                | Cell 3 | Cell 2      | Cell 3 |
| SSB ARFCN                                |                            |              | freq1                                 |        |             |        |
| Duplex mode                              | Config 1, 2                |              | TDD                                   |        |             |        |
| TDD configuration                        | Config 1, 2                |              | TDDConf.1.1 CCA                       |        |             |        |
| BW <sub>channel</sub>                    | Config 1, 2                | MHz          | 40: N <sub>RB,c</sub> = 106           |        |             |        |
| BWP configuration                        | Initial DL BWP             |              | DLBWP.0.1                             |        |             |        |
|  | Dedicated DL BWP           |              | DLBWP.1.1                             |        |             |        |
|  | Initial UL BWP             |              | ULBWP.0.1                             |        |             |        |
|  | Dedicated UL BWP           |              | ULBWP.1.1                             |        |             |        |
| DRX Cycle                                |                            | ms           | Not Applicable                        |        |             |        |
| PDSCH Reference measurement channel      | Config 1, 2                |              | SR.1.1 CCA                            |        | SR.1.1 CCA  |        |
| RMSI CORESET Reference Channel           | Config 1, 2                |              | CR.1.1 CCA                            |        | CR.1.1 CCA  |        |
| Control Channel RMC                      | Config 1, 2                |              | CCR.1.1 CCA                           |        | CCR.1.1 CCA |        |
| TRS configuration                        | Config 1, 2                |              | TRS.1.2 TDD                           |        | TRS.1.2 TDD |        |
| OCNG Patterns                            |                            |              | OP. 1                                 |        |             |        |
| SS-RSSI-Measurement                      |                            |              | Not Applicable                        |        |             |        |
| Time offset with Cell 2                  | Config 1, 2                | µs           | -                                     | 3      | -           | 3      |
| SMTc configuration                       | Config 1, 2                |              | TBD                                   |        |             |        |
| SSB configuration                        | Semi-static channel access | Config 1, 2  | SSB.1 CCA<br>(As defined in A.3.10A ) |        |             |        |
|  | Dynamic channel access     |              | SSB.2 CCA<br>(As defined in A.3.10A ) |        |             |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1, 2                | kHz          | 30kHz                                 |        |             |        |
| DBT Window Configuration                 | Config 1, 2                |              | As defined in A.3.28.1                |        |             |        |
| DL CCA model                             | Config 1, 2                |              | As specified in clause A.3.20.2.1     |        |             |        |
| UL CCA model                             | Config 1, 2                |              | As specified in clause A.3.20.2.2     |        |             |        |
| EPRE ratio of PSS to SSS                 |                            | dB           | 0                                     | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS           |                            |              |                                       |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS          |                            |              |                                       |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS          |                            |              |                                       |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |                            |              |                                       |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS          |                            |              |                                       |        |             |        |
| EPRE ratio of PDSCH to PDSCH             |                            |              |                                       |        |             |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                            |              |                                       |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                            |              |                                       |        |             |        |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1, 2                | NR_CCA_FR1_I | -91                                   |        | -110        |        |
|  |                            | NR_CCA_FR1_J |                                       |        | -109.5      |        |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1, 2                | NR_CCA_FR1_I | -88                                   |        | -107        |        |
|  |                            | NR_CCA_FR1_J |                                       |        | -106.5      |        |
| $\hat{E}_s / I_{ot}$                     |                            | dB           | -1.76                                 |        | -5.46       | -5.46  |
| $\hat{E}_s / N_{oc}$                     |                            | dB           | 3                                     | 3      | -4          | -4     |
| SS-RSRP <sup>Note3</sup>                 | Config 1, 2                | NR_CCA_FR1_I | -85                                   | -85    | -111        | -111   |
|  |                            | NR_CCA_FR1_J |                                       |        | -110.5      | -110.5 |
| SS-RSRQ <sup>Note3</sup>                 |                            | NR_CCA_FR1_I | -14.77                                | -14.77 | -17.34      | -17.34 |
|  |                            | NR_CCA_FR1_J |                                       |        |             |        |
| I <sub>o</sub> <sup>Note3</sup>          | Config 1, 2                | NR_CCA_FR1_I | -50                                   |        |             | -73.4  |
|  |                            | NR_CCA_FR1_J |                                       |        |             | -72.9  |
| Propagation condition                    |                            | -            | AWGN                                  | AWGN   | AWGN        | AWGN   |
| Antenna configuration                    |                            |              | 1x2                                   | 1x2    | 1x2         | 1x2    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRQ, SS-RSRP, and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | NR operating band groups are as defined in Clause 3.5.2.   |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |

### A.10.5.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.29.1.1.

## A.10.5.2.2 Inter-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell

### A.10.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.30.1.1 and 10.1.30.1.2 for inter-frequency measurements with the testing configurations in Table A.10.5.2.2.2-1.

### A.10.5.2.2.2 Test Parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.4.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.10.5.2.2.2-2. The inter-frequency measurements are supported by a measurement gap.

**Table A.10.5.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

| Config | Description   |
|--------|---|
| 1      | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode   |
| 2      | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

**Table A.10.5.2.2-2: SS-RSRQ Inter frequency test parameters**

| Parameter  |                            | Unit         | Test 1                               |        | Test 2      |         | Test 3      |        |         |
|--|----------------------------|--------------|--------------------------------------|--------|-------------|---------|-------------|--------|---------|
|  |                            |              | Cell 2                               | Cell 3 | Cell 2      | Cell 3  | Cell 2      | Cell 3 |         |
| SSB ARFCN  |                            |              | freq1                                | freq2  | freq1       | freq2   | freq1       | freq2  |         |
| Duplex mode  | Config 1, 2                |              | TDD                                  |        |             |         |             |        |         |
| TDD configuration  | Config 1, 2                |              | TDDConf.1.1 CCA                      |        |             |         |             |        |         |
| BW <sub>channel</sub>  | Config 1, 2                |              | 40: N <sub>RB,c</sub> = 106          |        |             |         |             |        |         |
| BWP BW   | Config 1, 2                | MHz          | 40: N <sub>RB,c</sub> = 106          |        |             |         |             |        |         |
| Gap pattern ID   |                            |              | 0                                    |        |             |         |             |        |         |
| DRX Cycle  |                            | ms           | Not Applicable                       |        |             |         |             |        |         |
| PDSCH Reference measurement channel  | Config 1, 2                |              | SR.1.1 CCA                           |        | SR.1.1 CCA  |         | SR.1.1 CCA  |        |         |
| RMSI CORESET Reference Channel   | Config 1, 2                |              | CR.1.1 CCA                           |        | CR.1.1 CCA  |         | CR.1.1 CCA  |        |         |
| Dedicated CORESET Reference Channel  | Config 1, 2                |              | CCR.1.1 CCA                          |        | CCR.1.1 CCA |         | CCR.1.1 CCA |        |         |
| TRS configuration  | Config 1, 2                |              | TRS.1.2 TDD                          |        | TRS.1.2 TDD |         | TRS.1.2 TDD |        |         |
| OCNG Patterns  |                            |              | OCNG pattern 1                       |        |             |         |             |        |         |
| Time offset with Cell 2  | Config 1, 2                | µs           | -                                    | 3      | -           | 3       | -           | 3      |         |
| SMTc configuration   |                            | Config 1, 2  | TBD                                  |        |             |         |             |        |         |
| SSB configuration  | Semi-static channel access | Config 1, 2  | SSB.1 CCA<br>(As defined in A.3.10A) |        |             |         |             |        |         |
|  | Dynamic channel access     |              | SSB.2 CCA<br>(As defined in A.3.10A) |        |             |         |             |        |         |
| DBT Window Configuration   | Config 1, 2                |              | As defined in A.3.28.1               |        |             |         |             |        |         |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2                | kHz          | 30 kHz                               |        |             |         |             |        |         |
| EPRE ratio of PSS to SSS   |                            | dB           | 0                                    | 0      | 0           | 0       | 0           | 0      |         |
| EPRE ratio of PBCH DMRS to SSS   |                            |              |                                      |        |             |         |             |        |         |
| EPRE ratio of PBCH to PBCH DMRS  |                            |              |                                      |        |             |         |             |        |         |
| EPRE ratio of PDCCH DMRS to SSS  |                            |              |                                      |        |             |         |             |        |         |
| EPRE ratio of PDCCH to PDCCH DMRS  |                            |              |                                      |        |             |         |             |        |         |
| EPRE ratio of PDSCH DMRS to SSS  |                            |              |                                      |        |             |         |             |        |         |
| EPRE ratio of PDSCH to PDSCH   |                            |              |                                      |        |             |         |             |        |         |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                            |              |                                      |        |             |         |             |        |         |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                            |              |                                      |        |             |         |             |        |         |
| $N_{oc}^{Note2}$   | Config 1, 2                | NR_CCA_FR1_I | dBm/15kHz                            | -86.27 | -86.27      | -113    | -113        | -112   | -112    |
|  |                            | NR_CCA_FR1_J |                                      |        |             |         |             | -111.5 | -111.5  |
| $N_{oc}^{Note2}$   | Config 1, 2                | NR_CCA_FR1_I | dBm/SCS                              | -83.27 | -83.27      | -110    | -110        | -109   | -109    |
|  |                            | NR_CCA_FR1_J |                                      |        |             |         |             | -108.5 | -108.5  |
| $\hat{E}_s / I_{ot}$   |                            |              | dB                                   | -1.75  | -1.75       | -1.75   | -1.75       | 3      | -1.75   |
| $\hat{E}_s / N_{oc}$   |                            |              | dB                                   | -1.75  | -1.75       | -1.75   | -1.75       | 3      | -1.75   |
| SS-RSRP <sup>Note3</sup>   | Config 1, 2                | NR_CCA_FR1_I | dBm/SCS                              | -85.02 | -85.02      | -111.75 | -111.75     | -106   | -110.75 |
|  |                            | NR_CCA_FR1_J |                                      |        |             |         |             | -105.5 | -110.25 |
| SS-RSRQ <sup>Note3</sup>   |                            |              | dB                                   | -14.77 | -14.77      | -40.59  | -40.59      | -12.56 | -14.76  |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1, 2                | NR_CCA_FR1_I | dBm/38.16MHz                         | -50    | -50         | -76.73  | -76.73      | -73.19 | -75.23  |
|  |                            | NR_CCA_FR1_J |                                      |        |             |         |             | -72.69 | -74.73  |
| Propagation condition  |                            |              |                                      | AWGN   | AWGN        | AWGN    | AWGN        | AWGN   | AWGN    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |                            |              |                                      |        |             |         |             |        |         |

|         |   |
|---------|---|
| Note 4: | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.                            |
| Note 5: | NR operating band groups are as defined in Section 3.5.2.   |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

#### A.10.5.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.30.1.1 and 10.1.30.1.2.

### A.10.5.3 SS-SINR

#### A.10.5.3.1 Intra-frequency measurement accuracy on PSCC

##### A.10.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.31.1.

##### A.10.5.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.10.5.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.10.5.3.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7A.2.1. In all test cases, Cell 2 is the PSCell with CCA and Cell 3 is the target cell with CCA. Two sub-tests (Test 1 and Test 2) are provided with different  $N_{oc}$  on Cells 2 and 3.

**Table A.10.5.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD<br>NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD<br>NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.10.5.3.1.2-2: SS-SINR Intra frequency test parameters**

| Parameter  |                  | Unit         | Test 1   |        | Test 2      |        |
|--|------------------|--------------|--|--------|-------------|--------|
|  |                  |              | Cell 2   | Cell 3 | Cell 2      | Cell 3 |
| SSB ARFCN  |                  |              | freq1  |        | freq1       |        |
| DL CCA model   | Config 1,2       |              | As specified in clause A.3.26.2.1  |        |             |        |
| UL CCA model   | Config 1,2       |              | As specified in clause A.3.26.2.2  |        |             |        |
| UL CCA probability   | $P_{CCA\_UL}$    |              | 1.0  | -      | 1.0         | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | $P_{CCA\_DL}$    |              | 0.9375   | -      | 0.9375      | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | $P_{CCA\_DL\_1}$ |              | 0.75   | -      | 0.75        | -      |
|  | $P_{CCA\_DL\_2}$ |              | 0.75   | -      | 0.75        | -      |
| Duplex mode  | Config 1,2       |              | TDD  |        |             |        |
| TDD configuration  | Config 1,2       |              | TDDConf.1.1 CCA  |        |             |        |
| Downlink initial BWP configuration   |                  |              | DLBWP.0.1  |        |             |        |
| Downlink dedicated BWP configuration                                       |                  |              | DLBWP.1.1  |        |             |        |
| Uplink initial BWP configuration   |                  |              | ULBWP.0.1  |        |             |        |
| Uplink dedicated BWP configuration   |                  |              | ULBWP.1.1  |        |             |        |
| DRX Cycle configuration  |                  | ms           | Not Applicable   |        |             |        |
| TRS Configuration  | Config 1,2       |              | TRS.1.2 TDD  |        | TRS.1.2 TDD |        |
| PDSCH Reference measurement channel  | Config 1,2       |              | SR.1.1 CCA   |        | SR1.1 CCA   |        |
| RMSI CORESET Reference Channel   | Config 1,2       |              | CR.1.1 CCA   |        | CR.1.1 CCA  |        |
| Dedicated CORESET Reference Channel  | Config 1,2       |              | CCR.1.1 CCA  |        | CCR.1.1 CCA |        |
| OCNG Patterns  |                  |              | OP.1   |        |             |        |
| SS-RSSI-Measurement  |                  |              | Not Applicable   |        |             |        |
| Time offset with Cell 2  | Config 1,2       | $\mu$ s      | -  | 3      | -           | 3      |
| DBT Window Configuration   | Config 1,2       |              | DBT.1  |        |             |        |
| SSB configuration  | Config 1,2       |              | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |             |        |
| SMTC configuration   | Config 1,2       |              | SMTC.1   |        |             |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1,2       | kHz          | 30   |        |             |        |
| EPRE ratio of PSS to SSS   |                  | dB           | 0  | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |              |  |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |        |             |        |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |        |             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                  |              |  |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |              |  |        |             |        |
| $N_{oc}$ <small>Note2</small>  |                  | NR_CCA_FR1_I | -93  |        | -112        |        |
|  |                  | NR_CCA_FR1_J |  |        | -111.5      |        |
| $N_{oc}$ <small>Note2</small>  | Config 1,2       | NR_CCA_FR1_I | -90  |        | -109        |        |
|  |                  | NR_CCA_FR1_J |  |        | -108.5      |        |
| $\hat{E}_s / I_{ot}$   |                  | dB           | 0  | -3.19  | -5.46       | -5.46  |
| $\hat{E}_s / N_{oc}$   |                  | dB           | 4.54   | 2.66   | -4          | -4     |
| SS-RSRP <small>Note3</small>   | Config 1,2       | NR_CCA_FR1_I | -85.46   | -87.34 | -113        | -113   |
|  |                  | NR_CCA_FR1_J |  |        | -112.5      | -112.5 |
| SS-SINR <small>Note3</small>   |                  | NR_CCA_FR1_I | 0  | -3.19  | -5.46       | -5.46  |
|  |                  | NR_CCA_FR1_J |  |        |             |        |

|                       |  |              |                  |        |        |
|-----------------------|--|--------------|------------------|--------|--------|
| Io <sup>Note3</sup>   | Config 1,2   | NR_CCA_FR1_I | dBm/<br>38.16MHz | -51.41 | -75.41 |
|                       |  | NR_CCA_FR1_J |                  |        | -74.91 |
| Propagation condition |  |              | -                | AWGN   |        |
| Antenna configuration |  |              | -                | 1x2    |        |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |              |                  |        |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                  |        |        |
| Note 3:               | SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |              |                  |        |        |
| Note 4:               | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |              |                  |        |        |
| Note 5:               | NR operating band groups are as defined in Clause 3.5.2.   |              |                  |        |        |
| Note 6:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.   |              |                  |        |        |
| Note 7:               | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |              |                  |        |        |
| Note 8:               | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |              |                  |        |        |
| Note 9:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |              |                  |        |        |

A.10.5.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.31.1.1.

A.10.5.3.2 Inter-frequency measurement accuracy on PSCC

A.10.5.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.32.1.1 and 10.1.32.1.2 for inter-frequency measurement.

A.10.5.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.10.5.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.10.5.3.2.2-2. In all test cases, Cell 2 is the PSCell with CCA and Cell 3 is target cell with CCA. Cell 1 is the E-UTRA cell of which specific test parameters for this test case are specified in Table A.3.7A.2.1-1. Three sub-tests (Test 1, Test 2 and Test 3) are provided different  $N_{oc}$  on Cells 2 and 3.

**Table A.10.5.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD<br>NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD<br>NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.10.5.3.2.2-2: SS-SINR Inter frequency test parameters**



| Parameter  |                  | Unit         | Test 1   |        | Test 2      |        | Test 3      |        |
|--|------------------|--------------|--|--------|-------------|--------|-------------|--------|
|  |                  |              | Cell 2   | Cell 3 | Cell 2      | Cell 3 | Cell 2      | Cell 3 |
| SSB ARFCN  |                  |              | freq1  | freq2  | freq1       | freq2  | freq1       | freq2  |
| DL CCA model   | Config 1,2       |              | As specified in clause A.3.26.2.1  |        |             |        |             |        |
| UL CCA model   | Config 1,2       |              | As specified in clause A.3.26.2.2  |        |             |        |             |        |
| UL CCA probability   | $P_{CCA\_UL}$    |              | 1.0  | -      | 1.0         | -      | 1.0         | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | $P_{CCA\_DL}$    |              | 0.9375   | -      | 0.9375      | -      | 0.9375      | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | $P_{CCA\_DL\_1}$ |              | 0.75   | -      | 0.75        | -      | 0.75        | -      |
|  | $P_{CCA\_DL\_2}$ |              | 0.75   | -      | 0.75        | -      | 0.75        | -      |
| Duplex mode  | Config 1,2       |              | TDD  |        |             |        |             |        |
| TDD configuration  | Config 1,2       |              | TDDConf.1.1 CCA  |        |             |        |             |        |
| Downlink initial BWP configuration   |                  |              | DLBWP.0.1  |        |             |        |             |        |
| Downlink dedicated BWP configuration                                       |                  |              | DLBWP.1.1  |        |             |        |             |        |
| Uplink initial BWP configuration   |                  |              | ULBWP.0.1  |        |             |        |             |        |
| Uplink dedicated BWP configuration   |                  |              | ULBWP.1.1  |        |             |        |             |        |
| DRX Cycle configuration  |                  | ms           | Not Applicable   |        |             |        |             |        |
| Gap pattern ID   |                  |              | 0  | -      | 0           | -      | 0           | -      |
| TRS configuration  | Config 1,2       |              | TRS.1.2 TDD  |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| PDSCH Reference measurement channel  | Config 1,2       |              | SR.1.1 CCA   |        | SR.1.1 CCA  |        | SR.1.1 CCA  |        |
| RMSI CORESET Reference Channel   | Config 1,2       |              | CR.1.1 CCA   |        | CR.1.1 CCA  |        | CR.1.1 CCA  |        |
| Dedicated CORESET Reference Channel  | Config 1,2       |              | CCR.1.1 CCA  |        | CCR.1.1 CCA |        | CCR.1.1 CCA |        |
| OCNG Patterns  |                  |              | OP.1   |        |             |        |             |        |
| SS-RSSI-Measurement  |                  |              | Not Applicable   |        |             |        |             |        |
| Time offset with Cell 2  | Config 1,2       | $\mu$ s      | -  | 3      | -           | 3      | -           | 3      |
| DBT Window configuration   | Config 1,2       |              | DBT.1  |        |             |        |             |        |
| SSB configuration  | Config 1,2       |              | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |             |        |             |        |
| SMTC configuration   | Config 1,2       |              | SMTC.1   |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1,2       | kHz          | 30   |        |             |        |             |        |
| EPRE ratio of PSS to SSS   |                  | dB           | 0  | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |              |  |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                  |              |  |        |             |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |              |  |        |             |        |             |        |
| $N_{oc}$ <small>Note2</small>  |                  | dBm/15k Hz   | -88  |        | -108.5      |        | -115.5      |        |
|  |                  |              |  |        |             |        | -116        |        |
| $N_{oc}$ <small>Note2</small>  | Config 1,2       | dBm/SC S     | -85  |        | -105.5      |        | -112.5      |        |
|  |                  |              |  |        |             |        | -113        |        |
| $\hat{E}_s / I_{\alpha}$   |                  | dB           | -1.75  |        | 20          |        | -4.0        |        |
| $\hat{E}_s / N_{oc}$   |                  |              | -1.75  |        | 20          |        | -4.0        |        |
| SS-RSRP <sup>Not e3</sup>  | Config 1,2       | NR_CCA_FR1_I | -86.75   |        | -85.5       |        | -116.5      |        |
|  |                  | NR_CCA_FR1_J |  |        |             |        | -116        |        |
| SS-SINR <small>Note3</small>   |                  | NR_CCA_FR1_I | -1.75  |        | 20          |        | -4.0        |        |
|  |                  | NR_CCA_FR1_J |  |        |             |        |             |        |

|                                 |  |              |                       |        |        |       |
|---------------------------------|--|--------------|-----------------------|--------|--------|-------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1,2   | NR_CCA_FR1_I | dBm/<br>38.16MHz<br>z | -51.73 | -54.41 | -80   |
|                                 |  | NR_CCA_FR1_J |                       |        |        | -79.5 |
| Propagation condition           |  |              | -                     | AWGN   |        |       |
| Antenna configuration           |  |              | -                     | 1x2    |        |       |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |              |                       |        |        |       |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                       |        |        |       |
| Note 3:                         | SS-SINR, SS-RSRP, and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |              |                       |        |        |       |
| Note 4:                         | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |              |                       |        |        |       |
| Note 5:                         | NR operating band groups are as defined in Clause 3.5.2.   |              |                       |        |        |       |
| Note 6:                         | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration  |              |                       |        |        |       |
| Note 7:                         | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |              |                       |        |        |       |
| Note 8:                         | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |              |                       |        |        |       |
| Note 9:                         | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |              |                       |        |        |       |

A.10.5.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.32.1.1 and 10.1.32.1.2.

A.10.5.3.3 Intra-frequency measurement accuracy on SCC

A.10.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.31.1.

A.10.5.3.3.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.10.5.3.3.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.10.5.3.3.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7A.2.1. In all test cases, Cell 2 is the PSCell with CCA, Cell 3 is the SCell with CCA, and Cell 4 is the target cell with CCA. Two sub-tests (Test 1 and Test 2) are provided different  $N_{oc}$  on Cells 2, 3 and 4.

**Table A.10.5.3.3.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | LTE FDD<br>NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                  |
| 2      | LTE TDD<br>NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                  |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.10.5.3.3.2-2: SS-SINR Intra frequency test parameters**

| Parameter  |                  | Unit      | Test 1   |        | Test 2                               |        |
|--|------------------|-----------|--|--------|--------------------------------------|--------|
|  |                  |           | Cell 2 / Cell 3  | Cell 4 | Cell 2 / Cell 3                      | Cell 4 |
| SSB ARFCN  |                  |           | freq1 for Cell 2<br>freq2 for Cell 3   | freq2  | freq1 for Cell 2<br>freq2 for Cell 3 | freq2  |
| DL CCA model   | Config 1,2       |           | As specified in clause A.3.26.2.1  |        |                                      |        |
| UL CCA model   | Config 1,2       |           | As specified in clause A.3.26.2.2  |        |                                      |        |
| UL CCA probability   | $P_{CCA\_UL}$    |           | 1.0  | -      | 1.0                                  | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | $P_{CCA\_DL}$    |           | 0.9375   | -      | 0.9375                               | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | $P_{CCA\_DL\_1}$ |           | 0.75   | -      | 0.75                                 | -      |
|  | $P_{CCA\_DL\_2}$ |           | 0.75   | -      | 0.75                                 | -      |
| Duplex mode  | Config 1,2       |           | TDD  |        |                                      |        |
| TDD configuration  | Config 1,2       |           | TDDConf.1.1 CCA  |        |                                      |        |
| Downlink initial BWP configuration   |                  |           | DLBWP.0.1  |        |                                      |        |
| Downlink dedicated BWP configuration                                       |                  |           | DLBWP.1.1  |        |                                      |        |
| Uplink initial BWP configuration   |                  |           | ULBWP.0.1  |        |                                      |        |
| Uplink dedicated BWP configuration   |                  |           | ULBWP.1.1  |        |                                      |        |
| DRX Cycle configuration  |                  | ms        | Not Applicable   |        |                                      |        |
| TRS Configuration  | Config 1,2       |           | TRS.1.2 TDD  |        | TRS.1.2 TDD                          |        |
| PDSCH Reference measurement channel  | Config 1,2       |           | SR.1.1 CCA   |        | SR.1.1 CCA                           |        |
| RMSI CORESET Reference Channel   | Config 1,2       |           | CR.1.1 CCA   |        | CR.1.1 CCA                           |        |
| Dedicated CORESET Reference Channel  | Config 1,2       |           | CCR.1.1 CCA  |        | CCR.1.1 CCA                          |        |
| OCNG Patterns  |                  |           | OP.1   |        |                                      |        |
| SS-RSSI-Measurement  |                  |           | Not Applicable   |        |                                      |        |
| Time offset with Cell 2  | Config 1,2       | µs        | 3 (for Cell 3)   | 3      | 3 (for Cell 3)                       | 3      |
| DBT Window Configuration   | Config 1,2       |           | DBT.1  |        |                                      |        |
| SSB configuration  | Config 1,2       |           | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |                                      |        |
| SMTc configuration   | Config 1,2       |           | SMTc.1   |        |                                      |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1,2       | kHz       | 30   |        |                                      |        |
| EPRE ratio of PSS to SSS   |                  | dB        | 0  | 0      | 0                                    | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                  |           |  |        |                                      |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDSCH to PDSCH   |                  |           |  |        |                                      |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                  |           |  |        |                                      |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |           |  |        |                                      |        |
| $N_{oc}$ <small>Note2</small>  |                  | dBm/15kHz | -93  |        |                                      | -112   |
|  |                  |           |  |        |                                      |        |
| $N_{oc}$ <small>Note2</small>  | Config 1,2       | dBm/SCS   | -90  |        |                                      | -109   |
|  |                  |           |  |        |                                      |        |
| $\hat{E}_s / I_{ot}$   |                  | dB        | 0  | -3.19  | -5.46                                | -5.46  |
| $\hat{E}_s / N_{oc}$   |                  | dB        | 4.54   | 2.66   | -4                                   | -4     |

|   |            |              |                  |        |        |        |        |
|---|------------|--------------|------------------|--------|--------|--------|--------|
| SS-RSRP <sup>Note3</sup>  | Config 1,2 | NR_CCA_FR1_I | dBm/SCS          | -85.46 | -87.34 | -113   | -113   |
|   |            | NR_CCA_FR1_J |                  |        |        | -112.5 | -112.5 |
| SS-SINR <sup>Note3</sup>  |            | NR_CCA_FR1_I | dB               | 0      | -3.19  | -5.46  | -5.46  |
|   |            | NR_CCA_FR1_J |                  |        |        |        |        |
| Io <sup>Note3</sup>   | Config 1,2 | NR_CCA_FR1_I | dBm/<br>38.16MHz | -51.41 |        | -75.41 |        |
|   |            | NR_CCA_FR1_J |                  |        |        | -74.91 |        |
| Propagation condition   |            |              | -                | AWGN   |        |        |        |
| Antenna configuration   |            |              | -                | 1x2    |        |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in Clause 3.5.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration</p> <p>Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 9: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |            |              |                  |        |        |        |        |

A.10.5.3.3.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.31.1.1.

A.10.5.4 L1-RSRP measurement for beam reporting with CCA serving cell

A.10.5.4.1 SSB based L1-RSRP measurement

A.10.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.33.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.10.5.4.1.1-1.

**Table A.10.5.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | LTE FDD,<br>NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode             |
| 2      | LTE TDD,<br>NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode             |
| Note:  | The UE is only required to pass in one of the supported test configurations |

A.10.5.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell under CCA (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model.

Two sub-tests (Test 1 and Test 2) are provided with different  $N_{oc}$  on Cell 2. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 are given in Table A.10.5.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.10.5.4.1.2-1.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

**Table A.10.5.4.1.2-1: FR1 SSB based L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|-----------|--------|------|--------|--------|
|-----------|--------|------|--------|--------|

|   |              |     |                            |                            |          |           |        |        |
|---|--------------|-----|----------------------------|----------------------------|----------|-----------|--------|--------|
| SSB GSCN  | 1,2          |     | freq1                      | freq1                      |          |           |        |        |
| DL CCA model                                      | 1,2          |     | As specified in A.3.20.2.1 | As specified in A.3.20.2.1 |          |           |        |        |
| UL CCA model                                      | 1,2          |     | As specified in A.3.20.2.2 | As specified in A.3.20.2.2 |          |           |        |        |
| Duplex mode                                       | 1,2          |     | TDD                        | TDD                        |          |           |        |        |
| TDD Configuration                                 | 1,2          |     | TDDConf.1.1 CCA            | TDDConf.1.1 CCA            |          |           |        |        |
| $BW_{channel}$                                    | 1,2          | MHz | 40: $N_{RB,c} = 106$       | 40: $N_{RB,c} = 106$       |          |           |        |        |
| Duplex mode                                       | 1,2          |     | TDD                        | TDD                        |          |           |        |        |
| TDD configuration                                 | 1,2          |     | TDDConf.1.1 CCA            | TDDConf.1.1 CCA            |          |           |        |        |
| PDSCH Reference measurement channel               | 1,2          |     | SR.1.1 CCA                 | SR.1.1 CCA                 |          |           |        |        |
| RMSI CORESET Reference Channel                    | 1,2          |     | CR.1.1 CCA                 | CR.1.1 CCA                 |          |           |        |        |
| Dedicated CORESET Reference Channel               | 1,2          |     | CCR.1.1 CCA                | CCR.1.1 CCA                |          |           |        |        |
| SSB configuration for Semi-static channel access  | 1,2          |     | SSB.3 CCA                  | SSB.3 CCA                  |          |           |        |        |
| SSB configuration for Dynamic channel access      | 1,2          |     | SSB.4 CCA                  | SSB.4 CCA                  |          |           |        |        |
| OCNG Patterns                                     | 1,2          |     | OP.1                       | OP.1                       |          |           |        |        |
| TRS configuration                                 | 1,2          |     | TRS.1.2 TDD                | TRS.1.2 TDD                |          |           |        |        |
| Initial BWP Configuration                         | 1,2          |     | DLBWP.0.1<br>ULBWP.0.1     | DLBWP.0.1<br>ULBWP.0.1     |          |           |        |        |
| Dedicated BWP configuration                       | 1,2          |     | DLBWP.1.1<br>ULBWP.1.1     | DLBWP.1.1<br>ULBWP.1.1     |          |           |        |        |
| DBT Window Configuration                          | 1,2          |     | DBT.1                      | DBT.1                      |          |           |        |        |
| reportConfigType                                  | 1,2          |     | periodic                   | periodic                   |          |           |        |        |
| reportQuantity                                    | 1,2          |     | ssb-Index-RSRP             | ssb-Index-RSRP             |          |           |        |        |
| Number of reported RS                             | 1,2          |     | 2                          | 2                          |          |           |        |        |
| L1-RSRP reporting period                          | 1,2          |     | slot80                     | slot80                     |          |           |        |        |
| EPRE ratio of PSS to SSS                          | 1,2          | dB  | 0                          | 0                          |          |           |        |        |
| EPRE ratio of PBCH DMRS to SSS                    | 1,2          |     |                            |                            |          |           |        |        |
| EPRE ratio of PBCH to PBCH DMRS                   |              |     |                            |                            |          |           |        |        |
| EPRE ratio of PDCCH DMRS to SSS                   |              |     |                            |                            |          |           |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS                 |              |     |                            |                            |          |           |        |        |
| EPRE ratio of PDSCH DMRS to SSS                   |              |     |                            |                            |          |           |        |        |
| EPRE ratio of PDSCH to PDSCH DMRS                 |              |     |                            |                            |          |           |        |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |              |     |                            |                            |          |           |        |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |              |     |                            |                            |          |           |        |        |
| $N_{oc}$ <sup>Note2</sup>                         | NR_TDD_FR1_I |     |                            |                            | 1,2      | dBm/15kHz | -94.65 | [-113] |
| $N_{oc}$ <sup>Note2</sup>                         | NR_TDD_FR1_I |     |                            |                            | 1,2      | dBm/SCS   | -91.65 | [-110] |
| $\hat{E}_s / I_{ot}$                              |              | 1,2 | dB                         | 10                         | -3       |           |        |        |
| SS-RSRP <sup>Note3</sup>                          | NR_TDD_FR1_I | 1,2 | dBm/SCS                    | -81.65                     | [-113]   |           |        |        |
| $I_o$ <sup>Note3</sup>                            | NR_TDD_FR1_I | 1,2 | dBm/38.16MHz               | -50.19                     | [-77.19] |           |        |        |
| $\hat{E}_s / N_{oc}$                              |              | 1,2 | dB                         | 10                         | -3       |           |        |        |
| Propagation condition                             | 1,2          |     | AWGN                       | AWGN                       |          |           |        |        |
| Antenna configuration                             | 1,2          |     | 1x2                        | 1x2                        |          |           |        |        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  |

#### A.10.5.4.1.3 Test Requirements

In both Test 1 and Test 2, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.33.1.

### A.10.5.5 RSSI

#### A.10.5.5.1 RSSI measurement accuracy on PSCC with CCA

##### A.10.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.1.

##### A.10.5.5.1.2 Test parameters

In all test cases, Cell 1 is E-UTRAN PCell on a licensed band, and Cell 2 is PSCell operating on a carrier frequency under CCA. RSSI is measured on channel number 1. Supported test configurations are shown in table A.10.5.5.1.2-1. The accuracy of RSSI intra-frequency measurements is tested by using the parameters in A.10.5.5.1.2-2 and A.10.5.5.1.2-3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.5.5.1.2-1: RSSI supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |



Table A.10.5.1.2-2: RSSI test parameters

| Parameter   |   | Configurations | Unit      | Test 1                           |
|---|---|----------------|-----------|----------------------------------|
|   |   |                |           | Cell 2                           |
| RF Channel Number   |   |                |           | 1                                |
| $BW_{channel}$  |   |                | MHz       | 40                               |
| SSB configuration   | Semi-static channel access <small>Note 1, 3</small> | 1,2            |           | SSB.1 CCA                        |
|   | Dynamic channel access <small>Note 2, 3</small>     | 1,2            |           | SSB.2 CCA                        |
| $P_{CCA\_DL}$   |   |                |           | TBD                              |
| $P_{CCA\_UL}$   |   |                |           | TBD                              |
| DL CCA model  |   |                |           | As specified in A.3.20.2.1       |
| UL CCA model  |   |                |           | As specified in A.3.20.2.2       |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |
| Channel access bandwidth  |   |                | MHz       | 20                               |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      |
| OCNG Patterns   |   |                |           | OP.1                             |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/SCS   | -106                             |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/SCS   | -87                              |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dB        | 2.5                              |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                | dB        | -Infinity                        |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)  |   |                | dBm/SCS   | -103.5                           |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)  |   |                |           | -Infinity                        |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)                            |   |                | dBm/BW    | -101.6                           |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)                                |   |                | dBm/BW    | -87                              |
| Propagation condition   |   |                | -         | AWGN                             |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |   |                |           |                                  |
| Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |   |                |           |                                  |
| Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |                |           |                                  |

**Table A.10.5.5.1.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.10.5.5.1.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.1. The nominal RSSI used to evaluate the requirement shall be based on  $I_0$  in slots corresponding to RSSI measurement time configuration (RMTC).

## A.10.5.5.2 RSSI measurement accuracy on SCC with CCA

### A.10.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.1.

### A.10.5.5.2.2 Test parameters

In all test cases, Cell 1 is E-UTRAN PCell on a licensed band, Cell 2 is PSCell operating on a carrier frequency under CCA, Cell 3 is SCell on a carrier frequency under CCA. RSSI is measured on channel number 2. Supported test configurations are shown in table A.10.5.5.2.2-1. The accuracy of RSSI intra-frequency measurements is tested by using the parameters in A.10.5.5.2.2-2 and A.10.5.5.2.2-3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.5.5.2.2-1: RSSI supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.5.5.2.2-2: RSSI test parameters**

| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 2                           | Cell 3                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| $BW_{channel}$  |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2            |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2            |           | SSB.2 CCA                        | SSB.2 CCA                  |
| $P_{CCA\_DL}$   |   |                |           | 1                                | TBD                        |
| $P_{CCA\_UL}$   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       | SR.1.1 CCA                 |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       | CR.1.1 CCA                 |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      | CCR.1.1 CCA                |
| OCNG Patterns   |   |                |           | OP.1                             | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|   |  |        |        |        |
|---|--|--------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)                            |  | dBm/BW | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)                                |  | dBm/BW | -101.6 | -87    |
| Propagation condition   |  | -      | AWGN   |        |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |  |        |        |        |
| Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |  |        |        |        |
| Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |  |        |        |        |

**Table A.10.5.5.2.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.10.5.5.2.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.1. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## A.10.5.5.3 Inter-frequency RSSI measurement accuracy on a carrier with CCA

### A.10.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.2.

### A.10.5.5.3.2 Test parameters

In all test cases, Cell 1 is E-UTRAN PCell on a licensed band, Cell 2 is PSCell operating on a carrier frequency under CCA, and Cell 3 is the neighbour with CCA. RSSI is measured on channel number 2. Supported test configurations are shown in table A.10.5.5.3.2-1. The accuracy of RSSI inter-frequency measurements is tested by using the parameters in A.10.5.5.3.2-2 and A.10.5.5.3.2-3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.5.5.3.2-1: RSSI supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.5.5.3.2-2: RSSI test parameters**

| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 2                           | Cell 3                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| $BW_{channel}$  |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2            |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2            |           | SSB.2 CCA                        | SSB.2 CCA                  |
| $P_{CCA\_DL}$   |   |                |           | 1                                | TBD                        |
| $P_{CCA\_UL}$   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 TDD                       | NA                         |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 TDD                       | NA                         |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 TDD                      | NA                         |
| OCNG Patterns   |   |                |           | OP.1                             | NA                         |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | NA                         |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|  |  |        |        |        |
|--|--|--------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/BW | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/BW | -101.6 | -87    |
| Propagation condition  |  | -      | AWGN   |        |
| <p>Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |  |        |        |        |

**Table A.10.5.5.3.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.10.5.5.3.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.2. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## A.10.5.6 Channel occupancy

### A.10.5.6.1 Channel occupancy measurement accuracy on PSCC with CCA

#### A.10.5.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.35.1.

#### A.10.5.6.1.2 Test parameters

In all test cases, Cell 1 is E-UTRAN PCell on a licensed band, and Cell 2 is PSCell operating on a carrier frequency under CCA. Channel occupancy is measured on channel number 1. Supported test configurations are shown in table A.10.5.6.1.2-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in A.10.5.6.1.2-2 and A.10.5.6.1.2-3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.5.6.1.2-1: CO supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |



Table A.10.5.6.1.2-2: CO test parameters

| Parameter  |   | Configurations | Unit      | Test 1                           |
|--|---|----------------|-----------|----------------------------------|
|  |   |                |           | Cell 2                           |
| RF Channel Number  |   |                |           | 1                                |
| $BW_{channel}$   |   |                | MHz       | 40                               |
| SSB configuration  | Semi-static channel access <small>Note 1, 3</small> | 1,2            |           | SSB.1 CCA                        |
|  | Dynamic channel access <small>Note 2, 3</small>     | 1,2            |           | SSB.2 CCA                        |
| $P_{CCA\_DL}$  |   |                |           | TBD                              |
| $P_{CCA\_UL}$  |   |                |           | TBD                              |
| DL CCA model   |   |                |           | As specified in A.3.20.2.1       |
| UL CCA model   |   |                |           | As specified in A.3.20.2.2       |
| Measurement bandwidth  |   |                | $n_{PRE}$ | Same as channel access bandwidth |
| Channel access bandwidth   |   |                | MHz       | 20                               |
| DRX Cycle configuration  |   |                | ms        | Not Applicable                   |
| PDSCH Reference measurement channel  |   |                |           | SR.1.1 CCA                       |
| RMSI CORESET Reference Channel   |   |                |           | CR.1.1 CCA                       |
| Dedicated CORESET Reference Channel  |   |                |           | CCR.1.1 CCA                      |
| OCNG Patterns  |   |                |           | OP.1                             |
| EPRE ratio of PSS to SSS   |   |                | dB        | 0                                |
| EPRE ratio of PBCH DMRS to SSS   |   |                |           |                                  |
| EPRE ratio of PBCH to PBCH DMRS  |   |                |           |                                  |
| EPRE ratio of PDCCH DMRS to SSS  |   |                |           |                                  |
| EPRE ratio of PDCCH to PDCCH DMRS  |   |                |           |                                  |
| EPRE ratio of PDSCH DMRS to SSS  |   |                |           |                                  |
| EPRE ratio of PDSCH to PDSCH   |   |                |           |                                  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |   |                |           |                                  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |   |                |           |                                  |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)  |   |                | dBm/SCS   | -106                             |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)  |   |                | dBm/SCS   | -87                              |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC)  |   |                | dB        | 2.5                              |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)  |   |                | dB        | -Infinity                        |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/SCS   | -103.5                           |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                |           | -Infinity                        |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/BW    | -101.6                           |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/BW    | -87                              |
| Propagation condition  |   |                | -         | AWGN                             |
| channelOccupancyThreshold  |   |                | dBm       | -83                              |
| <p>Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |   |                |           |                                  |

**Table A.10.5.6.1.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.10.5.6.1.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## A.10.5.6.2 Channel occupancy measurement accuracy on SCC with CCA

### A.10.5.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.35.1.

### A.10.5.6.2.2 Test parameters

In all test cases, Cell 1 is E-UTRAN PCell on a licensed band, Cell 2 is PSCell operating on a carrier frequency under CCA, Cell 3 is SCell on a carrier frequency under CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in table A.10.5.6.2.2-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in A.10.5.6.2.2-2 and A.10.5.6.2.2-3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.5.6.2.2-1: CO supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.5.6.2.2-2: CO test parameters**

| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 2                           | Cell 3                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| $BW_{channel}$  |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2            |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2            |           | SSB.2 CCA                        | SSB.2 CCA                  |
| $P_{CCA\_DL}$   |   |                |           | 1                                | TBD                        |
| $P_{CCA\_UL}$   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       | SR.1.1 CCA                 |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       | CR.1.1 CCA                 |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      | CCR.1.1 CCA                |
| OCNG Patterns   |   |                |           | OP.1                             | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|   |  |        |        |        |
|---|--|--------|--------|--------|
| lo within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)  |  | dBm/BW | -101.6 | -101.6 |
| lo within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)  |  | dBm/BW | -101.6 | -87    |
| Propagation condition   |  | -      | AWGN   |        |
| channelOccupancyThreshold   |  | dBm    | -83    |        |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |  |        |        |        |

**Table A.10.5.6.2.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.10.5.6.2.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## A.10.5.6.3 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA

### A.10.5.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.35.2.

### A.10.5.6.3.2 Test parameters

In all test cases, Cell 1 is E-UTRAN PCell on a licensed band, Cell 2 is PSCell operating on a carrier frequency under CCA, and Cell 3 is the neighbour with CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in table A.10.5.6.3.2-1. The accuracy of channel occupancy inter-frequency measurements is tested by using the parameters in A.10.5.6.3.2-2 and A.10.5.6.3.2-3. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.10.5.6.3.2-1: CO supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.10.5.5.3.2-2: CO test parameters**

| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 2                           | Cell 3                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| $BW_{channel}$  |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2            |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2            |           | SSB.2 CCA                        | SSB.2 CCA                  |
| $P_{CCA\_DL}$   |   |                |           | 1                                | TBD                        |
| $P_{CCA\_UL}$   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 TDD                       | NA                         |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 TDD                       | NA                         |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 TDD                      | NA                         |
| OCNG Patterns   |   |                |           | OP.1                             | NA                         |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | NA                         |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|   |  |        |        |        |
|---|--|--------|--------|--------|
| lo within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)                            |  | dBm/BW | -101.6 | -101.6 |
| lo within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)                                |  | dBm/BW | -101.6 | -87    |
| Propagation condition   |  | -      | AWGN   |        |
| channelOccupancyThreshold   |  | dBm    | -83    |        |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |  |        |        |        |
| Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |  |        |        |        |
| Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |  |        |        |        |

**Table A.10.5.6.3.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.10.5.6.3.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## A.11 NR Standalone Tests with NR PCell under CCA and Other NR Cells in FR1

*Editor's note: Test cases for NR SA with NR PCell under CCA and SCell under CCA are also included here.*

### A.11.1 RRC\_IDLE state mobility

#### A.11.1.1 Cell re-selection with both source and target NR carrier frequencies under CCA

##### A.11.1.1.1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell

###### A.11.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements subject to CCA specified in clause 4.2A.2.3. Supported test configurations are shown in table A. 11.1.1.1.2-1.

###### A.11.1.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier that is subject to CCA and 2 cells as given in tables A.11.1.1.2-1, A.11.1.1.2-2 and A.11.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.



Table A.11.1.1.1.2-1: Supported test configurations

| Configuration | Description   |
|---------------|---|
| 1             | With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Table A.11.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case when subject to CCA

| Parameter                  |                            | Unit | Test configuration | Value                             | Comment   |
|----------------------------|----------------------------|------|--------------------|-----------------------------------|---|
| Initial condition          | Active cell                |      | 1                  | Cell1                             |   |
|                            | Neighbour cells            |      | 1                  | Cell2                             |   |
| T2 end condition           | Active cell                |      | 1                  | Cell2                             |   |
|                            | Neighbour cells            |      | 1                  | Cell1                             |   |
| Final condition            | Active cell                |      | 1                  | Cell1                             |   |
| RF Channel Number          |                            |      | 1                  | 1                                 |   |
| Time offset between cells  |                            |      | 1                  | 3 $\mu$ s                         | Synchronous cells   |
| Access Barring Information |                            | -    | 1                  | Not Sent                          | No additional delays in random access procedure.  |
| SSB configuration          | Semi-static channel access |      | 1                  | SSB.1 CCA                         | (As defined in A.3.10A )  |
|                            | Dynamic channel access     |      |                    | SSB.2 CCA                         |   |
| DBT Window Configuration   |                            |      | 1                  | DBT.1                             | As specified in clause A.3.28.1.  |
| SMTC configuration         |                            |      |                    | SMTC.1                            |   |
| DL CCA model               |                            |      | 1                  | As specified in clause A.3.26.2.1 |   |
| UL CCA model               |                            |      | 1                  | As specified in clause A.3.26.2.2 |   |
| DRX cycle length           |                            | s    | 1                  | 1.28                              | The value shall be used for all cells in the test.  |
| PRACH configuration index  |                            |      | 1                  | 102                               | The detailed configuration is specified in TS 38.211 clause 6.3.3.2   |
| rangeToBestCell            |                            |      | 1                  | Not configured                    |   |
| T1                         |                            | s    | 1                  | >7                                | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2                         |                            | s    | 1                  | 40                                | T2 needs to be defined so that cell re-selection reaction time is taken into account.   |
| T3                         |                            | s    | 1                  | 15                                | T3 needs to be defined so that cell re-selection reaction time is taken into account.   |

**Table A.11.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN when subject to CCA**

| Parameter   | Unit   | Test configuration | Cell 1                  |        |        | Cell 2  |      |       |
|---|--|--------------------|-------------------------|--------|--------|---|------|-------|
|   |  |                    | T1                      | T2     | T3     | T1  | T2   | T3    |
| TDD configuration   |  | 1                  | TDDConf.1.1 CCA         |        |        | TDDConf.1.1 CCA                                 |      |       |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )           |  | 1                  | 0.9                     |        |        | 0.9   |      |       |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ ) |  | 1                  | 0.75                    |        |        | 0.75  |      |       |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ ) |  | 1                  | 0.5                     |        |        | 0.5   |      |       |
| UL CCA probability $P_{CCA\_UL}$  |  | 1                  | 1                       |        |        | 1   |      |       |
| $M_{d,max}$   |  | 1                  | 16                      |        |        | 16  |      |       |
| $M_{m,max}$   |  | 1                  | 4                       |        |        | 4   |      |       |
| $M_{e,max}$   |  | 1                  | 8                       |        |        | 8   |      |       |
| PDSCH RMC   |  | 1                  | SR.1.1 CCA              |        |        | SR.1.1 CCA                                      |      |       |
| RMSI CORESET  |  | 1                  | CR.1.1 CCA              |        |        | CR.1.1 CCA                                      |      |       |
| Dedicated CORESET   |  | 1                  | CCR.1.1 CCA             |        |        | CCR.1.1 CCA                                     |      |       |
| OCNG Pattern  |  | 1                  | OP.1 defined in A.3.2.1 |        |        | OP.1 defined in A.3.2.1                         |      |       |
| Initial DL BWP configuration  |  | 1                  | DLBWP.0.1               |        |        | DLBWP.0.1                                       |      |       |
| Initial UL BWP configuration  |  | 1                  | ULBWP.0.1               |        |        | ULBWP.0.1                                       |      |       |
| RLM-RS  |  | 1                  | SSB                     |        |        | SSB   |      |       |
| $Q_{rxlevmin}$  | dBm/SCS  | 1                  | -127                    |        |        | -127  |      |       |
| $P_{compensation}$  | dB   | 1                  | 0                       |        |        | 0   |      |       |
| $Q_{hysts}$   | dB   | 1                  | 0                       |        |        | 0   |      |       |
| $Q_{offsets,n}$   | dB   | 1                  | 0                       |        |        | 0   |      |       |
| Cell_selection_and_reselection_quality_measurement                            |  | 1                  | SS-RSRP                 |        |        | SS-RSRP   |      |       |
| $\hat{E}_s / I_{ot}$  | dB   | 1                  | 16                      | -3.11  | 2.79   | -infinity                                       | 2.79 | -3.11 |
| $N_{oc}$ Note2  | dBm/SCS  | 1                  | -95                     |        |        |   |      |       |
| $N_{oc}$ Note2  | dBm/15 kHz   | 1                  | -98                     |        |        |   |      |       |
| $\hat{E}_s / N_{oc}$  | dB   | 1                  | 16                      | 13     | 16     | -infinity                                       | 16   | 13    |
| SS-RSRP Note3   | dBm/SCS  | 1                  | -79                     | -82    | -79    | -infinity                                       | -79  | -82   |
| $I_o$   | dBm/38.16 MHz  | 1                  | -47.85                  | -46.12 | -46.12 | Same as parameters specified in Cell 1 columns- |      |       |
| Treselection  | s  | 1                  | 0                       | 0      | 0      | 0   | 0    | 0     |
| SintrasearchP   | dB   | 1                  | 50                      |        |        | 50  |      |       |
| Propagation Condition   |  | 1                  | AWGN                    |        |        |   |      |       |
| Note 1:   | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                    |                         |        |        |   |      |       |
| Note 2:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                    |                         |        |        |   |      |       |
| Note 3:   | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                    |                         |        |        |   |      |       |
| Note 4:   | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |                    |                         |        |        |   |      |       |

### A.11.1.1.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than  $(25 + M_d) \cdot 1.28 + T_{SI\_CCA}$  s.  $M_d$  is the number of DRX cycles with at least one SMTC where there are no SSBs available during the  $T_{detect, NR\_Intra\_CCA}$ . If  $M_d > M_{d, max}$  the UE is required to restart the detection of Cell 2.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than  $(5 + M_e) \cdot 1.28 + T_{SI\_CCA}$  s.  $M_e$  is the number of DRX cycles with at least one SMTC where there are no SSBs available during the  $T_{evaluate, NR\_Intra\_CCA}$ . If  $M_e > M_{e, max}$  the UE is required to restart the evaluation of Cell 2.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as:  $T_{detect, NR\_Intra\_CCA} + T_{SI\_CCA}$ , and to an already detected cell can be expressed as:  $T_{evaluate, NR\_intra\_CCA} + T_{SI\_CCA}$ ,

Where:

$T_{detect, NR\_Intra\_CCA}$  See Table 4.2A.2.3-1 in clause 4.2A.2.3

$T_{evaluate, NR\_intra\_CCA}$  See Table 4.2A.2.3-1 in clause 4.2A.2.3

$T_{SI\_CCA}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of  $(25 + M_d) \cdot 1.28 + T_{SI\_CCA}$  s for the cell re-selection delay to a newly detectable cell and  $(5 + M_e) \cdot 1.28 + T_{SI\_CCA}$  s for the cell re-selection delay to an already detected cell in the test case.

### A.11.1.1.2 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell

#### A.11.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements subject to CCA specified in clause 4.2A.2.4. Supported test configurations are shown in table A.11.1.1.2.2-1.

#### A.11.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers that are subject to CCA respectively as given in tables A.11.1.1.2.2-1, A.11.1.1.2.2-2 and A.11.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

**Table A.11.1.1.2.2-1: Supported test configurations**

| Configuration | Description of cell 1 with CCA                    | Description of cell 2 with CCA                    |
|---------------|---|---|
| 1             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.1.1.2.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case when subject to CCA**

| Parameter                  |                            | Unit | Test configuration | Value                             | Comment  |
|----------------------------|----------------------------|------|--------------------|-----------------------------------|--|
| Initial condition          | Active cell                |      | 1                  | Cell2                             | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1  |
| T1 end condition           | Active cell                |      | 1                  | Cell1                             | The UE shall perform reselection to cell 1 during T1   |
|                            | Neighbour cells            |      | 1                  | Cell2                             |  |
| T3 end condition           | Active cell                |      | 1                  | Cell2                             | The UE shall perform reselection to cell 2 with higher priority during T3  |
| RF Channel Number          |                            |      | 1                  | 1, 2                              |  |
| Time offset between cells  |                            |      | 1                  | 3 $\mu$ s                         | Synchronous cells  |
| Access Barring Information |                            | -    | 1                  | Not Sent                          | No additional delays in random access procedure.   |
| SSB configuration          | Semi-static channel access |      | 1                  | SSB.1 CCA (As defined in A.3.10A) |  |
|                            | Dynamic channel access     |      |                    | SSB.2 CCA (As defined in A.3.10A) |  |
| DBT Window Configuration   |                            |      | 1                  | DBT.1                             | As specified in clause A.3.28.1.   |
| SMTC configuration         |                            |      | 1                  | SMTC.1                            |  |
| DL CCA model               |                            |      | 1                  | As specified in clause A.3.26.2.1 |  |
| UL CCA model               |                            |      | 1                  | As specified in clause A.3.26.2.2 |  |
| DRX cycle length           |                            | s    | 1                  | 1.28                              | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                            |      | 1                  | 102                               | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| rangeToBestCell            |                            |      | 1                  | Not configured                    |  |
| T1                         |                            | s    | 1                  | 15                                | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2                         |                            | s    | 1                  | >7                                | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3                         |                            | s    | 1                  | 75                                | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

**Table A.11.1.1.2.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN**

| Parameter   | Unit          | Test configuration | Cell 1                  |        |        | Cell 2                  |           |        |
|---|---------------|--------------------|-------------------------|--------|--------|-------------------------|-----------|--------|
|   |               |                    | T1                      | T2     | T3     | T1                      | T2        | T3     |
| TDD configuration   |               | 1                  | TDDConf.1.1 CCA         |        |        | TDDConf.1.1 CCA         |           |        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )           |               | 1                  | 0.9                     |        |        | 0.9                     |           |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ ) |               | 1                  | 0.75                    |        |        | 0.75                    |           |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ ) |               | 2                  | 0.5                     |        |        | 0.5                     |           |        |
| UL CCA probability $P_{CCA\_UL}$  |               | 1                  | 1                       |        |        | 1                       |           |        |
| $M_{d,max}$   |               | 1                  | 16                      |        |        | 16                      |           |        |
| $M_{m,max}$   |               | 1                  | 4                       |        |        | 4                       |           |        |
| $M_{e,max}$   |               | 1                  | 8                       |        |        | 8                       |           |        |
| PDSCH RMC   |               | 1                  | SR.1.1 CCA              |        |        | SR.1.1 CCA              |           |        |
| RMSI CORESET  |               | 1                  | CR.1.1 CCA              |        |        | CR.1.1 CCA              |           |        |
| Dedicated CORESET   |               | 1                  | CCR.1.1 CCA             |        |        | CCR.1.1 CCA             |           |        |
| OCNG Pattern  |               | 1                  | OP.1 defined in A.3.2.1 |        |        | OP.1 defined in A.3.2.1 |           |        |
| Initial DL BWP configuration  |               | 1                  | DLBWP.0.1               |        |        | DLBWP.0.1               |           |        |
| Initial UL BWP configuration  |               | 1                  | ULBWP.0.1               |        |        | ULBWP.0.1               |           |        |
| RLM-RS  |               | 1                  | SSB                     |        |        | SSB                     |           |        |
| Qrxlevmin   | dBm/SCS       | 1                  | -137                    |        |        | -137                    |           |        |
| Pcompensation   | dB            | 1                  | 0                       |        |        | 0                       |           |        |
| $Q_{hyst_s}$  | dB            | 1                  | 0                       |        |        | 0                       |           |        |
| $Q_{offset_{s,n}}$  | dB            | 1                  | 0                       |        |        | 0                       |           |        |
| Cell_selection_and_reselection_quality_measurement                            |               | 1                  | SS-RSRP                 |        |        | SS-RSRP                 |           |        |
| $\hat{E}_s / I_{oc}$  | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
| $N_{oc}$ Note2  | dBm/SCS       | 1                  | -95                     |        |        |                         |           |        |
| $N_{oc}$ Note2  | dBm/15 kHz    | 1                  | -98                     |        |        |                         |           |        |
| $\hat{E}_s / N_{oc}$  | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
| SS-RSRP Note3   | dBm/SCS       | 1                  | -81                     | -81    | -81    | -99                     | -infinity | -83    |
| Io  | dBm/38.16 MHz | 1                  | -49.79                  | -49.79 | -49.79 | -62.50                  | -infinity | -51.69 |
| Treselection  | s             | 1                  | 0                       | 0      | 0      | 0                       | 0         | 0      |
| SnonintrasearchP  | dB            | 1                  | 50                      |        |        | 50                      |           |        |
| Thresh <sub>x,high</sub>  | dB            | 1                  | 48                      |        |        | 48                      |           |        |
| Thresh <sub>serv,low</sub>  | dB            | 1                  | 44                      |        |        | 44                      |           |        |
| Thresh <sub>x,low</sub>   | dB            | 1                  | 50                      |        |        | 50                      |           |        |
| Propagation Condition   |               | 1                  | AWGN                    |        |        |                         |           |        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |

### A.11.1.1.2.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than  $60 + 1.28 \times (5 + M_e) + T_{SI\_CCA}$  s.  $M_e$  is the number of DRX cycles with at least one SMTC where there are no SSBs available during the  $T_{evaluate, NR\_Intra\_CCA}$ . If  $M_e > M_{e,max}$  the UE is required to restart the evaluation of cell 2.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than  $1.28 \times (5 + M_e) + T_{SI\_CCA}$  s.  $M_e$  is the number of DRX cycles with at least one SMTC where there are no SSBs available during the  $T_{evaluate, NR\_Intra\_CCA}$ . If  $M_e > M_{e,max}$  the UE is required to restart the evaluation of cell 2.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR\_inter\_CCA} + T_{SI\_CCA}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR\_inter\_CCA} + T_{SI\_CCA}$ ,

Where:

$T_{higher\_priority\_search}$  See clause 4.2.2.7

$T_{evaluate, NR\_inter\_CCA}$  See Table 4.2A.2.4-1 in clause 4.2A.2.4

$T_{SI\_CCA}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of  $60 + 1.28 \times (5 + M_e) + T_{SI\_CCA}$  s for the cell re-selection delay to a higher priority cell and  $1.28 \times (5 + M_e) + T_{SI\_CCA}$  s for the cell re-selection delay to a lower priority cell in the test case.

## A.11.1.2 Cell re-selection to NR with source NR carrier frequency under CCA

### A.11.1.2.1 Cell reselection to FR1 inter-frequency NR case when serving cell is subject to CCA

#### A.11.1.2.1.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4 when the serving cell is subject to CCA. Supported test configurations are shown in table A.11.1.2.1.2-1.

#### A.11.1.2.1.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers where the first carrier is subject to CCA as given in tables A.11.1.2.1.2-1, A.11.1.2.1.2-2 and A.11.1.2.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

**Table A.11.1.2.1.2-1: Supported test configurations**

| <b>Configuration</b> | <b>Description of a cell with CCA</b>             | <b>Description of a cell without CCA</b>          |
|----------------------|---|---|
| 1                    | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2                    | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3                    | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations.



**Table A.11.1.2.1.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case when serving cell is subject to CCA**

| Parameter                  |                 | Unit | Test configuration | Value  | Comment  |
|----------------------------|-----------------|------|--------------------|--|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell2  | The UE camps on cell 2 which is subject to CCA in the initial phase and during T1 period the UE reselects to cell 1 which is an inter-frequency NR cell  |
| T1 end condition           | Active cell     |      | 1, 2, 3            | Cell1  | The UE shall perform reselection to cell 1 during T1   |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2  |  |
| T3 end condition           | Active cell     |      | 1, 2, 3            | Cell2  | The UE shall perform reselection to cell 2 with higher priority during T3  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1, 2   |  |
| Time offset between cells  |                 |      | 1                  | 3 ms   | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s  | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s  | Synchronous cells  |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent   | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | Cell 1: SSB.1 FR1<br>Cell 2: SSB.1 CCA for semi-static channel access;<br>Cell 2: SSB.2 CCA for dynamic channel access |  |
|                            |                 |      | 2                  | Cell 1: SSB.1 FR1<br>Cell 2: SSB.1 CCA for semi-static channel access;<br>Cell 2: SSB.2 CCA for dynamic channel access |  |
|                            |                 |      | 3                  | Cell 1: SSB.2 FR1<br>Cell 2: SSB.1 CCA for semi-static channel access;<br>Cell 2: SSB.2 CCA for dynamic channel access |  |
| SMTC configuration         |                 |      | 1                  | Cell 1: SMTC pattern 2<br>Cell 2: N/A  |  |
|                            |                 |      | 2                  | Cell 1: SMTC pattern 1<br>Cell 2: N/A  |  |
|                            |                 |      | 3                  | Cell 1: SMTC pattern 1<br>Cell 2: N/A  |  |
| DBT Window Configuration   |                 |      | 1, 2, 3            | Cell 1: N/A<br>Cell 2: DBT.1   | As specified in clause A.3.28.1.   |
| DL CCA model               |                 |      | 1, 2, 3            | Cell 1: N/A<br>Cell 2: As specified in clause A.3.26.2.1   |  |
| UL CCA model               |                 |      | 1, 2, 3            | Cell 1: N/A<br>Cell 2: As specified in clause A.3.26.2.2   |  |
| DRX cycle length           |                 | s    | 1, 2, 3            | 1.28   | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                 |      | 1, 2, 3            | 102  | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| rangeToBestCell            |                 |      | 1, 2, 3            | Not configured   |  |
| T1                         |                 | s    | 1, 2, 3            | 15   | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2                         |                 | s    | 1, 2, 3            | >7   | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |

|    |   |         |    |   |
|----|---|---------|----|---|
| T3 | s | 1, 2, 3 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
|----|---|---------|----|---|

**Table A.11.1.2.1.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN when serving cell is subject to CCA**

| Parameter   | Unit          | Test configuration | Cell 1                  |        |        | Cell 2                  |           |        |
|---|---------------|--------------------|-------------------------|--------|--------|-------------------------|-----------|--------|
|   |               |                    | T1                      | T2     | T3     | T1                      | T2        | T3     |
| TDD configuration   |               | 1                  | N/A                     |        |        | TDDConf.1.1.CCA         |           |        |
|   |               | 2                  | TDDConf.1.1             |        |        | TDDConf.1.1.CCA         |           |        |
|   |               | 3                  | TDDConf.2.1             |        |        | TDDConf.1.1.CCA         |           |        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )           |               | 1, 2, 3            | N/A                     |        |        | 0.9                     |           |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ ) |               | 1, 2, 3            | N/A                     |        |        | 0.75                    |           |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ ) |               | 1, 2, 3            | N/A                     |        |        | 0.5                     |           |        |
| UL CCA probability $P_{CCA\_UL}$  |               | 1, 2, 3            | N/A                     |        |        | 1                       |           |        |
| $M_{d,max}$   |               | 1, 2, 3            | N/A                     |        |        | 16                      |           |        |
| $M_{m,max}$   |               | 1, 2, 3            | N/A                     |        |        | 4                       |           |        |
| $M_{e,max}$   |               | 1, 2, 3            | N/A                     |        |        | 8                       |           |        |
| PDSCH RMC configuration   |               | 1                  | SR.1.1 FDD              |        |        | SR.1.1 CCA              |           |        |
|   |               | 2                  | SR.1.1 TDD              |        |        | SR.1.1 CCA              |           |        |
|   |               | 3                  | SR.2.1 TDD              |        |        | SR.1.1 CCA              |           |        |
| RMSI CORESET RMC configuration  |               | 1                  | CR.1.1 FDD              |        |        | CR.1.1 CCA              |           |        |
|   |               | 2                  | CR.1.1 TDD              |        |        | CR.1.1 CCA              |           |        |
|   |               | 3                  | CR.2.1 TDD              |        |        | CR.1.1 CCA              |           |        |
| Dedicated CORESET RMC configuration   |               | 1                  | CCR.1.1 FDD             |        |        | CCR.1.1 CCA             |           |        |
|   |               | 2                  | CCR.1.1 TDD             |        |        | CCR.1.1 CCA             |           |        |
|   |               | 3                  | CCR.2.1 TDD             |        |        | CCR.1.1 CCA             |           |        |
| OCNG Pattern  |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        |        | OP.1 defined in A.3.2.1 |           |        |
| Initial DL BWP configuration  |               | 1, 2, 3            | DLBWP.0.1               |        |        | DLBWP.0.1               |           |        |
| Initial UL BWP configuration  |               | 1, 2, 3            | ULBWP.0.1               |        |        | ULBWP.0.1               |           |        |
| RLM-RS  |               | 1, 2, 3            | SSB                     |        |        | SSB                     |           |        |
| Qrxlevmin   | dBm/SCS       | 1, 2               | -140                    |        |        | -137                    |           |        |
|   |               | 3                  | -137                    |        |        | -137                    |           |        |
| Pcompensation   | dB            | 1, 2, 3            | 0                       |        |        | 0                       |           |        |
| Cell_selection_and_reselection_quality_measurement                            |               | 1, 2, 3            | SS-RSRP                 |        |        | SS-RSRP                 |           |        |
| $\hat{E}_s / I_{ot}$  | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
|   |               | 2                  |                         |        |        |                         |           |        |
|   |               | 3                  |                         |        |        |                         |           |        |
| $N_{oc}$ Note2  | dBm/SCS       | 1                  | -98                     |        |        | -95                     |           |        |
|   |               | 2                  | -98                     |        |        | -95                     |           |        |
|   |               | 3                  |                         |        |        | -95                     |           |        |
| $N_{oc}$ Note2  | dBm/15 kHz    | 1                  | -98                     |        |        |                         |           |        |
|   |               | 2                  |                         |        |        |                         |           |        |
|   |               | 3                  |                         |        |        |                         |           |        |
| $\hat{E}_s / N_{oc}$  | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
|   |               | 2                  |                         |        |        |                         |           |        |
|   |               | 3                  |                         |        |        |                         |           |        |
| SS-RSRP Note3   | dBm/SCS       | 1                  | -84                     | -84    | -84    | -102                    | -infinity | -83    |
|   |               | 2                  | -84                     | -84    | -84    | -102                    | -infinity | -83    |
|   |               | 3                  | -81                     | -81    | -81    | -99                     | -infinity | -83    |
| Io  | dBm/9.36 MHz  | 1                  | -55.88                  | -55.88 | -55.88 | -68.60                  | --        | --     |
|   | dBm/9.36 MHz  | 2                  | -55.88                  | -55.88 | -55.88 | -68.60                  | --        | --     |
|   | dBm/38.16 MHz | 3                  | -49.79                  | -49.79 | -49.79 | -62.50                  | -63.96    | -51.69 |
| Treselection  | s             | 1, 2, 3            | 0                       | 0      | 0      | 0                       | 0         | 0      |
| SnonintrasearchP  | dB            | 1, 2, 3            | 50                      |        |        | 50                      |           |        |

|                              |  |         |      |    |
|------------------------------|--|---------|------|----|
| Thresh <sub>x, highP</sub>   | dB   | 1, 2, 3 | 48   | 48 |
| Thresh <sub>serv, lowP</sub> | dB   | 1, 2, 3 | 44   | 44 |
| Thresh <sub>x, lowP</sub>    | dB   | 1, 2, 3 | 50   | 50 |
| Propagation Condition        |  | 1, 2, 3 | AWGN |    |
| Note 1:                      | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |         |      |    |
| Note 2:                      | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |         |      |    |
| Note 3:                      | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |         |      |    |
| Note 4:                      | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |         |      |    |

### A.11.1.2.1.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than  $60 + 1.28 \times (5 + M_e) + T_{SI\_CCA}$  s.  $M_e$  is the number of DRX cycles with at least one SMTC where there are no SSBs available during the  $T_{evaluate, NR\_Intra\_CCA}$ . If  $M_e > M_{e, max}$  the UE is required to restart the evaluation of cell 2.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR\_inter\_CCA} + T_{SI\_CCA}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR\_inter} + T_{SI\_NR}$ .

Where:

$T_{higher\_priority\_search}$  See clause 4.2.2.7

$T_{evaluate, NR\_inter\_CCA}$  See Table 4.2A.2.4-1 in clause 4.2A.2.4

$T_{SI\_CCA}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

$T_{evaluate, NR\_inter}$  See Table 4.2.2.4-1 in clause 4.2.2.4

$T_{SI\_NR}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test cases.

This gives a total of  $60 + 1.28 \times (5 + M_e) + T_{SI\_CCA}$  s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

### A.11.1.3 Cell re-selection from NR carrier with target NR carrier frequency under CCA

#### A.11.1.3.1 Cell reselection to FR1 inter-frequency NR case when target cell is subject to CCA

##### A.11.1.3.1.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2A.2.4 when the target cell is subject to CCA. Supported test configurations are shown in table A. 11.1.3.1.2-1.

##### A.11.1.3.1.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers where the second carrier is subject to CCA as given in tables A.11.1.3.1.2-1, A.11.1.3.1.2-2 and A.11.1.3.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

**Table A.11.1.3.1.2-1: Supported test configurations**

| Configuration   | Description of a cell without CCA                 | Description of a cell with CCA                    |
|---|---|---|
| 1   | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3   | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| The UE is only required to be tested in one of the supported test configurations. |   |   |

**Table A.11.1.3.1.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case when target cell is subject to CCA**



| Parameter                  |                 | Unit | Test configuration | Value   | Comment  |
|----------------------------|-----------------|------|--------------------|---|--|
| Initial condition          | Active cell     |      | 1, 2, 3            | Cell2   | The UE camps on cell 2 which is an inter-frequency NR cell in the initial phase and during T1 period the UE reselects to cell 1 which is cell subject to CCA |
|                            | Neighbour cell  |      | 1, 2, 3            | Cell 1  |  |
| T1 end condition           | Active cell     |      | 1, 2, 3            | Cell1   | The UE shall perform reselection to cell 1 during T1   |
|                            | Neighbour cells |      | 1, 2, 3            | Cell2   |  |
| T3 end condition           | Active cell     |      | 1, 2, 3            | Cell2   | The UE shall perform reselection to cell 2 with higher priority during T3  |
|                            | Neighbour cell  |      | 1, 2, 3            | Cell 1  |  |
| RF Channel Number          |                 |      | 1, 2, 3            | 1, 2  |  |
| Time offset between cells  |                 |      | 1                  | 3 ms  | Asynchronous cells   |
|                            |                 |      | 2                  | 3 $\mu$ s   | Synchronous cells  |
|                            |                 |      | 3                  | 3 $\mu$ s   | Synchronous cells  |
| Access Barring Information |                 | -    | 1, 2, 3            | Not Sent  | No additional delays in random access procedure.   |
| SSB configuration          |                 |      | 1                  | Cell 1: SSB.1 CCA for semi-static channel access;<br>Cell 1: SSB.2 CCA for dynamic channel access;<br>Cell 2: SSB.1 FR1 |  |
|                            |                 |      | 2                  | Cell 1: SSB.1 CCA for semi-static channel access;<br>Cell 1: SSB.2 CCA for dynamic channel access;<br>Cell 2: SSB.1 FR1 |  |
|                            |                 |      | 3                  | Cell 1: SSB.1 CCA for semi-static channel access;<br>Cell 1: SSB.2 CCA for dynamic channel access;<br>Cell 2: SSB.2 FR1 |  |
| SMTC configuration         |                 |      | 1                  | Cell 1: SMTC.1<br>Cell 2: SMTC.2  |  |
|                            |                 |      | 2                  | Cell 1: SMTC.1<br>Cell 2: SMTC.1  |  |
|                            |                 |      | 3                  | Cell 1: SMTC.1<br>Cell 2: SMTC.1  |  |
| DBT Window Configuration   |                 |      | 1, 2, 3            | Cell 1: DBT.1<br>Cell 2: N/A  | As specified in clause A.3.28.1.   |
| DL CCA model               |                 |      | 1, 2, 3            | Cell 1: As specified in clause A.3.26.2.1<br>Cell 2: N/A  |  |
| UL CCA model               |                 |      | 1, 2, 3            | Cell 1: As specified in clause A.3.26.2.2<br>Cell 2: N/A  |  |
| DRX cycle length           |                 | s    | 1, 2, 3            | 1.28  | The value shall be used for all cells in the test.   |
| PRACH configuration index  |                 |      | 1, 2, 3            | 102   | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| rangeToBestCell            |                 |      | 1, 2, 3            | Not configured  |  |

|    |   |         |    |  |
|----|---|---------|----|--|
| T1 | s | 1, 2, 3 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2 | s | 1, 2, 3 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2, 3 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

**Table A.11.1.3.1.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN when target cell is subject to CCA**

| Parameter   | Unit          | Test configuration | Cell 1                  |        |        | Cell 2                  |           |        |
|---|---------------|--------------------|-------------------------|--------|--------|-------------------------|-----------|--------|
|   |               |                    | T1                      | T2     | T3     | T1                      | T2        | T3     |
| TDD configuration   |               | 1                  | TDDConf.1.1.CCA         |        |        | N/A                     |           |        |
|   |               | 2                  | TDDConf.1.1.CCA         |        |        | TDDConf.1.1             |           |        |
|   |               | 3                  | TDDConf.1.1.CCA         |        |        | TDDConf.2.1             |           |        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )           |               | 1, 2, 3            | 0.9                     |        |        | N/A                     |           |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ ) |               | 1, 2, 3            | 0.75                    |        |        | N/A                     |           |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ ) |               | 1, 2, 3            | 0.5                     |        |        | N/A                     |           |        |
| UL CCA probability $P_{CCA\_UL}$  |               | 1, 2, 3            | 1                       |        |        | N/A                     |           |        |
| $M_{d,max}$   |               | 1, 2, 3            | 16                      |        |        | N/A                     |           |        |
| $M_{m,max}$   |               | 1, 2, 3            | 4                       |        |        | N/A                     |           |        |
| $M_{e,max}$   |               | 1, 2, 3            | 8                       |        |        | N/A                     |           |        |
| PDSCH RMC configuration   |               | 1                  | SR.1.1 CCA              |        |        | SR.1.1 FDD              |           |        |
|   |               | 2                  | SR.1.1 CCA              |        |        | SR.1.1 TDD              |           |        |
|   |               | 3                  | SR.1.1 CCA              |        |        | SR.2.1 TDD              |           |        |
| RMSI CORESET RMC configuration  |               | 1                  | CR.1.1 CCA              |        |        | CR.1.1 FDD              |           |        |
|   |               | 2                  | CR.1.1 CCA              |        |        | CR.1.1 TDD              |           |        |
|   |               | 3                  | CR.1.1 CCA              |        |        | CR.2.1 TDD              |           |        |
| Dedicated CORESET RMC configuration   |               | 1                  | CCR.1.1 CCA             |        |        | CCR.1.1 FDD             |           |        |
|   |               | 2                  | CCR.1.1 CCA             |        |        | CCR.1.1 TDD             |           |        |
|   |               | 3                  | CCR.1.1 CCA             |        |        | CCR.2.1 TDD             |           |        |
| OCNG Pattern  |               | 1, 2, 3            | OP.1 defined in A.3.2.1 |        |        | OP.1 defined in A.3.2.1 |           |        |
| Initial DL BWP configuration  |               | 1, 2, 3            | DLBWP.0.1               |        |        | DLBWP.0.1               |           |        |
| Initial UL BWP configuration  |               | 1, 2, 3            | ULBWP.0.1               |        |        | ULBWP.0.1               |           |        |
| RLM-RS  |               | 1, 2, 3            | SSB                     |        |        | SSB                     |           |        |
| Qrxlevmin   | dBm/SCS       | 1, 2               | -137                    |        |        | -140                    |           |        |
|   |               | 3                  | -137                    |        |        | -137                    |           |        |
| Pcompensation   | dB            | 1, 2, 3            | 0                       |        |        | 0                       |           |        |
| Cell_selection_and_reselection_quality_measurement                            |               | 1, 2, 3            | SS-RSRP                 |        |        | SS-RSRP                 |           |        |
| $\hat{E}_s / I_{ot}$  | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
|   |               | 2                  |                         |        |        |                         |           |        |
|   |               | 3                  |                         |        |        |                         |           |        |
| $N_{oc}$ Note2  | dBm/SCS       | 1                  | -95                     |        |        | -98                     |           |        |
|   |               | 2                  | -95                     |        |        | -98                     |           |        |
|   |               | 3                  | -95                     |        |        | -98                     |           |        |
| $N_{oc}$ Note2  | dBm/15 kHz    | 1                  | -98                     |        |        | -98                     |           |        |
|   |               | 2                  |                         |        |        |                         |           |        |
|   |               | 3                  |                         |        |        |                         |           |        |
| $\hat{E}_s / N_{oc}$  | dB            | 1                  | 14                      | 14     | 14     | -4                      | -infinity | 12     |
|   |               | 2                  |                         |        |        |                         |           |        |
|   |               | 3                  |                         |        |        |                         |           |        |
| SS-RSRP Note3   | dBm/SCS       | 1                  | -81                     | -81    | -81    | -102                    | -infinity | -86    |
|   |               | 2                  | -81                     | -81    | -81    | -102                    | -infinity | -86    |
|   |               | 3                  | -81                     | -81    | -81    | -99                     | -infinity | -83    |
| Io  | dBm/9.36 MHz  | 1                  | --                      | --     | --     | -68.60                  | -70.05    | -57.78 |
|   | dBm/9.36 MHz  | 2                  | --                      | --     | --     | -68.60                  | -70.05    | -57.78 |
|   | dBm/38.16 MHz | 3                  | -49.79                  | -49.79 | -49.79 | -62.50                  | -63.96    | -51.69 |
| Treselection  | s             | 1, 2, 3            | 0                       | 0      | 0      | 0                       | 0         | 0      |
| SnonintrasearchP  | dB            | 1, 2, 3            | 50                      |        |        | 50                      |           |        |

|                              |  |         |      |    |
|------------------------------|--|---------|------|----|
| Thresh <sub>x, highP</sub>   | dB   | 1, 2, 3 | 48   | 48 |
| Thresh <sub>serv, lowP</sub> | dB   | 1, 2, 3 | 44   | 44 |
| Thresh <sub>x, lowP</sub>    | dB   | 1, 2, 3 | 50   | 50 |
| Propagation Condition        |  | 1, 2, 3 | AWGN |    |
| Note 1:                      | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |         |      |    |
| Note 2:                      | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |         |      |    |
| Note 3:                      | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |         |      |    |
| Note 4:                      | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |         |      |    |

### A.11.1.3.1.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

$1.28 \times (5 + M_e) + T_{SI\_CCA}$  s.  $M_e$  is the number of DRX cycles with at least one SMTC where there are no SSBs available during the  $T_{evaluate\_NR\_Intra\_CCA}$ . If  $M_e > M_{e,max}$  the UE is required to restart the evaluation of cell 2.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate\_NR\_inter} + T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate\_NR\_inter} + T_{SI-NR}$ .

Where:

$T_{higher\_priority\_search}$  See clause 4.2.2.7

$T_{evaluate\_NR\_inter\_CCA}$  See Table 4.2A.2.4-1 in clause 4.2A.2.4

$T_{SI\_CCA}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

$T_{evaluate\_NR\_inter}$  See Table 4.2.2.4-1 in clause 4.2.2.4

$T_{SI-NR}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and  $1.28 \times (5 + M_e) + T_{SI\_CCA}$  s for the cell re-selection delay to a lower priority cell in the test case.

## A.11.1.4 Inter-RAT cell re-selection to E-UTRAN with source NR carrier frequency under CCA

### A.11.1.4.1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA

#### A.11.1.4.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR cell subject to CCA to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2A.2.5 when the E-UTRAN cell is of higher priority.

#### A.11.1.4.1.2 Test Parameters

The test scenario comprises of one NR cell which is subject to CCA and one E-UTRAN cell as given in tables A.11.1.4.1.2-1, A.11.1.4.1.2-2, A.11.1.4.1.2-3 and A.11.1.4.1.2-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

**Table A.11.1.4.1.2-1: Supported test configurations**

| Configuration   | Description of a cell with CCA                       | Description of a cell without CCA     |
|---|--|---------------------------------------|
| 1   | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2   | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |  |                                       |

**Table A.11.1.4.1.2-2: General test parameters for NR cell subject to CCA to E-UTRAN cell re-selection test case**

| Parameter                         |                 | Unit | Test configuration | Value  | Comment  |
|-----------------------------------|-----------------|------|--------------------|--|--|
| Initial condition                 | Active cell     |      | 1, 2               | Cell1  | The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.   |
| T2 end condition                  | Active cell     |      | 1, 2               | Cell2  | The UE shall perform reselection to cell 2 during T2.  |
|                                   | Neighbour cells |      | 1, 2               | Cell1  |  |
| T3 end condition                  | Active cell     |      | 1, 2               | Cell1  | The UE shall perform reselection to cell 1 during T3 for iteration of the tests.   |
|                                   | Neighbour cells |      | 1, 2               | Cell2  |  |
| Access Barring Information        |                 | -    | 1, 2               | Not Sent   | No additional delays in random access procedure.   |
| SMTC configuration                |                 |      | 1, 2               | SMTC.1   |  |
| DBT Window Configuration          |                 |      | 1, 2               | DBT.1  | As specified in clause A.3.28.1.   |
| SSB configuration                 |                 |      |                    | Cell 1: SSB.1 CCA for semi-static channel access;<br>Cell 1: SSB.2 CCA for dynamic channel access; |  |
| DL CCA model                      |                 |      | 1, 2               | As specified in clause A.3.26.2.1  |  |
| UL CCA model                      |                 |      | 1, 2               | As specified in clause A.3.26.2.2  |  |
| DRX cycle length                  |                 | s    | 1, 2               | 1.28   | The value shall be used for all cells in the test.   |
| NR PRACH configuration index      |                 |      | 1, 2               | 102  | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| E-UTRAN PRACH configuration index |                 |      | 1                  | 53   | As specified in table 5.7.1-2 in TS 36.211 [23]  |
|                                   |                 |      | 2                  | 4  |  |
| E-UTRAN PRACH configuration index |                 |      | 1                  | 53   | As specified in table 5.7.1-2 in TS 36.211 [23]  |
|                                   |                 |      | 2                  | 4  |  |
| T1                                |                 | s    | 1, 2               | >7   | During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2. |
| T2                                |                 | s    | 1, 2               | 75   | T2 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T3                                |                 | s    | 1, 2               | 15   | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

**Table A.11.1.4.1.2-3: Cell specific test parameters for NR cell 1 subject to CCA**

| Parameter | Unit | Test configuration | Cell 1 |    |    |
|-----------|------|--------------------|--------|----|----|
|           |      |                    | T1     | T2 | T3 |
|           |      |                    |        |    |    |

|   |               |      |   |        |        |
|---|---------------|------|---|--------|--------|
| TDD configuration   |               | 1, 2 | TDDConf.1.1.CCA   |        |        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )   |               | 1, 2 | 0.9   |        |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ )   |               | 1, 2 | 0.75  |        |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ )   |               | 1, 2 | 0.5   |        |        |
| UL CCA probability $P_{CCA\_UL}$  |               | 1, 2 | 1   |        |        |
| $M_{d,max}$   |               | 1, 2 | 16  |        |        |
| $M_{m,max}$   |               | 1, 2 | 4   |        |        |
| $M_{e,max}$   |               | 1, 2 | 8   |        |        |
| PDSCH parameters  |               | 1, 2 | SR.1.1 CCA  |        |        |
| RMSI CORESET parameters   |               | 1, 2 | CR.1.1 CCA  |        |        |
| Dedicated CORESET parameters  |               | 1, 2 | CCR.1.1 CCA   |        |        |
| SSB parameters  |               | 1, 2 | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access |        |        |
| NR SMTC parameters  |               | 1, 2 | SMTC.1  |        |        |
| OCNG Pattern  |               | 1, 2 | OP.1 defined in A.3.2.1   |        |        |
| Initial DL BWP configuration  |               | 1, 2 | DLBWP.0   |        |        |
| Initial UL BWP configuration  |               | 1, 2 | ULBWP.0   |        |        |
| RLM-RS  |               | 1, 2 | SSB   |        |        |
| Qrxlevmin   | dBm/SCS       | 1, 2 | -137  |        |        |
| $N_{oc}$  | dBm/SCS       | 1, 2 | -95   |        |        |
| $N_{oc}$  | dBm/15 kHz    | 1, 2 | -98   |        |        |
| SS-RSRP   |               | 1, 2 | -81   | -81    | -81    |
| $\hat{E}_s / I_{ot}$  | dB            | 1, 2 | 14  | 14     | 14     |
| $\hat{E}_s / N_{oc}$  | dB            | 1, 2 | 14  | 14     | 14     |
| $I_o$   | dBm/38.16 MHz | 1, 2 | -49.79  | -49.79 | -49.79 |
| Treselection  | S             | 1, 2 | 0   |        |        |
| Snonintrasearch   | dB            | 1, 2 | 50  |        |        |
| Thresh <sub>x, high</sub> (Note 2)  | dB            | 1, 2 | 48  |        |        |
| Thresh <sub>serv, low</sub>   | dB            | 1, 2 | 44  |        |        |
| Thresh <sub>x, low</sub>  | dB            | 1, 2 | 50  |        |        |
| Propagation Condition   |               | 1, 2 | AWGN  |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: This refers to the value of Thresh<sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell</p> <p>Note 4: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |               |      |   |        |        |

Table A.11.1.4.1.2-4: Cell specific test parameters for E-UTRA cell 2

| Parameter  | Unit | Cell 2  |    |    |
|--|------|---|----|----|
|  |      | T1  | T2 | T3 |
| E-UTRA RF Channel number                             |      | 1   |    |    |
| $BW_{channel}$                                       | MHz  | 10  |    |    |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |      | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |    |    |
| PBCH_RA  | dB   | 0   |    |    |
| PBCH_RB  | dB   |   |    |    |
| PSS_RA   | dB   |   |    |    |
| SSS_RA   | dB   |   |    |    |
| PCFICH_RB  | dB   |   |    |    |
| PHICH_RA   | dB   |   |    |    |
| PHICH_RB   | dB   |   |    |    |

|  |            |           |     |      |
|--|------------|-----------|-----|------|
| PDCCH_RA   | dB         |           |     |      |
| PDCCH_RB   | dB         |           |     |      |
| PDSCH_RA   | dB         |           |     |      |
| PDSCH_RB   | dB         |           |     |      |
| OCNG_RA <sup>Note 1</sup>  | dB         |           |     |      |
| OCNG_RB <sup>Note 1</sup>  | dB         |           |     |      |
| Qrxlevmin  | dBm        | -140      |     |      |
| $N_{oc}$   | dBm/15 kHz | -98       |     |      |
| RSRP   | dBm/15 KHz | -infinity | -86 | -102 |
| $\hat{E}_s / I_{ot}$   | dB         | -infinity | 12  | -4   |
| $\hat{E}_s / N_{oc}$   | dB         | -infinity | 12  | -4   |
| Treselection <sup>EUTRAN</sup>   | S          | 0         |     |      |
| Snonintrasearch  | dB         | 50        |     |      |
| Thresh <sub>x, high</sub> (Note 2)   | dB         | 48        |     |      |
| Thresh <sub>servng, low</sub>  | dB         | 44        |     |      |
| Thresh <sub>x, low</sub>   | dB         | 50        |     |      |
| Propagation Condition  |            | AWGN      |     |      |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: This refers to the value of Thresh<sub>x, high</sub> which is included in E-UTRA system information, and is a threshold for the NR target cell</p> |            |           |     |      |

#### A.11.1.4.1.3 Test Requirements

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{\text{higher\_priority\_search}} + T_{\text{evaluate, E-UTRAN}} + T_{\text{SI-E-UTRA}}$ .

Where:

$T_{\text{higher\_priority\_search}}$  See clause 4.2.2.7

$T_{\text{evaluate, E-UTRAN}}$  See Table 4.2.2.5-1 in clause 4.2.2.5

$T_{\text{SI-E-UTRA}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

#### A.11.1.4.2 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA

##### A.11.1.4.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR cell subject to CCA to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2A.2.5 when the E-UTRAN cell is of lower priority.

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.11.1.4.2.1-1, A.11.1.4.2.1-2, A.11.1.4.2.1-3 and A.11.1.4.2.1-4. The test consists of three successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.



**Table A.11.1.4.2.1-1: Supported test configurations**

| Configuration   | Description of a cell with CCA                       | Description of a cell without CCA     |
|---|--|---------------------------------------|
| 1   | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2   | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |  |                                       |

**Table A.11.1.4.2.1-2: General test parameters for NR cell subject to CCA to E-UTRAN cell re-selection test case**

| Parameter                         |                 | Unit | Test configuration | Value                             | Comment   |
|-----------------------------------|-----------------|------|--------------------|-----------------------------------|---|
| Initial condition                 | Active cell     |      | 1, 2               | Cell1                             | The UE camps on cell 1 in the initial phase.  |
| T1 end condition                  | Active cell     |      | 1, 2               | Cell2                             | The UE shall perform reselection to cell 2 during T1.                                 |
|                                   | Neighbour cells |      | 1, 2               | Cell1                             |   |
| T2 end condition                  | Active cell     |      | 1, 2               | Cell1                             | The UE shall perform reselection to cell 1 during T2 for iteration of the tests.      |
|                                   | Neighbour cells |      | 1, 2               | Cell2                             |   |
| Access Barring Information        |                 | -    | 1, 2               | Not Sent                          | No additional delays in random access procedure.                                      |
| SMTC configuration                |                 |      | 1, 2               | SMTC.1                            |   |
| DBT Window Configuration          |                 |      | 1, 2               | DBT.1                             | As specified in clause A.3.28.1.  |
| DL CCA model                      |                 |      | 1, 2               | As specified in clause A.3.26.2.1 |   |
| UL CCA model                      |                 |      | 1, 2               | As specified in clause A.3.26.2.1 |   |
| DRX cycle length                  |                 | s    | 1, 2               | 1.28                              | The value shall be used for all cells in the test.                                    |
| NR PRACH configuration index      |                 |      | 1, 2               | 102                               | The detailed configuration is specified in TS 38.211 clause 6.3.3.2                   |
| E-UTRAN PRACH configuration index |                 |      | 1                  | 53                                | As specified in table 5.7.1-2 in TS 36.211 [23]                                       |
|                                   |                 |      | 2                  | 4                                 |   |
| T1                                |                 | s    | 1, 2               | 15                                | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2                                |                 | s    | 1, 2               | 75                                | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.11.1.4.2.1-3: Cell specific test parameters for NR cell 1 subject to CCA

| Parameter   | Unit          | Test configuration | Cell 1  |        |
|---|---------------|--------------------|---|--------|
|   |               |                    | T1  | T2     |
| TDD configuration   |               | 1, 2               | TDDConf.1.1.CCA   |        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )   |               | 1, 2               | 0.9   |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ )   |               | 1, 2               | 0.75  |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ )   |               | 1, 2               | 0.5   |        |
| UL CCA probability $P_{CCA\_UL}$  |               | 1, 2               | 1   |        |
| $M_{d,max}$   |               | 1, 2               | 16  |        |
| $M_{m,max}$   |               | 1, 2               | 4   |        |
| $M_{e,max}$   |               | 1, 2               | 8   |        |
| PDSCH RMC configuration   |               | 1, 2               | SR.1.1 CCA  |        |
| RMSI CORESET RMC Configuration  |               | 1, 2               | CR.1.1 CCA  |        |
| Dedicated CORESET RMC Configuration   |               | 1, 2               | CCR.1.1 CCA   |        |
| SSB configuration   |               | 1, 2               | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access |        |
| SMTTC configuration   |               | 1, 2               | SMTTC.1   |        |
| OCNG Pattern  |               | 1, 2               | OP.1 defined in A.3.2.1   |        |
| Initial DL BWP configuration  |               | 1, 2               | DLBWP.0   |        |
| Initial UL BWP configuration  |               | 1, 2               | ULBWP.0   |        |
| RLM-RS  |               | 1, 2               | SSB   |        |
| $Q_{rxlevmin}$  | dBm/SCS       | 1, 2               | -137  |        |
| $N_{oc}$  | dBm/SCS       | 1, 2               | -95   |        |
| $N_{oc}$  | dBm/15 kHz    | 1, 2               | -98   |        |
| SS-RSRP   | dBm/SCS       | 1, 2               | -99   | -83    |
| $\hat{E}_s / I_{ot}$  | dB            | 1, 2               | -4  | 12     |
| $\hat{E}_s / N_{oc}$  | dB            | 1, 2               | -4  | 12     |
| $l_o$   | dBm/38.16 MHz | 1, 2               | -62.50  | -51.69 |
| Treselection  | S             | 1, 2               | 0   |        |
| Snonintrasearch   | dB            | 1, 2               | 50  |        |
| Thresh <sub>x, high</sub> (Note 2)  | dB            | 1, 2               | 48  |        |
| Thresh <sub>serv, low</sub>   | dB            | 1, 2               | 44  |        |
| Thresh <sub>x, low</sub>  | dB            | 1, 2               | 50  |        |
| Propagation Condition   |               | 1, 2               | AWGN  |        |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.     |               |                    |   |        |
| Note 2: This refers to the value of Thresh <sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell           |               |                    |   |        |
| Note 4: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |               |                    |   |        |

Table A.11.1.4.2.1-4: Cell specific test parameters for E-UTRA cell 2

| Parameter   | Unit       | Cell 2  |     |
|---|------------|---|-----|
|   |            | T1  | T2  |
| E-UTRA RF Channel number  |            | 1   |     |
| $BW_{\text{channel}}$   | MHz        | 10  |     |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2  |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |
| PBCH_RA   | dB         | 0   |     |
| PBCH_RB   | dB         |   |     |
| PSS_RA  | dB         |   |     |
| SSS_RA  | dB         |   |     |
| PCFICH_RB   | dB         |   |     |
| PHICH_RA  | dB         |   |     |
| PHICH_RB  | dB         |   |     |
| PDCCH_RA  | dB         |   |     |
| PDCCH_RB  | dB         |   |     |
| PDSCH_RA  | dB         |   |     |
| PDSCH_RB  | dB         |   |     |
| OCNG_RA <sup>Note 1</sup>   | dB         |   |     |
| OCNG_RB <sup>Note 1</sup>   | dB         |   |     |
| $Q_{\text{rxlevmin}}$   | dBm        |   |     |
| $N_{oc}$  | dBm/15 kHz | -98   |     |
| RSRP  | dBm/15 KHz | -84   | -84 |
| $\hat{E}_s / I_{ot}$  | dB         | 14  | 14  |
| $\hat{E}_s / N_{oc}$  | dB         | 14  | 14  |
| $T_{\text{reselectionEUTRAN}}$  | S          | 0   |     |
| $S_{\text{nonintrasearch}}$   | dB         | 50  |     |
| $\text{Thresh}_{x, \text{high}}$ (Note 2)   | dB         | 48  |     |
| $\text{Thresh}_{\text{servng, low}}$  | dB         | 44  |     |
| $\text{Thresh}_{x, \text{low}}$   | dB         | 50  |     |
| Propagation Condition   |            | AWGN  |     |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $\text{Thresh}_{x, \text{high}}$ which is included in E-UTRA system information, and is a threshold for the NR target cell |            |   |     |

#### A.11.1.4.2.2 Test Requirements

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as:  $T_{\text{evaluate, E-UTRAN}} + T_{\text{SI-E-UTRA}}$ ,

Where:

$T_{\text{evaluate, E-UTRAN}}$  See Table 4.2.2.5-1 in clause 4.2.2.5

$T_{\text{SI-E-UTRA}}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

## A.11.2 RRC\_CONNECTED state mobility

### A.11.2.1 Handover

#### A.11.2.1.1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell

##### A.11.2.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR intra frequency handover requirements from FR1 carrier under CCA to FR1 carrier under CCA specified in clause 6.1B.1.2.

##### A.11.2.1.1.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.1.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.1.2-2, and A.11.2.1.1.2-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover.

**Table A.11.2.1.1.2-1: Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.2.1.1.2-2: General test parameters Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA**

| Parameter   |   | Unit | Value                             | Comment  |
|---|---|------|-----------------------------------|--|
| Initial conditions  | Active cell                                     |      | Cell 1                            | On the carrier under CCA                             |
|   | Neighbouring cell                               |      | Cell 2                            | On the carrier under CCA                             |
| Final condition   | Active cell                                     |      | Cell 2                            | On the carrier under CCA                             |
| DL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.20.2.1 |  |
|   | Semi-static channel access <sup>Note 2, 3</sup> |      |                                   |  |
| UL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.20.2.2 |  |
|   | Semi-static channel access <sup>Note 2,3</sup>  |      |                                   |  |
| A3-Offset   |   | dB   | 0                                 |  |
| Hysteresis  |   | dB   | 0                                 |  |
| Time To Trigger   |   | s    | 0                                 |  |
| Filter coefficient  |   |      | 0                                 | L3 filtering is not used                             |
| Access Barring Information  |   | -    | Not Sent                          | No additional delays in random access procedure.     |
| Time offset between cells   |   |      | 3 $\mu$ s                         | Synchronous cells                                    |
| T304  |   | ms   | 500                               |  |
| LCCA_DL   |   |      | 5                                 |  |
| WCCA_DL   |   | ms   | T304                              |  |
| LCCA_UL   |   |      | 5                                 |  |
| WCCA_UL   |   | ms   | T304                              |  |
| T1  |   | s    | 5                                 |  |
| T2  |   | s    | $\leq 5$                          |  |
| T3  |   | s    | $\geq T_{\text{interrupt}}$       | $T_{\text{interrupt}}$ is defined in clause 6.1B.1.2 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |      |                                   |  |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |      |                                   |  |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |      |                                   |  |

**Table A.11.2.1.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case**

| Parameter | Unit | Cell 1 |    |    | Cell 2 |    |    |
|-----------|------|--------|----|----|--------|----|----|
|           |      | T1     | T2 | T3 | T1     | T2 | T3 |
|           |      |        |    |    |        |    |    |

|  |                  |              |  |        |  |        |        |        |
|--|------------------|--------------|--|--------|--|--------|--------|--------|
| NR RF Channel Number   |                  |              | 1  |        | 1  |        |        |        |
| P <sub>CCA_DL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                  | -            | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |        | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |        |        |        |
| P <sub>CCA_DL</sub> for semi-static channel access <sup>Note 5,6</sup> |                  | -            | P <sub>CCA_DL</sub> =0.9375                                |        | P <sub>CCA_DL</sub> =0.9375                                |        |        |        |
| P <sub>CCA_UL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                  | -            | 0.75   |        | 0.75   |        |        |        |
| P <sub>CCA_UL</sub> for semi-static channel access <sup>Note 5,6</sup> |                  | -            | 0.87   |        | 0.87   |        |        |        |
| TDD configuration  | Config 1         |              | TDDConf.1.1 CCA  |        |  |        |        |        |
| BW <sub>channel</sub>  | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |        |  |        |        |        |
| BWP BW   | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |        |  |        |        |        |
| DRX Cycle  |                  | ms           | Not Applicable   |        |  |        |        |        |
| PDSCH Reference  | Config 1         |              | SR.1.1 CCA   |        |  |        |        |        |
| CORESET Reference Channel  | Config 1         |              | CR.1.1 CCA   |        |  |        |        |        |
| Dedicated CORESET RMC configuration                                    | Config 1         |              | CCR.1.1 CCA  |        |  |        |        |        |
| TRS configuration  | Config 1         |              | TRS.1.1 TDD  |        |  |        |        |        |
| OCNG Patterns  |                  |              | OP.1   |        |  |        |        |        |
| SMTC Configuration   |                  |              | SMTC.1   |        |  |        |        |        |
| DBT window configuration   | Config 1         |              | DBT.1  |        |  |        |        |        |
| SSB configuration for semi-static channel access <sup>Note 4, 6</sup>  | Config 1         |              | SSB.1 CCA  |        |  |        |        |        |
| SSB configuration for dynamic channel access <sup>Note 5, 6</sup>      | Config 1         |              | SSB.2 CCA  |        |  |        |        |        |
| ssb-PositionQCL  | Config 1         |              | [1]  |        |  |        |        |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |        |  |        |        |        |
| PUCCH/PUSCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |        |  |        |        |        |
| PRACH configuration  |                  |              | FR1 PRACH configuration 1 under CCA                        |        |  |        |        |        |
| BWP configuration  | Initial DL BWP   |              | DLBWP.0.1  |        |  |        |        |        |
|  | Dedicated DL BWP |              | DLBWP.1.1  |        |  |        |        |        |
|  | Initial UL BWP   |              | ULBWP.0.1  |        |  |        |        |        |
|  | Dedicated UL BWP |              | ULBWP.1.1  |        |  |        |        |        |
| EPRE ratio of PSS to SSS   |                  | dB           | 0  |        |  |        |        |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |        |  |        |        |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |        |  |        |        |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |        |  |        |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |                  |              |  |        |  |        |        |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |        |  |        |        |        |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |        |  |        |        |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                |                  |              |  |        |  |        |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                               |                  |              |  |        |  |        |        |        |
| N <sub>oc</sub> <sup>Note2</sup>                                       |                  | dBm/15kHz    | -98  |        |  |        |        |        |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1         | dBm/SCS      | -95  |        |  |        |        |        |
| $\hat{E}_s / I_{ot}$   |                  | dB           | 8  | -3.3   | -3.3   | -      | 2.36   | 2.36   |
| $\hat{E}_s / N_{oc}$   |                  | dB           | 8  | 8      | 8  | -      | 11     | 11     |
| SSB <sub>RP</sub>  | Config 1         | dBm/SCS      | -87  | -87    | -87  | -      | -84    | -84    |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1         | dBm/38.16MHz | -55.31   | -50.96 | -50.96   | -55.31 | -50.96 | -50.96 |
| Propagation condition  |                  | -            | AWGN   |        |  | AWGN   |        |        |

- Note 1: OCNNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
- Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
- Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### A.11.2.1.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{\text{interrupt}}$  from the beginning of time period T3, where  $T_{\text{interrupt}}$  is defined in clause 6.1B.1.2

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

$$T_{\text{interrupt}} = T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}}$$

$$T_{\text{search}} = 0.$$

$$T_{\text{processing}} = 20 \text{ ms.}$$

$$T_{\text{margin}} = 2 \text{ ms.}$$

$$T_{\Delta} = (1 + L_2) * 20 \text{ ms.}$$

$$T_{\text{IU}} = (1 + L_3) * 10 + 10 \text{ ms}$$

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2],  $L_2$  is the number of SMTC occasions not available at the UE during the time tracking period where  $L_2 \leq L_{\text{CCA\_DL}}$ , and  $L_3$  is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where  $L_3 \leq L_{\text{CCA\_UL}}$ .  $L_3 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [33]. The interruption time considering the potential extensions caused by  $L_1$ ,  $L_2$ ,  $L_3$  and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [2]. Test equipment should make sure that  $L_{\text{CCA\_DL}}$  and  $L_{\text{CCA\_UL}}$  are not exceeded during a test by monitoring the number of CCA failures and preventing additional CCA failures from happening after  $L_{\text{CCA\_DL}}$  or  $L_{\text{CCA\_UL}}$  is reached.

### A.11.2.1.2 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell

#### A.11.2.1.2.1 Test Purpose and Environment

This test is to verify the requirement intra frequency handover requirements from FR1 carrier under CCA to FR1 carrier under CCA specified in clause 6.1B.1.2.

#### A.11.2.1.2.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.2.2-2, and A.11.2.1.2.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.11.2.1.2.2-1: Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.2.1.2.2-2: General test parameters Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA**

| Parameter   |   | Unit | Value                             | Comment  |
|---|---|------|-----------------------------------|--|
| Initial conditions  | Active cell                                     |      | Cell 1                            | On the carrier under CCA                             |
|   | Neighbouring cell                               |      | Cell 2                            | On the carrier under CCA                             |
| Final condition   | Active cell                                     |      | Cell 2                            | On the carrier under CCA                             |
| DL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.20.2.1 |  |
|   | Semi-static channel access <sup>Note 2, 3</sup> |      |                                   |  |
| UL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.20.2.2 |  |
|   | Semi-static channel access <sup>Note 2,3</sup>  |      |                                   |  |
| Access Barring Information  |   | -    | Not Sent                          | No additional delays in random access procedure.     |
| Time offset between cells   |   |      | 3 $\mu$ s                         | Synchronous cells                                    |
| T304  |   | ms   | 500                               |  |
| L <sub>CCA_DL</sub>   |   |      | 5                                 |  |
| W <sub>CCA_DL</sub>   |   | ms   | T304                              |  |
| L <sub>CCA_UL</sub>   |   |      | 5                                 |  |
| W <sub>CCA_UL</sub>   |   | ms   | T304                              |  |
| T1  |   | s    | 5                                 |  |
| T2  |   | s    | $\geq T_{\text{interrupt}}$       | $T_{\text{interrupt}}$ is defined in clause 6.1B.1.2 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |      |                                   |  |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |      |                                   |  |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |      |                                   |  |

**Table A.11.2.1.2.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case**

| Parameter | Unit | Cell 1 |    | Cell 2 |    |
|-----------|------|--------|----|--------|----|
|           |      | T1     | T2 | T1     | T2 |



|  |                  |              |  |        |  |        |
|--|------------------|--------------|--|--------|--|--------|
| NR RF Channel Number   |                  |              | 1  |        | 1  |        |
| P <sub>CCA_DL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                  | -            | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |        | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |        |
| P <sub>CCA_DL</sub> for semi-static channel access <sup>Note 5,6</sup> |                  | -            | P <sub>CCA_DL</sub> =0.9375                                |        | P <sub>CCA_DL</sub> =0.9375                                |        |
| P <sub>CCA_UL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                  | -            | 0.75   |        | 0.75   |        |
| P <sub>CCA_UL</sub> for semi-static channel access <sup>Note 5,6</sup> |                  | -            | 0.87   |        | 0.87   |        |
| TDD configuration  | Config 1         |              | TDDConf.1.1 CCA  |        |  |        |
| BW <sub>channel</sub>  | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |        |  |        |
| BWP BW   | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |        |  |        |
| DRX Cycle  |                  | ms           | Not Applicable   |        |  |        |
| PDSCH Reference  | Config 1         |              | SR.1.1 CCA   |        |  |        |
| CORESET Reference Channel  | Config 1         |              | CR.1.1 CCA   |        |  |        |
| Dedicated CORESET RMC configuration                                    | Config 1         |              | CCR.1.1 CCA  |        |  |        |
| TRS configuration  | Config 1         |              | TRS.1.2 TDD  |        |  |        |
| OCNG Patterns  |                  |              | OP.1   |        |  |        |
| SMTC Configuration   |                  |              | SMTC.1   |        |  |        |
| DBT window configuration   | Config 1         |              | DBT.1  |        |  |        |
| SSB configuration for semi-static channel access <sup>Note 4, 6</sup>  | Config 1         |              | SSB.1 CCA  |        |  |        |
| SSB configuration for dynamic channel access <sup>Note 5, 6</sup>      | Config 1         |              | SSB.2 CCA  |        |  |        |
| ssb-PositionQCL  | Config 1         |              | [1]  |        |  |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |        |  |        |
| PUCCH/PUSCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |        |  |        |
| PRACH configuration  |                  |              | FR1 PRACH configuration 1 under CCA                        |        |  |        |
| BWP configuration  | Initial DL BWP   |              | DLBWP.0.1  |        |  |        |
|  | Dedicated DL BWP |              | DLBWP.1.1  |        |  |        |
|  | Initial UL BWP   |              | ULBWP.0.1  |        |  |        |
|  | Dedicated UL BWP |              | ULBWP.1.1  |        |  |        |
| EPRE ratio of PSS to SSS   |                  | dB           | 0  |        |  |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |        |  |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |        |  |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |        |  |        |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |                  |              |  |        |  |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |        |  |        |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |        |  |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                 |                  |              |  |        |  |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                               |                  |              |  |        |  |        |
| N <sub>oc</sub> <sup>Note2</sup>                                       |                  | dBm/15kHz    | -98  |        |  |        |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1         | dBm/SCS      | -95  |        |  |        |
| $\hat{E}_s / I_{ot}$   |                  | dB           | 8  | -0.64  | -Infinity  | -0.64  |
| $\hat{E}_s / N_{oc}$   |                  | dB           | 8  | 8      | -Infinity  | 8      |
| SSB <sub>RP</sub>  | Config 1         | dBm/SCS      | -87  | -87    | -Infinity  | -87    |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1         | dBm/38.16MHz | -55.31   | -52.60 | -55.31   | -52.60 |
| Propagation condition  |                  | -            | AWGN   |        | AWGN   |        |

- Note 1: OCNNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
- Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
- Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### A.11.2.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{\text{interrupt}}$  from the beginning of time period T3, where  $T_{\text{interrupt}}$  is defined in clause 6.1B.1.2

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

$$T_{\text{interrupt}} = T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}}$$

$$T_{\text{search}} = (1+L_1) * 20 \text{ ms.}$$

$$T_{\text{processing}} = 20 \text{ ms.}$$

$$T_{\text{margin}} = 2 \text{ ms.}$$

$$T_{\Delta} = (1+L_2) * 20 \text{ ms.}$$

$$T_{\text{IU}} = (1+L_3) * 10 + 10 \text{ ms}$$

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2],  $L_1$  is the number of SMTC occasions not available at the UE during the intra-frequency detection period,  $L_2$  is the number of SMTC occasions not available at the UE during the time tracking period, where  $L_1 + L_2 \leq L_{\text{CCA\_DL}}$ , and  $L_3$  is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where  $L_3 \leq L_{\text{CCA\_UL}}$ .  $L_3 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [33]. The interruption time considering the potential extensions caused by  $L_1$ ,  $L_2$ ,  $L_3$  and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer.

### A.11.2.1.3 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell

#### A.11.2.1.3.1 Test Purpose and Environment

This test is to verify the requirement for inter frequency handover requirements from FR1 carrier under CCA to FR1 carrier under CCA specified in clause 6.1B.1.2.

#### A.11.2.1.3.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.3.2-2, and A.11.2.1.3.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.11.2.1.3.2-1: Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.2.1.3.2-2: General test parameters Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA**

| Parameter   |   | Unit | Value                             | Comment  |
|---|---|------|-----------------------------------|--|
| Initial conditions  | Active cell                                     |      | Cell 1                            | On the carrier under CCA                             |
|   | Neighbouring cell                               |      | Cell 2                            | On the carrier under CCA                             |
| Final condition   | Active cell                                     |      | Cell 2                            | On the carrier under CCA                             |
| DL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.20.2.1 |  |
|   | Semi-static channel access <sup>Note 2, 3</sup> |      |                                   |  |
| UL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.20.2.2 |  |
|   | Semi-static channel access <sup>Note 2,3</sup>  |      |                                   |  |
| Access Barring Information  |   | -    | Not Sent                          | No additional delays in random access procedure.     |
| T304  |   | ms   | 500                               |  |
| LCCA_DL   |   |      | 5                                 |  |
| WCCA_DL   |   | ms   | T304                              |  |
| LCCA_UL   |   |      | 5                                 |  |
| WCCA_UL   |   | ms   | T304                              |  |
| T1  |   | s    | 5                                 |  |
| T2  |   | s    | $\leq T_{\text{interrupt}}$       | $T_{\text{interrupt}}$ is defined in clause 6.1B.1.2 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |      |                                   |  |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |      |                                   |  |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |      |                                   |  |

**Table A.11.2.1.3.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case**

| Parameter | Unit | Cell 1 |    | Cell 2 |    |
|-----------|------|--------|----|--------|----|
|           |      | T1     | T2 | T1     | T2 |

|  |                  |              |  |  |           |        |
|--|------------------|--------------|--|--|-----------|--------|
| NR RF Channel Number   |                  |              | 1  | 2  |           |        |
| P <sub>CCA_DL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                  | -            | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |           |        |
| P <sub>CCA_DL</sub> for semi-static channel access <sup>Note 5,6</sup> |                  | -            | P <sub>CCA_DL</sub> =0.9375                                | P <sub>CCA_DL</sub> =0.9375                                |           |        |
| P <sub>CCA_UL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                  | -            | 0.75   | 0.75   |           |        |
| P <sub>CCA_UL</sub> for semi-static channel access <sup>Note 5,6</sup> |                  | -            | 0.87   | 0.87   |           |        |
| TDD configuration  | Config 1         |              | TDDConf.1.1 CCA  |  |           |        |
| BW <sub>channel</sub>  | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |  |           |        |
| BWP BW   | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |  |           |        |
| DRX Cycle  |                  | ms           | Not Applicable   |  |           |        |
| PDSCH Reference  | Config 1         |              | SR.1.1 CCA   |  |           |        |
| CORESET Reference Channel  | Config 1         |              | CR1.1 CCA  |  |           |        |
| Dedicated CORESET RMC configuration                                    | Config 1         |              | CCR.1.1 CCA  |  |           |        |
| TRS configuration  | Config 1         |              | TRS.1.2 TDD  |  |           |        |
| OCNG Patterns  |                  |              | OP.1   |  |           |        |
| SMTC Configuration   |                  |              | SMTC.1   |  |           |        |
| DBT window configuration   | Config 1         |              | DBT.1  |  |           |        |
| SSB configuration for semi-static channel access <sup>Note 4, 6</sup>  | Config 1         |              | SSB.1 CCA  |  |           |        |
| SSB configuration for dynamic channel access <sup>Note 5, 6</sup>      | Config 1         |              | SSB.2 CCA  |  |           |        |
| ssb-PositionQCL  | Config 1         |              | [1]  |  |           |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |  |           |        |
| PUCCH/PUSCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |  |           |        |
| PRACH configuration  |                  |              | FR1 PRACH configuration 1 under CCA                        |  |           |        |
| BWP configuration  | Initial DL BWP   |              | DLBWP.0.1  |  |           |        |
|  | Dedicated DL BWP |              | DLBWP.1.1  |  |           |        |
|  | Initial UL BWP   |              | ULBWP.0.1  |  |           |        |
|  | Dedicated UL BWP |              | ULBWP.1.1  |  |           |        |
| EPRE ratio of PSS to SSS   |                  | dB           | 0  |  |           |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |  |           |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |  |           |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |  |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |                  |              |  |  |           |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |  |           |        |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |  |           |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                 |                  |              |  |  |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                               |                  |              |  |  |           |        |
| N <sub>oc</sub> <sup>Note2</sup>                                       |                  | dBm/15kHz    | -98  |  |           |        |
| N <sub>oc</sub> <sup>Note2</sup>   Config 1                            |                  | dBm/SCS      | -95  |  |           |        |
| $\hat{E}_s / I_{ot}$   |                  | dB           | 4  | 4  | -Infinity | 5      |
| $\hat{E}_s / N_{oc}$   |                  | dB           | 4  | 4  | -Infinity | 5      |
| SSB <sub>RP</sub>  | Config 1         | dBm/SCS      | -91  | -91  | -Infinity | -90    |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1         | dBm/38.16MHz | -58.49   | -58.49   | -63.94    | -57.75 |
| Propagation condition  |                  | -            | AWGN   |  | AWGN      |        |

- Note 1: OCNNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
- Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
- Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### A.11.2.1.3.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{\text{interrupt}}$  from the beginning of time period T3, where  $T_{\text{interrupt}}$  is defined in clause 6.1B.1.2

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

$$T_{\text{interrupt}} = T_{\text{search}} + T_{\text{IU}} + T_{\text{processing}} + T_{\Delta} + T_{\text{margin}}$$

$$T_{\text{search}} = (3+L_1') * 20 \text{ ms.}$$

$$T_{\text{processing}} = 20 \text{ ms.}$$

$$T_{\text{margin}} = 2 \text{ ms.}$$

$$T_{\Delta} = (1+L_2) * 20 \text{ ms.}$$

$$T_{\text{IU}} = (1+L_3) * 10 + 10 \text{ ms}$$

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2],  $L_1'$  is the number of SMTC occasions not available at the UE during the inter-frequency detection period,  $L_2$  is the number of SMTC occasions not available at the UE during the time tracking period, where  $L_1' + L_2 \leq L_{\text{CCA\_DL}}$ , and  $L_3$  is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where  $L_3 \leq L_{\text{CCA\_UL}}$ .  $L_3 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [33]. The interruption time considering the potential extensions caused by  $L_1', L_2, L_3$  and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer.

### A.11.2.1.4 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell

#### A.11.2.1.4.1 Test Purpose and Environment

This test is to verify the requirement for the NR with CCA FR1-NR FR1 handover requirements specified in clause 6.1.1.2.

#### A.11.2.1.4.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.4.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.4.2-2, and A.11.2.1.4.2-3.

The test consists of three successive time periods, with time durations of T1 T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR with CCA shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover.

**Table A.11.2.1.4.2-1: Handover from NR with CCA FR1 to NR FR1 test configuration**

| Config   | Description   |
|--|---|
| 1  | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.2.1.4.2-2: General test parameters handover from NR with CCA FR1 to NR FR1**

| Parameter                  | Unit              | Value                             | Comment  |
|----------------------------|-------------------|-----------------------------------|--|
| Initial conditions         | Active cell       | Cell 1                            | NR cell with CCA                                 |
|                            | Neighbouring cell | Cell 2                            | NR cell  |
| Final condition            | Active cell       | Cell 2                            |  |
| DL CCA model               |                   | As specified in clause A.3.20.2.1 |  |
| UL CCA model               |                   | As specified in clause A.3.20.2.2 |  |
| A3-Offset                  | dB                | 0                                 |  |
| Hysteresis                 | dB                | 0                                 |  |
| Time To Trigger            | s                 | 0                                 |  |
| Filter coefficient         |                   | 0                                 | L3 filtering is not used                         |
| Access Barring Information | -                 | Not Sent                          | No additional delays in random access procedure. |
| Time offset between cells  |                   | 3 $\mu$ s                         | Synchronous cells                                |
| T1                         | s                 | 5                                 |  |
| T2                         | s                 | $\leq 5$                          |  |
| T3                         | s                 | 1                                 |  |

**Table A.11.2.1.4.2-3: Cell specific test parameters for NR with CCA FR1 – NR FR1 handover test case**

| Parameter  |  | Unit                       | Test configuration | Cell 1                               |    |    | Cell 2                      |    |    |
|--|--|----------------------------|--------------------|--------------------------------------|----|----|-----------------------------|----|----|
|  |  |                            |                    | T1                                   | T2 | T3 | T1                          | T2 | T3 |
| NR RF Channel Number   |  |                            | 1,2,3              | 1                                    |    |    | 2                           |    |    |
| Duplex mode  |  |                            | 1                  | TDD                                  |    |    | FDD                         |    |    |
|  |  |                            | 2                  | TDD                                  |    |    | TDD                         |    |    |
|  |  |                            | 3                  | TDD                                  |    |    | TDD                         |    |    |
| TDD configuration  |  |                            | 1                  | TDDConf.1.1 CCA                      |    |    | Not Applicable              |    |    |
|  |  |                            | 2                  | TDDConf.1.1 CCA                      |    |    | TDDConf.1.1                 |    |    |
|  |  |                            | 3                  | TDDConf.1.1 CCA                      |    |    | TDDConf.2.1                 |    |    |
| BW <sub>channel</sub>  |  | MHz                        | 1                  | 40: N <sub>RB,c</sub> = 106          |    |    | 10: N <sub>RB,c</sub> = 52  |    |    |
|  |  |                            | 2                  | 40: N <sub>RB,c</sub> = 106          |    |    | 10: N <sub>RB,c</sub> = 52  |    |    |
|  |  |                            | 3                  | 40: N <sub>RB,c</sub> = 106          |    |    | 40: N <sub>RB,c</sub> = 106 |    |    |
| BWP BW   |  | MHz                        | 1                  | 40: N <sub>RB,c</sub> = 106          |    |    | 10: N <sub>RB,c</sub> = 52  |    |    |
|  |  |                            | 2                  | 40: N <sub>RB,c</sub> = 106          |    |    | 10: N <sub>RB,c</sub> = 52  |    |    |
|  |  |                            | 3                  | 40: N <sub>RB,c</sub> = 106          |    |    | 40: N <sub>RB,c</sub> = 106 |    |    |
| DRX Cycle  |  | ms                         | 1,2,3              | Not Applicable                       |    |    |                             |    |    |
| PDSCH Reference measurement channel  |  |                            | 1                  | SR.1.1 CCA                           |    |    | SR.1.1 FDD                  |    |    |
|  |  |                            | 2                  | SR.1.1 CCA                           |    |    | SR.1.1 TDD                  |    |    |
|  |  |                            | 3                  | SR.1.1 CCA                           |    |    | SR.2.1 TDD                  |    |    |
| CORESET Reference Channel  |  |                            | 1                  | CR1.1 CCA                            |    |    | CR.1.1 FDD                  |    |    |
|  |  |                            | 2                  | CR1.1 CCA                            |    |    | CR.1.1 TDD                  |    |    |
|  |  |                            | 3                  | CR1.1 CCA                            |    |    | CR.2.1 TDD                  |    |    |
| Dedicated CORESET RMC configuration  |  |                            | 1                  | CCR.1.1 CCA                          |    |    | CCR.1.1 FDD                 |    |    |
|  |  |                            | 2                  | CCR.1.1 CCA                          |    |    | CCR.1.1 TDD                 |    |    |
|  |  |                            | 3                  | CCR.1.1 CCA                          |    |    | CCR.2.1 TDD                 |    |    |
| DL CCA probability for semi-static channel access (P <sub>CCA_DL</sub> )DL CCA probability P <sub>CCA_DL</sub> |  |                            | 1,2,3              | 0.9375                               |    |    | N/A                         |    |    |
| DL CCA probability for dynamic channel access (P <sub>CCA_DL_1</sub> )   |  |                            | 1,2,3              | 0.75                                 |    |    | N/A                         |    |    |
| DL CCA probability for dynamic channel access (P <sub>CCA_DL_2</sub> )   |  |                            | 1,2,3              | 0.75                                 |    |    | N/A                         |    |    |
| UL CCA probability for semi-static channel access P <sub>CCA_UL</sub>  |  |                            | 1,2,3              | 0.75                                 |    |    | N/A                         |    |    |
| UL CCA probability for dynamic static channel access P <sub>CCA_UL</sub>                                       |  |                            | 1,2,3              | 0.87                                 |    |    |                             |    |    |
| TRS configuration  |  |                            | 1                  | TRS.1.2 TDD                          |    |    | TRS.1.1 FDD                 |    |    |
|  |  |                            | 2                  | TRS.1.2 TDD                          |    |    | TRS.1.1 TDD                 |    |    |
|  |  |                            | 3                  | TRS.1.2 TDD                          |    |    | TRS.1.2 TDD                 |    |    |
| OCNG Patterns  |  |                            |                    | OP.1                                 |    |    |                             |    |    |
| SMTc Configuration   |  |                            |                    | SMTc.1                               |    |    |                             |    |    |
| SSB Configuration  |  | Semi-static channel access | 1,2                | SSB.1 CCA<br>(As defined in A.3.10A) |    |    | SSB.1 FR1                   |    |    |
|  |  |                            |                    | SSB.2 CCA<br>(As defined in A.3.10A) |    |    |                             |    |    |
|  |  | Dynamic channel access     | 3                  | SSB.1 CCA<br>(As defined in A.3.10A) |    |    | SSB.2 FR1                   |    |    |
|  |  |                            |                    | SSB.2 CCA<br>(As defined in A.3.10A) |    |    |                             |    |    |
| DBT window configuration   |  |                            |                    | As defined in A.3.28.1               |    |    | Not applicable              |    |    |
| PDSCH/PDCCH subcarrier spacing   |  | kHz                        | 1,2                | 30 kHz                               |    |    | 15 kHz                      |    |    |
|  |  |                            | 3                  | 30 kHz                               |    |    | 30 kHz                      |    |    |
| PUCCH/PUSCH subcarrier spacing   |  | kHz                        | 1,2                | 30 kHz                               |    |    | 15 kHz                      |    |    |
|  |  |                            | 3                  | 30 kHz                               |    |    | 30 kHz                      |    |    |
| PRACH configuration  |  |                            |                    | FR1 PRACH configuration 1 under CCA  |    |    | FR1 PRACH configuration 1   |    |    |
| BWP configuration  |  | Initial DL BWP             | 1,2,3              | DLBWP.0.1                            |    |    |                             |    |    |
|  |  | Dedicated DL BWP           | 1,2,3              | DLBWP.1.1                            |    |    |                             |    |    |



|  |                  |                  |       |           |        |        |           |        |        |
|--|------------------|------------------|-------|-----------|--------|--------|-----------|--------|--------|
|  | Initial UL BWP   |                  | 1,2,3 | ULBWP.0.1 |        |        |           |        |        |
|  | Dedicated UL BWP |                  | 1,2,3 | ULBWP.1.1 |        |        |           |        |        |
| EPRE ratio of PSS to SSS   |                  | dB               | 1,2,3 | 0         |        |        |           |        |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |                  | 1,2,3 |           |        |        |           |        |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |                  | 1,2,3 |           |        |        |           |        |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |                  | 1,2,3 |           |        |        |           |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |                  | 1,2,3 |           |        |        |           |        |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |                  | 1,2,3 |           |        |        |           |        |        |
| EPRE ratio of PDSCH to PDSCH   |                  |                  | 1,2,3 |           |        |        |           |        |        |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>  |                  |                  | 1,2,3 |           |        |        |           |        |        |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>   |                  |                  | 1,2,3 |           |        |        |           |        |        |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/S CS         | 1,2   | [-101]    |        |        | -98       |        |        |
|  |                  |                  | 3     | [-101]    |        |        | -95       |        |        |
| $\hat{E}_s / I_{ot}$   |                  | dB               | 1,2,3 | 8         | -3.3   | -3.3   | -Infinity | 2.36   | 2.36   |
| $\hat{E}_s / N_{oc}$   |                  | dB               | 1,2,3 | 8         | 8      | 8      | -Infinity | 11     | 11     |
| SSB_RP   | Config 1         | dBm/S CS         | 1,2,3 | -90       | -90    | -90    | -Infinity | -87    | -87    |
| $I_o$ <sup>Note3</sup>   | Config 1         | dBm/9.36MHz<br>z | 1,2,3 | -61.41    | -57.06 | -57.06 | -61.41    | -57.06 | -57.06 |
| Propagation condition  |                  | -                | 1,2,3 | AWGN      |        |        | AWGN      |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                  |                  |       |           |        |        |           |        |        |

### A.11.2.1.4.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 112 ms from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$  = 102 ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of 112 ms.

### A.11.2.1.5 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell

#### A.11.2.1.5.1 Test Purpose and Environment

This test is to verify the requirement for the NR with CCA FR1-NR FR1 handover requirements specified in clause 6.1.1.2.

#### A.11.2.1.5.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.5.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.5.2-2, and A.12.2.1.7.2-3.

The test scenario comprises of two carriers and one cell on each carrier. Cell 1 is the NR with CCA cell and Cell 2 is an NR neighbour cell. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2.

Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.11.2.1.5.2-1: Handover from NR with CCA FR1 to NR FR1 test configuration**

| Config   | Description   |
|--|---|
| 1  | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.2.1.5.2-2: General test parameters handover from NR with CCA FR1 to NR FR1**

| Parameter                  |                   | Unit | Value                             | Comment  |
|----------------------------|-------------------|------|-----------------------------------|--|
| Initial conditions         | Active cell       |      | Cell 1                            | NR cell with CCA                                 |
|                            | Neighbouring cell |      | Cell 2                            | NR cell  |
| Final condition            | Active cell       |      | Cell 2                            |  |
| DL CCA model               |                   |      | As specified in clause A.3.20.2.1 |  |
| UL CCA model               |                   |      | As specified in clause A.3.20.2.2 |  |
| Access Barring Information |                   | -    | Not Sent                          | No additional delays in random access procedure. |
| Time offset between cells  |                   |      | 3 $\mu$ s                         | Synchronous cells                                |
| T1                         |                   | s    | 5                                 |  |
| T2                         |                   | s    | $\leq 5$                          |  |

**Table A.11.2.1.5.2-3: Cell specific test parameters for NR with CCA FR1 – NR FR1 handover test case**

| Parameter  | Unit                       | Configuration | Cell 1                            |    | Cell 2                      |    |
|--|----------------------------|---------------|-----------------------------------|----|-----------------------------|----|
|  |                            |               | T1                                | T2 | T1                          | T2 |
| NR RF Channel Number   |                            | 1, 2, 3       | 1                                 |    | 2                           |    |
| Duplex mode  |                            | 1             | TDD                               |    | FDD                         |    |
|  |                            | 2             | TDD                               |    | TDD                         |    |
|  |                            | 3             | TDD                               |    | TDD                         |    |
| DL CCA model   |                            | 1, 2, 3       | As specified in clause A.3.26.2.1 |    | N/A                         |    |
| UL CCA model   |                            | 1, 2, 3       | As specified in clause A.3.26.2.2 |    |                             |    |
| TDD configuration  |                            | 1             | TDDConf.1.1 CCA                   |    | Not Applicable              |    |
|  |                            | 2             | TDDConf.1.1 CCA                   |    | TDDConf.1.1                 |    |
|  |                            | 3             | TDDConf.1.1 CCA                   |    | TDDConf.2.1                 |    |
| BW <sub>channel</sub>  | MHz                        | 1             | 40: N <sub>RB,c</sub> = 106       |    | 10: N <sub>RB,c</sub> = 52  |    |
|  |                            | 2             | 40: N <sub>RB,c</sub> = 106       |    | 10: N <sub>RB,c</sub> = 52  |    |
|  |                            | 3             | 40: N <sub>RB,c</sub> = 106       |    | 40: N <sub>RB,c</sub> = 106 |    |
| BWP BW   | MHz                        | 1             | 40: N <sub>RB,c</sub> = 106       |    | 10: N <sub>RB,c</sub> = 52  |    |
|  |                            | 2             | 40: N <sub>RB,c</sub> = 106       |    | 10: N <sub>RB,c</sub> = 52  |    |
|  |                            | 3             | 40: N <sub>RB,c</sub> = 106       |    | 40: N <sub>RB,c</sub> = 106 |    |
| DRX Cycle  | ms                         |               | Not Applicable                    |    |                             |    |
| PDSCH Reference measurement channel  |                            | 1             | SR.1.1 CCA                        |    | SR.1.1 FDD                  |    |
|  |                            | 2             | SR.1.1 CCA                        |    | SR.1.1 TDD                  |    |
|  |                            | 3             | SR.1.1 CCA                        |    | SR2.1 TDD                   |    |
| CORESET Reference Channel  |                            | 1             | CR2.1 TDD                         |    | CR.1.1 FDD                  |    |
|  |                            | 2             | CR2.1 TDD                         |    | CR.1.1 TDD                  |    |
|  |                            | 3             | CR2.1 TDD                         |    | CR2.1 TDD                   |    |
| Dedicated CORESET RMC configuration  |                            | 1             | CCR.1.1 CCA                       |    | CCR.1.1 FDD                 |    |
|  |                            | 2             | CCR.1.1 CCA                       |    | CCR.1.1 TDD                 |    |
|  |                            | 3             | CCR.1.1 CCA                       |    | CCR.2.1 TDD                 |    |
| TRS configuration  |                            | 1             | TRS.1.2 TDD                       |    | TRS.1.1 FDD                 |    |
|  |                            | 2             | TRS.1.2 TDD                       |    | TRS.1.1 TDD                 |    |
|  |                            | 3             | TRS.1.2 TDD                       |    | TRS.1.2 TDD                 |    |
| DL CCA probability for semi-static channel access (P <sub>CCA,DL</sub> )DL CCA probability P <sub>CCA,DL</sub> |                            | 1, 2, 3       | 0.9375                            |    | N/A                         |    |
| DL CCA probability for dynamic channel access (P <sub>CCA,DL,1</sub> )   |                            | 1, 2, 3       | 0.75                              |    | N/A                         |    |
| DL CCA probability for dynamic channel access (P <sub>CCA,DL,2</sub> )   |                            | 1, 2, 3       | 0.75                              |    | N/A                         |    |
| UL CCA probability for semi-static channel access P <sub>CCA,UL</sub>  |                            | 1, 2, 3       | 0.75                              |    | N/A                         |    |
| UL CCA probability for dynamic static channel access P <sub>CCA,UL</sub>                                       |                            | 1, 2, 3       | 0.87                              |    | N/A                         |    |
| OCNG Patterns  |                            | 1, 2, 3       | OP.1                              |    |                             |    |
| SMTC Configuration   |                            | 1, 2, 3       | SMTC.1                            |    |                             |    |
| DBT window configuration   |                            | 1, 2, 3       | As defined in A.3.28.1            |    | N/A                         |    |
| SSB configuration  | Semi-static channel access | 1,2           | SSB.1 CCA (As defined in A.3.10A) |    | SSB.1 FR1                   |    |
|  | Dynamic channel access     |               | SSB.2 CCA (As defined in A.3.10A) |    |                             |    |
|  | Semi-static channel access | 3             | SSB.1 CCA (As defined in A.3.10A) |    | SSB.2 FR1                   |    |
|  | Dynamic channel access     |               | SSB.2 CCA (As defined in A.3.10A) |    |                             |    |
| ssb-PositionQCL  |                            |               | [1]                               |    | N/A                         |    |
| PDSCH/PDCCH subcarrier spacing   | kHz                        | 1             | 30 kHz                            |    | 15 kHz                      |    |
|  |                            | 2             | 30 kHz                            |    | 15 kHz                      |    |
|  |                            | 3             | 30 kHz                            |    | 30 kHz                      |    |
| PUCCH/PUSCH subcarrier spacing   | kHz                        | 1             | 30 kHz                            |    | 15 kHz                      |    |
|  |                            | 2             | 30 kHz                            |    | 15 kHz                      |    |

|  |                  |       |                           |        |                                     |       |
|--|------------------|-------|---------------------------|--------|-------------------------------------|-------|
|  |                  | 3     | 30 kHz                    |        | 30 kHz                              |       |
| PRACH configuration  |                  | 1,2,3 | FR1 PRACH configuration 1 |        | FR1 PRACH configuration 1 under CCA |       |
| BWP configuration  | Initial DL BWP   | 1,2,3 | DLBWP.0.1                 |        |                                     |       |
|  | Dedicated DL BWP | 1,2,3 | DLBWP.1.1                 |        |                                     |       |
|  | Initial UL BWP   | 1,2,3 | ULBWP.0.1                 |        |                                     |       |
|  | Dedicated UL BWP | 1,2,3 | ULBWP.1.1                 |        |                                     |       |
| EPRE ratio of PSS to SSS   | dB               | 1,2,3 | 0                         |        |                                     |       |
| EPRE ratio of PBCH DMRS to SSS   |                  | 1,2,3 |                           |        |                                     |       |
| EPRE ratio of PBCH to PBCH DMRS  |                  | 1,2,3 |                           |        |                                     |       |
| EPRE ratio of PDCCH DMRS to SSS  |                  | 1,2,3 |                           |        |                                     |       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  | 1,2,3 |                           |        |                                     |       |
| EPRE ratio of PDSCH DMRS to SSS  |                  | 1,2,3 |                           |        |                                     |       |
| EPRE ratio of PDSCH to PDSCH   |                  | 1,2,3 |                           |        |                                     |       |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>  |                  | 1,2,3 |                           |        |                                     |       |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>   |                  | 1,2,3 |                           |        |                                     |       |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS          | 1,2,3 | [-101]                    |        | -98                                 |       |
|  |                  |       | [-101]                    |        | -95                                 |       |
| $\hat{E}_s / I_{ot}$   | dB               | 1,2,3 | -Infinity                 | 5      | 4                                   | 4     |
| $\hat{E}_s / N_{oc}$   |                  |       | -Infinity                 | 5      | 4                                   | 4     |
| SSB_RP   | dBm/SCS          | 1,2,3 | -Infinity                 | -93    | -94                                 | -94   |
|  |                  |       | -Infinity                 | -90    | -91                                 | -91   |
| $I_o$ <sup>Note3</sup>   | dBm/<br>9.36MHz  | 1,2,3 | -70.05                    | -63.85 | -                                   | -     |
|  |                  |       |                           |        | 64.59                               | 64.59 |
|  | dBm/<br>38.16MHz | 1,2,3 | -63.94                    | -57.75 | -                                   | -     |
|  |                  |       |                           |        | 58.49                               | 58.49 |
| Propagation condition  | -                | 1,2,3 | AWGN                      |        | AWGN                                |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                  |       |                           |        |                                     |       |

### A.11.2.1.5.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$  = 122 ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of 132 ms.

### A.11.2.1.6 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell

#### A.11.2.1.6.1 Test Purpose and Environment

This test is to verify the requirement for inter frequency handover requirements from FR1 to FR1 carrier under CCA specified in clause 6.1B.1.2.

### A.11.2.1.6.2 Test Parameters

Supported test configurations are shown in table A.11.2.1.6.2-1. Both handover delay and interruption length are tested by using the parameters in table A.11.2.1.6.2-2, and A.11.2.1.6.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

**Table A.11.2.1.6.2-1: Inter-frequency handover from FR1 to FR1 carrier under CCA test configurations**

| Configuration | Description of a cell with CCA                    | Description of a cell without CCA                 |
|---------------|---|---|
| 1             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations

**Table A.11.2.1.6.2-2: General test parameters Inter-frequency handover from FR1 to FR1 carrier under CCA**

| Parameter                  | Unit              | Value                             | Comment  |
|----------------------------|-------------------|-----------------------------------|--|
| Initial conditions         | Active cell       | Cell 1                            |  |
|                            | Neighbouring cell | Cell 2                            | On the carrier under CCA                             |
| Final condition            | Active cell       | Cell 2                            | On the carrier under CCA                             |
| DL CCA model               |                   | As specified in clause A.3.20.2.1 |  |
| UL CCA model               |                   | As specified in clause A.3.20.2.2 |  |
| Access Barring Information | -                 | Not Sent                          | No additional delays in random access procedure.     |
| T1                         | s                 | 5                                 |  |
| T2                         | s                 | $\leq T_{\text{interrupt}}$       | $T_{\text{interrupt}}$ is defined in clause 6.1B.1.2 |

**Table A.11.2.1.6.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case**

| Parameter   | Unit             | Configuration | Cell 1                    |    | Cell 2   |    |
|---|------------------|---------------|---------------------------|----|--|----|
|   |                  |               | T1                        | T2 | T1   | T2 |
| NR RF Channel Number  |                  | 1, 2, 3       | 1                         |    | 2  |    |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )DL CCA probability $P_{CCA\_DL}$ |                  | 1, 2, 3       | N/A                       |    | 0.9375   |    |
| DL CCA probability for dynamic channel access ( $P_{CCA\_DL\_1}$ )                                  |                  | 1, 2, 3       | N/A                       |    | 0.75   |    |
| DL CCA probability for dynamic channel access ( $P_{CCA\_DL\_2}$ )                                  |                  | 1, 2, 3       | N/A                       |    | 0.75   |    |
| UL CCA probability for semi-static channel access $P_{CCA\_UL}$                                     |                  | 1, 2, 3       | N/A                       |    | 0.75   |    |
| UL CCA probability for dynamic static channel access $P_{CCA\_UL}$                                  |                  | 1, 2, 3       | N/A                       |    | 0.87   |    |
| TDD configuration   |                  | 1             | N/A                       |    | TDDConf.1.1.CCA  |    |
|   |                  | 2             | TDDConf.1.1               |    | TDDConf.1.1.CCA  |    |
|   |                  | 3             | TDDConf.1.2               |    | TDDConf.1.1.CCA  |    |
| BW <sub>channel</sub>   |                  | 1             | 10: $N_{RB,c} = 52$       |    | 40: $N_{RB,c} = 106$   |    |
|   |                  | 2             | 10: $N_{RB,c} = 52$       |    | 40: $N_{RB,c} = 106$   |    |
|   |                  | 3             | 40: $N_{RB,c} = 106$      |    | 40: $N_{RB,c} = 106$   |    |
| BWP BW  |                  | 1             | 10: $N_{RB,c} = 52$       |    | 40: $N_{RB,c} = 106$   |    |
|   |                  | 2             | 10: $N_{RB,c} = 52$       |    | 40: $N_{RB,c} = 106$   |    |
|   |                  | 3             | 40: $N_{RB,c} = 106$      |    | 40: $N_{RB,c} = 106$   |    |
| DRX Cycle   | ms               |               | Not Applicable            |    |  |    |
| PDSCH Reference   |                  | 1             | SR.1.1 FDD                |    | SR.1.1 CCA   |    |
|   |                  | 2             | SR.1.1 TDD                |    | SR.1.1 CCA   |    |
|   |                  | 3             | SR.2.1 TDD                |    | SR.1.1 CCA   |    |
| CORESET Reference Channel   |                  | 1             | CR.1.1 FDD                |    | CR.1.1 CCA   |    |
|   |                  | 2             | CR.1.1 TDD                |    | CR.1.1 CCA   |    |
|   |                  | 3             | CR.2.1 TDD                |    | CR.1.1 CCA   |    |
| Dedicated CORESET RMC configuration   |                  | 1             | CCR.1.1 FDD               |    | CCR.1.1 CCA  |    |
|   |                  | 2             | CCR.1.1 TDD               |    | CCR.1.1 CCA  |    |
|   |                  | 3             | CCR.2.1 TDD               |    | CCR.1.1 CCA  |    |
| TRS configuration   |                  | 1             | TRS.1.1 FDD               |    | TRS.1.2 TDD  |    |
|   |                  | 2             | TRS.1.1 TDD               |    | TRS.1.2 TDD  |    |
|   |                  | 3             | TRS.1.2 TDD               |    | TRS.1.2 TDD  |    |
| OCNG Patterns   |                  | 1, 2, 3       | OP.1                      |    |  |    |
| SMTC Configuration  |                  | 1, 2, 3       | SMTC.1                    |    |  |    |
| DBT window configuration  |                  | 1, 2, 3       | N/A                       |    | As defined in A.3.28.1   |    |
| SSB configuration   |                  | 1, 2          | SSB.1 FR1                 |    | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access; |    |
|   |                  | 3             | SSB.2 FR1                 |    | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access; |    |
|   |                  |               | N/A                       |    | [1]  |    |
| PDSCH/PDCCH subcarrier spacing  | kHz              | 1             | 15 kHz                    |    | 30 kHz   |    |
|   |                  | 2             | 15 kHz                    |    | 30 kHz   |    |
|   |                  | 3             | 30 kHz                    |    | 30 kHz   |    |
| PUCCH/PUSCH subcarrier spacing  | kHz              | 1             | 15 kHz                    |    | 30 kHz   |    |
|   |                  | 2             | 15 kHz                    |    | 30 kHz   |    |
|   |                  | 3             | 30 kHz                    |    | 30 kHz   |    |
| PRACH configuration   |                  |               | FR1 PRACH configuration 1 |    | FR1 PRACH configuration 1 CCA  |    |
| BWP configuration   | Initial DL BWP   | 1, 2, 3       | DLBWP.0.1                 |    |  |    |
|   | Dedicated DL BWP | 1, 2, 3       | DLBWP.1.1                 |    |  |    |



|  |                  |                  |         |           |     |           |        |
|--|------------------|------------------|---------|-----------|-----|-----------|--------|
|  | Initial UL BWP   |                  | 1, 2, 3 | ULBWP.0.1 |     |           |        |
|  | Dedicated UL BWP |                  | 1, 2, 3 | ULBWP.1.1 |     |           |        |
| EPRE ratio of PSS to SSS   |                  | dB               |         | 0         |     |           |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |                  |         |           |     |           |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |                  |         |           |     |           |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |                  |         |           |     |           |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |                  |         |           |     |           |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |                  |         |           |     |           |        |
| EPRE ratio of PDSCH to PDSCH   |                  |                  |         |           |     |           |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |                  |         |           |     |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                  |                  |         |           |     |           |        |
| $N_{oc}$ <sup>Note2</sup>  |                  | dBm/15kHz        |         | -98       |     |           |        |
| $N_{oc}$ <sup>Note2</sup>  | Config 1         | dBm/SCS          | 1, 2    | -98       |     |           |        |
|  |                  |                  | 3       | -95       |     |           |        |
| $\hat{E}_s / I_{ot}$   |                  | dB               |         | 4         | 4   | -Infinity | 5      |
| $\hat{E}_s / N_{oc}$   |                  | dB               |         | 4         | 4   | -Infinity | 5      |
| SSB_RP   | Config 1         | dBm/SCS          | 1, 2    | -94       | -94 | -Infinity | -93    |
|  |                  |                  | 3       | -91       | -91 | -Infinity | -90    |
| $I_o$ <sup>Note3</sup>   | Config 1         | dBm/<br>9.36MHz  | 1, 2    | -         | -   | -70.05    | -63.85 |
|  |                  | dBm/<br>38.16MHz | 3       | -         | -   | -63.94    | -57.75 |
| Propagation condition  |                  | -                |         | AWGN      |     | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                  |                  |         |           |     |           |        |

### A.11.2.1.6.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{interrupt}$  from the beginning of time period T3, where  $T_{interrupt}$  is defined in clause 6.1B.1.2

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{interrupt}$ , where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2],  $L_1'$  is the number of SMTC occasions not available at the UE during the inter-frequency detection period,  $L_2$  is the number of SMTC occasions not available at the UE during the time tracking period, and  $L_3$  is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure.  $L_3 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [33]. The interruption time considering the potential extensions caused by  $L_1, L_1', L_2, L_3$  and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [2].

## A.11.2.1.7 SA NR FR1 carrier under CCA - E-UTRAN handover with known target cell

### A.11.2.1.7.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1 carrier under CCA. This test shall verify the NR to E-UTRAN handover requirements as specified in clause 6.1.2.1.

The test comprises of one NR carrier under CCA and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.11.2.1.7-1. General test parameters are provided in Table A.11.2.1.7-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.11.2.1.7-3 and A.11.2.1.7-4 respectively.

**Table A.11.2.1.7-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests**

| Configuration   | Description of a cell with CCA                       | Description of a cell without CCA     |
|---|--|---------------------------------------|
| 1   | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 2   | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.                       |  |                                       |
| Note 2: The UE supporting SA operation only on NR band(s) with shared spectrum access is required to be tested. |  |                                       |

**Table A.11.2.1.7-2: General test parameters for SA inter-RAT E-UTRAN handover**

| Parameter                    | Unit              | Value                              | Comment  |
|------------------------------|-------------------|------------------------------------|--|
| NR RF Channel Number         |                   | 1                                  | 1 NR carrier frequency is used in the test             |
| LTE RF Channel Number        |                   | 2                                  | 1 E-UTRAN carrier frequency is used in the test        |
| Initial conditions           | Active cell       | Cell 1                             | NR cell on a carrier under CCA                         |
|                              | Neighbouring cell | Cell 2                             | E-UTRAN cell   |
| Final condition              | Active cell       | Cell 2                             |  |
| DL CCA model                 |                   | As specified in clause A.3.20.2.1  |  |
| UL CCA model                 |                   | As specified in clause A.3.20.2.2  |  |
| NR measurement quantity      |                   | SS-RSRP                            |  |
| E-UTRAN measurement quantity |                   | RSRP                               |  |
| b2-Threshold1                | dBm               | As specified in Table A.11.2.1.7-3 | Absolute NR SS-RSRP threshold for event B2             |
| b2-Threshold2EUTRAN          | dBm               | -98                                | Absolute E-UTRAN RSRP threshold for event B2           |
| Hysteresis                   | dB                | 0                                  |  |
| TimeToTrigger                | s                 | 0                                  |  |
| Filter coefficient           |                   | 0                                  | L3 filtering is not used                               |
| DRX                          |                   | OFF                                | Non-DRX test   |
| Access Barring Information   | -                 | Not sent                           | No additional delays in random access procedure        |
| Time offset between cells    |                   | 3 ms                               | Asynchronous cells                                     |
| Gap pattern configuration Id |                   | 0                                  | As specified in Table 9.1.2-1 started before T2 starts |
| T1                           | s                 | 5                                  |  |
| T2                           | s                 | ≤5                                 |  |
| T3                           | s                 | 1                                  |  |

**Table A.11.2.1.7-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)**

| Parameter   | Unit             | Configuration | Cell 1   |          |        |
|---|------------------|---------------|--|----------|--------|
|   |                  |               | T1   | T2       | T3     |
| RF channel number   |                  | 1, 2          | 1  |          |        |
| TDD Configuration   |                  | 1, 2          | TDDConf.1.1.CCA  |          |        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )DL CCA probability $P_{CCA\_DL}$ |                  | 1, 2          | 0.9375   |          |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ )                       |                  | 1, 2          | 0.75   |          |        |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ )                       |                  | 1, 2          | 0.75   |          |        |
| UL CCA probability for semi-static channel access $P_{CCA\_UL}$                                     |                  | 1, 2          | 0.75   |          |        |
| UL CCA probability for dynamic static channel access $P_{CCA\_UL}$                                  |                  | 1, 2          | 0.87   |          |        |
| $BW_{channel}$  |                  | 1, 2          | 40: $N_{RB,c} = 106$ (TDD)   |          |        |
| PDSCH reference measurement channel   |                  | 1, 2          | SR.1.1 CCA   |          |        |
| CORESET reference channel   |                  | 1, 2          | CR.1.1 CCA   |          |        |
| Dedicated CORESET RMC configuration   |                  | 1, 2          | CCR.1.1 CCA  |          |        |
| TRS configuration   |                  | 1, 2          | TRS.1.2 TDD  |          |        |
| OCNG pattern <sup>Note1</sup>   |                  | 1, 2          | OP.1   |          |        |
| BWP   | Initial DL BWP   | 1, 2          | DLBWP.0.1  |          |        |
|   | Dedicated DL BWP |               | DLBWP.1.1  |          |        |
|   | Initial UL BWP   |               | ULBWP.0.1  |          |        |
|   | Dedicated UL BWP |               | ULBWP.1.1  |          |        |
| SMTC configuration  |                  | 1, 2          | SMTC.1   |          |        |
| DBT window configuration  |                  | 1, 2          | As defined in A.3.28.1   |          |        |
| SSB configuration   |                  | 1, 2          | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access; |          |        |
| b2-Threshold1   | dBm              | 1, 2          | -93  |          |        |
| EPRE ratio of PSS to SSS  | dB               | 1, 2          | 0  |          |        |
| EPRE ratio of PBCH_DMRS to SSS  |                  |               |  |          |        |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |               |  |          |        |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |               |  |          |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |               |  |          |        |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |               |  |          |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |               |  |          |        |
| EPRE ratio of OCNG DMRS to SSS  |                  |               |  |          |        |
| EPRE ratio of OCNG to OCNG DMRS   |                  |               |  |          |        |
| $N_{oc}$ <sup>Note2</sup>   |                  |               |  |          |        |
| $N_{oc}$ <sup>Note2</sup>   | dBm/SCS          | 1, 2          | -97  | -101     | -97    |
| $\bar{E}_s/N_{oc}$  | dB               | 1, 2          | 12   | 0        | -4     |
| $\bar{E}_s/I_{ot}$ <sup>Note3</sup>   | dB               | 1, 2          | 12   | 0        | -4     |
| SS-RSRP <sup>Note3</sup>  | dBm/SCS          | 1, 2          | -85  | -101     | -101   |
| $I_o$ <sup>Note3</sup>  | dBm/38.16 MHz    | 1, 2          | -53.68   | -66.9448 | -64.49 |
| Propagation condition   |                  | 1, 2          | AWGN   |          |        |
| Antenna Configuration and Correlation Matrix  |                  | 1, 2          | 1x2 Low  |          |        |

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3:  $\hat{E}_s/I_{ot}$ , SS-RSRP, and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table A.11.2.1.7-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)**

| Parameter         | Unit | Configuration | Cell 2 |    |    |
|-------------------|------|---------------|--------|----|----|
|                   |      |               | T1     | T2 | T3 |
| RF channel number |      | 1, 2          |        | 2  |    |
| Duplex mode       |      | 1             | FDD    |    |    |
|                   |      | 2             | TDD    |    |    |

|  |           |      |  |  |  |
|--|-----------|------|--|--|--|
| TDD special subframe configuration <sup>Note1</sup>                              |           | 2    | 6  |  |  |
| TDD uplink-downlink configuration <sup>Note1</sup>                               |           | 2    | 1  |  |  |
| BW <sub>channel</sub>  | MHz       | 1, 2 | 10 MHz: N <sub>RB,c</sub> = 50           |  |  |
| PRACH Configuration <sup>Note2</sup>   |           | 1    | 4  |  |  |
|  |           | 2    | 53                                       |  |  |
| PDSCH parameters: DL Reference Measurement Channel <sup>Note3</sup>              |           | 1    | 10 MHz: R.3 FDD                          |  |  |
|  |           | 2    | 10 MHz: R.0 TDD                          |  |  |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel <sup>Note3</sup> |           | 1    | 10 MHz: R.6 FDD                          |  |  |
|  |           | 2    | 10 MHz: R.6 TDD                          |  |  |
| OCNG Patterns <sup>Note3</sup>   |           | 1    | 10 MHz: OP.10 FDD                        |  |  |
|  |           | 2    | 10 MHz: OP.1 TDD                         |  |  |
| PBCH_RA  | dB        | 1, 2 | 0  |  |  |
| PBCH_RB  |           |      |  |  |  |
| PSS_RA   |           |      |  |  |  |
| SSS_RA   |           |      |  |  |  |
| PCFICH_RB  |           |      |  |  |  |
| PHICH_RA   |           |      |  |  |  |
| PHICH_RB   |           |      |  |  |  |
| PDCCH_RA   |           |      |  |  |  |
| PDCCH_RB   |           |      |  |  |  |
| PDSCH_RA   |           |      |  |  |  |
| PDSCH_RB   |           |      |  |  |  |
| OCNG_RA <sup>Note4</sup>   |           |      |  |  |  |
| OCNG_RB <sup>Note4</sup>   |           |      |  |  |  |
| N <sub>oc</sub> <sup>Note5</sup>   |           |      |  |  |  |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2 | -Infinity                                | 8  | 78                                       |
| $\bar{E}_s/I_{ot}$ <sup>Note6</sup>  | dB        | 1, 2 | -Infinity                                | 78                                       | 78                                       |
| RSRP <sup>Note6</sup>  | dBm/15kHz | 1, 2 | -Infinity                                | -90                                      | -90                                      |
| SCH_RP <sup>Note6</sup>  | dBm/15kHz | 1, 2 | -Infinity                                | -90                                      | -90                                      |
| I <sub>o</sub> <sup>Note6</sup>  | dBm/9MHz  | 1, 2 | -67.21<br>+10log(N <sub>RB,c</sub> /100) | -58.57<br>+10log(N <sub>RB,c</sub> /100) | -58.57<br>+10log(N <sub>RB,c</sub> /100) |
| Propagation Condition  |           | 1, 2 | AWGN                                     |  |  |
| Antenna Configuration and Correlation Matrix <sup>Note7</sup>                    |           | 1, 2 | 1x2 Low                                  |  |  |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].

Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 6:  $\bar{E}_s/I_{ot}$ , RSRP, SCH\_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

### A.11.2.1.7.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay +  $T_{\text{interrupt}}$ , where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

$T_{\text{interrupt}}$  = 35 ms in the test;  $T_{\text{interrupt}}$  is defined in clause 6.1.2.1.

This gives a total of 85 ms.

### A.11.2.1.8 SA NR FR1 carrier under CCA - E-UTRAN handover with unknown target cell

#### A.11.2.1.8.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1 carrier under CCA. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in clause 6.1.2.1.

The test comprises of one NR carrier under CCA and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

A RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.11.2.1.8-1. General test parameters are provided in Table A.11.2.1.8-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.11.2.1.8-3 and A.11.2.1.8-4 respectively.

**Table A.11.2.1.8-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests**

| Configuration | Description of a cell with CCA  | Description of a cell without CCA     |
|---------------|---|---------------------------------------|
| 1             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  | LTE 10 MHz bandwidth, TDD duplex mode |
| 2             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  | LTE 10 MHz bandwidth, FDD duplex mode |
| Note 1:       | The UE is only required to be tested in one of the supported test configurations.                       |                                       |
| Note 2:       | The UE supporting SA operation only on NR band(s) with shared spectrum access is required to be tested. |                                       |

**Table A.11.2.1.8-2: General test parameters for SA inter-RAT E-UTRAN handover**

| Parameter                  |                   | Unit | Value                             | Comment   |
|----------------------------|-------------------|------|-----------------------------------|---|
| NR RF Channel Number       |                   |      | 1                                 | 1 NR carrier frequency is used in the test      |
| LTE RF Channel Number      |                   |      | 2                                 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions         | Active cell       |      | Cell 1                            | NR cell on a carrier under CCA                  |
|                            | Neighbouring cell |      | Cell 2                            | E-UTRAN cell                                    |
| Final condition            | Active cell       |      | Cell 2                            |   |
| DL CCA model               |                   |      | As specified in clause A.3.20.2.1 |   |
| UL CCA model               |                   |      | As specified in clause A.3.20.2.2 |   |
| NR measurement quantity    |                   |      | SS-RSRP                           |   |
| DRX                        |                   |      | OFF                               | Non-DRX test                                    |
| Access Barring Information |                   | -    | Not sent                          | No additional delays in random access procedure |
| Time offset between cells  |                   |      | 3 ms                              | Asynchronous cells                              |
| T1                         |                   | s    | ≤5                                |   |
| T2                         |                   | s    | 1                                 |   |

**Table A.11.2.1.8-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 |    |
|-----------|------|---------------|--------|----|
|           |      |               | T1     | T2 |
|           |      |               |        |    |



|   |                  |               |      |  |        |
|---|------------------|---------------|------|--|--------|
| RF channel number   |                  |               | 1, 2 | 1  |        |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )DL CCA probability $P_{CCA\_DL}$ |                  |               | 1, 2 | 0.9375   |        |
| DL CCA probability for dynamic channel access ( $P_{CCA\_DL\_1}$ )                                  |                  |               | 1, 2 | 0.75   |        |
| DL CCA probability for dynamic channel access ( $P_{CCA\_DL\_2}$ )                                  |                  |               | 1, 2 | 0.75   |        |
| UL CCA probability for semi-static channel access $P_{CCA\_UL}$                                     |                  |               | 1, 2 | 0.75   |        |
| UL CCA probability for dynamic static channel access $P_{CCA\_UL}$                                  |                  |               | 1, 2 | 0.87   |        |
| TDD Configuration   |                  |               | 1, 2 | TDDConf.1.1.CCA  |        |
| $BW_{channel}$  |                  | MHz           | 1, 2 | 40: $N_{RB,c} = 106$ (TDD)   |        |
| PDSCH reference measurement channel   |                  |               | 1, 2 | SR.1.1 CCA   |        |
| CORESET reference channel   |                  |               | 1, 2 | CR.1.1 CCA   |        |
| Dedicated CORESET RMC configuration   |                  |               | 1, 2 | CCR.1.1 CCA  |        |
| TRS configuration   |                  |               | 1, 2 | TRS.1.2 TDD  |        |
| OCNG pattern <sup>Note1</sup>   |                  |               | 1, 2 | OP.1   |        |
| BWP   | Initial DL BWP   |               | 1, 2 | DLBWP.0.1  |        |
|   | Dedicated DL BWP |               |      | DLBWP.1.1  |        |
|   | Initial UL BWP   |               |      | ULBWP.0.1  |        |
|   | Dedicated UL BWP |               |      | ULBWP.1.1  |        |
| SMTC configuration  |                  |               | 1, 2 | SMTC.1   |        |
| DBT window configuration  |                  |               | 1, 2 | As defined in A.3.28.1   |        |
| SSB configuration   |                  |               | 1, 2 | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access; |        |
| EPRE ratio of PSS to SSS  |                  | dB            | 1, 2 | 0  |        |
| EPRE ratio of PBCH_DMRS to SSS  |                  |               |      |  |        |
| EPRE ratio of PBCH to PBCH_DMRS   |                  |               |      |  |        |
| EPRE ratio of PDCCH_DMRS to SSS   |                  |               |      |  |        |
| EPRE ratio of PDCCH to PDCCH_DMRS   |                  |               |      |  |        |
| EPRE ratio of PDSCH_DMRS to SSS   |                  |               |      |  |        |
| EPRE ratio of PDSCH to PDSCH_DMRS   |                  |               |      |  |        |
| EPRE ratio of OCNG DMRS to SSS  |                  |               |      |  |        |
| EPRE ratio of OCNG to OCNG DMRS   |                  |               |      |  |        |
| $N_{oc}$ <sup>Note2</sup>   |                  | dBm/15 KHz    | 1, 2 | -98  |        |
| $N_{oc}$ <sup>Note2</sup>   |                  | dBm/SCS       | 1, 2 | -95  |        |
| $\bar{E}_s/N_{oc}$  |                  | dB            | 1, 2 | 0  | 0      |
| $\bar{E}_s/I_{ot}$ <sup>Note3</sup>   |                  | dB            | 1, 2 | 0  | 0      |
| SS-RSRP <sup>Note3</sup>  |                  | dBm/SCS       | 1, 2 | -95  | -95    |
| $I_o$ <sup>Note3</sup>  |                  | dBm/38.16 MHz | 1, 2 | -60.94   | -60.94 |
| Propagation condition   |                  |               | 1, 2 | AWGN   |        |

|  |  |      |         |
|--|--|------|---------|
| Antenna Configuration and Correlation Matrix |  | 1, 2 | 1x2 Low |
| Note 1:                                      | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |      |         |
| Note 2:                                      | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |      |         |
| Note 3:                                      | $\bar{E}_s/I_{ot}$ , SS-RSRP, and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |      |         |
| Note 4:                                      | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |      |         |

**Table A.11.2.1.8-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)**

| Parameter  | Unit      | Configuration | Cell 2                         |        |
|--|-----------|---------------|--------------------------------|--------|
|  |           |               | T1                             | T2     |
| RF channel number  |           | 1, 2          | 2                              |        |
| Duplex mode  |           | 1             | FDD                            |        |
|  |           | 2             | TDD                            |        |
| TDD special subframe configuration <sup>Note1</sup>  |           | 2             | 6                              |        |
| TDD uplink-downlink configuration <sup>Note1</sup>   |           | 2             | 1                              |        |
| BW <sub>channel</sub>  | MHz       | 1, 2          | 10 MHz: N <sub>RB,c</sub> = 50 |        |
| PRACH Configuration <sup>Note2</sup>   |           | 1             | 4                              |        |
|  |           | 2             | 53                             |        |
| PDSCH parameters: DL Reference Measurement Channel <sup>Note3</sup>  |           | 1             | 10 MHz: R.3 FDD                |        |
|  |           | 2             | 10 MHz: R.0 TDD                |        |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel <sup>Note3</sup>   |           | 1             | 10 MHz: R.6 FDD                |        |
|  |           | 2             | 10 MHz: R.6 TDD                |        |
| OCNG Patterns <sup>Note3</sup>   |           | 1             | 10 MHz: OP.10 FDD              |        |
|  |           | 2             | 10 MHz: OP.1 TDD               |        |
| PBCH_RA  | dB        | 1, 2          | 0                              |        |
| PBCH_RB  |           |               |                                |        |
| PSS_RA   |           |               |                                |        |
| SSS_RA   |           |               |                                |        |
| PCFICH_RB  |           |               |                                |        |
| PHICH_RA   |           |               |                                |        |
| PHICH_RB   |           |               |                                |        |
| PDCCH_RA   |           |               |                                |        |
| PDCCH_RB   |           |               |                                |        |
| PDSCH_RA   |           |               |                                |        |
| PDSCH_RB   |           |               |                                |        |
| OCNG_RA <sup>Note4</sup>   |           |               |                                |        |
| OCNG_RB <sup>Note4</sup>   |           |               |                                |        |
| N <sub>oc</sub> <sup>Note5</sup>   |           |               |                                |        |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2          | -Infinity                      | 7      |
| $\bar{E}_s/I_{ot}$ <sup>Note6</sup>  | dB        | 1, 2          | -Infinity                      | 7      |
| RSRP <sup>Note6</sup>  | dBm/15kHz | 1, 2          | -Infinity                      | -91    |
| SCH_RP <sup>Note6</sup>  | dBm/15kHz | 1, 2          | -Infinity                      | -91    |
| I <sub>o</sub> <sup>Note6</sup>  | dBm/9MHz  | 1, 2          | -70.22                         | -62.43 |
| Propagation Condition  |           | 1, 2          | AWGN                           |        |
| Antenna Configuration and Correlation Matrix <sup>Note7</sup>  |           | 1, 2          | 1x2 Low                        |        |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].</p> <p>Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 6: <math>\bar{E}_s/I_{ot}</math>, RSRP, SCH_RP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |               |                                |        |

**A.11.2.1.8.2 Test Requirements**

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

$T_{\text{interrupt}} = 115$  ms in the test;  $T_{\text{interrupt}}$  is defined in clause 6.1.2.1.

This gives a total of 165 ms.

## A.11.2.2 RRC connection mobility control

### A.11.2.2.1 RRC re-establishment

#### A.11.2.2.1.1 Intra-frequency RRC Re-establishment with CCA in FR1

##### A.11.2.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay with CCA in FR1 with known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1A.

The test parameters are given in table A.11.2.2.1.1.1-1, table A.11.2.2.1.1.1-2 and table A.11.2.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell with CCA, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

**Table A.11.2.2.1.1.1-1: Supported test configurations**

| Configuration | Description                                       |
|---------------|---|
| 1             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.2.2.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case with CCA**

| Parameter   |   | Unit | Value                               | Comment   |
|---|---|------|-------------------------------------|---|
| Initial Condition   | Active cell                                     | -    | Cell1                               | Cell 1 is with CCA.   |
|   | Neighbour cells                                 | -    | Cell2                               | Cell 2 is with CCA.   |
| Final condition   | Active cell                                     | -    | Cell2                               |   |
| RF Channel Number   |   | -    | 1                                   |   |
| DL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     | -    | As specified in clause A.3.26.2.1   |   |
|   | Semi-static channel access <sup>Note 2, 3</sup> | -    |                                     |   |
| UL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     | -    | As specified in clause A.3.26.2.2   |   |
|   | Semi-static channel access <sup>Note 2, 3</sup> | -    |                                     |   |
| Time offset between cells   |   | -    | 3 $\mu$ s                           | Synchronous cells   |
| N310  |   | -    | 1                                   | Maximum consecutive out-of-sync indications from lower layers |
| N311  |   | -    | 1                                   | Minimum consecutive in-sync indications from lower layers     |
| T310  |   | ms   | 0                                   | Radio link failure timer; T310 is disabled                    |
| T311  |   | ms   | 3000                                | RRC re-establishment timer                                    |
| Access Barring Information  |   | -    | Not Sent                            | No additional delays in random access procedure.              |
| SSB configuration   | Dynamic channel access <sup>Note 1, 3</sup>     | -    | SSB.2 CCA                           | Table A.3.10A.1.2-1   |
|   | Semi-static channel access <sup>Note 2, 3</sup> | -    | SSB.1 CCA                           | Table A.3.10A.1.1-1   |
| DBT window configuration  |   | -    | DBT.1                               | Table A.3.28.1-1  |
| SMTC configuration  |   | -    | SMTC pattern 1                      |   |
| DRX cycle length  |   | s    | OFF                                 |   |
| PRACH configuration   |   | -    | FR1 PRACH configuration 1 under CCA | Table A.3.8A.2.1-1  |
| T1  |   | s    | 5                                   |   |
| T2  |   | ms   | 480                                 | Time for the UE to detect RLF                                 |
| T3  |   | s    | 2                                   |   |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |      |                                     |   |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |      |                                     |   |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |      |                                     |   |

**Table A.11.2.2.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case with CCA**

| Parameter  | Unit          | Cell 1   |           |           | Cell 2   |        |               |
|--|---------------|--|-----------|-----------|--|--------|---------------|
|  |               | T1   | T2        | T3        | T1   | T2     | T3            |
| TDD configuration  | -             | TDDConf.1.1 CCA                                |           |           | TDDConf.1.1 CCA                                |        |               |
| DL CCA probability<br>$P_{CCA\_DL}$ for dynamic<br>channel access <sup>Note</sup><br>4,6   | -             | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |           |           | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |        |               |
| DL CCA probability<br>$P_{CCA\_DL}$ for semi-<br>static channel access<br><sup>Note</sup> 5,6  | -             | $P_{CCA\_DL}=0.9375$                           |           |           | $P_{CCA\_DL}=0.9375$                           |        |               |
| UL CCA probability<br>$P_{CCA\_UL}$  | -             | 1  |           |           | 1  |        |               |
| PDSCH RMC<br>configuration   |               | SR.1.1 CCA                                     |           |           | SR.1.1 CCA                                     |        |               |
| RMSI CORESET<br>RMC configuration  |               | CR.1.1 CCA                                     |           |           | CR.1.1 CCA                                     |        |               |
| Dedicated CORESET<br>RMC configuration   |               | CCR.1.1 CCA                                    |           |           | CCR.1.1 CCA                                    |        |               |
| OCNG Pattern   |               | OP.1 defined in A.3.2.1                        |           |           | OP.1 defined in A.3.2.1                        |        |               |
| TRS configuration  |               | TRS.1.2 TDD                                    |           |           | N/A  |        |               |
| Initial DL BWP<br>configuration  |               | DLBWP.0.1                                      |           |           | DLBWP.0.1                                      |        |               |
| Initial UL BWP<br>configuration  |               | ULBWP.0.1                                      |           |           | ULBWP.0.1                                      |        |               |
| Active DL BWP<br>configuration   |               | DLBWP.<br>1.1                                  | N/A       | N/A       | N/A  | N/A    | DLBW<br>P.1.1 |
| Active UL BWP<br>configuration   |               | ULBWP.<br>1.1                                  | N/A       | N/A       | N/A  | N/A    | ULBW<br>P.1.1 |
| RLM-RS   |               | SSB  |           |           | SSB  |        |               |
| $\hat{E}_s/I_{ot}$   | dB            | 1.54   | -infinity | -infinity | -3.79  | 4      | 4             |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | -95  |           |           |  |        |               |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | -98  |           |           |  |        |               |
| $\hat{E}_s/N_{oc}$   | dB            | 7  | -infinity | -infinity | 4  | 4      | 4             |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | -88  | -infinity | -infinity | -91  | -91    | -91           |
| $I_o$  | dBm/38.16 MHz | -54.65   | -58.50    | -58.50    | -54.65   | -58.50 | -58.50        |
| Propagation<br>Condition   |               | AWGN   |           |           |  |        |               |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |               |  |           |           |  |        |               |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |               |  |           |           |  |        |               |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |               |  |           |           |  |        |               |
| NOTE 4: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |               |  |           |           |  |        |               |
| NOTE 5: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |               |  |           |           |  |        |               |
| NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.  |               |  |           |           |  |        |               |

**A.11.2.2.1.1.2 Test Requirements**

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra frequency cell with CCA shall be less than  $1350 + \text{MAX}(200, (5+K_1) \times 20)$  ms.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish\_delay\_CCA} = T_{UE\_re-establish\_delay\_CCA} + T_{UL\_grant}$$

Where:

$T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$\begin{aligned} T_{UE\_re-establish\_delay\_CCA} &= 50 \text{ ms} + T_{identify\_intra\_NR\_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify\_inter\_NR\_CCA,i} + T_{SI-NR\_CCA} \\ &+ T_{PRACH\_CCA} \end{aligned}$$

Where

$$N_{freq} = 1$$

$$T_{identify\_intra\_NR\_CCA} = \text{MAX}(200 \text{ ms}, (5+K_1) \times T_{SMTC}), \text{ where}$$

$K_1$  is the number of SMTC occasions not available at the UE due to DL CCA failures during RRC re-establishment period on the carrier with CCA.

$T_{SMTC} = 20 \text{ ms}$  is the SMTC periodicity.

$$T_{identify\_inter\_NR\_CCA} = 0 \text{ ms}$$

$T_{SI-NR\_CCA} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

$T_{PRACH\_CCA} = T_{SSB,RO} + 10 \text{ ms}$ , where:

- $T_{SSB,RO}$  is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [39], which is  $T_{SSB,RO}=10 \text{ ms}$  for FR1 PRACH configuration 1 under CCA.

This gives a total of  $1350 + \text{MAX}(200, (5+K_1) \times 20) \text{ ms}$ .

#### A.11.2.2.1.2 Inter-frequency RRC Re-establishment with CCA in FR1

##### A.11.2.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay with CCA in FR1 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1A.

The test parameters are given in table A.11.2.2.1.2.1-1, table A.11.2.2.1.2.1-2 and table A.11.2.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell with CCA, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

**Table A.11.2.2.1.2.1-1: Supported test configurations**

| Configuration | Description                                       |
|---------------|---|
| 1             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.2.2.1.2-1: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter   |   | Unit | Value                             | Comment   |
|---|---|------|-----------------------------------|---|
| Initial Condition   | Active cell                                     | -    | Cell1                             | Cell 1 is with CCA.   |
|   | Neighbour cells                                 | -    | Cell2                             | Cell 2 is with CCA.   |
| Final condition   | Active cell                                     | -    | Cell2                             |   |
| RF Channel Number   |   | -    | 1                                 |   |
| DL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     | -    | As specified in clause A.3.20.2.1 |   |
|   | Semi-static channel access <sup>Note 2, 3</sup> | -    |                                   |   |
| UL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     | -    | As specified in clause A.3.20.2.2 |   |
|   | Semi-static channel access <sup>Note 2, 3</sup> | -    |                                   |   |
| Time offset between cells   |   | -    | 3 $\mu$ s                         | Synchronous cells   |
| N310  |   | -    | 1                                 | Maximum consecutive out-of-sync indications from lower layers |
| N311  |   | -    | 1                                 | Minimum consecutive in-sync indications from lower layers     |
| T310  |   | ms   | 0                                 | Radio link failure timer; T310 is disabled                    |
| T311  |   | ms   | 3000                              | RRC re-establishment timer                                    |
| Access Barring Information  |   | -    | Not Sent                          | No additional delays in random access procedure.              |
| SSB configuration   | Dynamic channel access <sup>Note 1, 3</sup>     | -    | SSB.2 CCA                         | Table A.3.10A.1.2-1   |
|   | Semi-static channel access <sup>Note 2, 3</sup> | -    | SSB.1 CCA                         | Table A.3.10A.1.1-1   |
| DBT window configuration  |   | -    | [DBT.1]                           | Table A.3.28.1-1  |
| SMTC configuration  |   | -    | SMTC pattern 1                    |   |
| DRX cycle length  |   | s    | OFF                               |   |
| PRACH configuration   |   | -    | [TBD]                             |   |
| T1  |   | s    | [5]                               |   |
| T2  |   | ms   | [200]                             | Time for the UE to detect RLF                                 |
| T3  |   | s    | [2]                               |   |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |      |                                   |   |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |      |                                   |   |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |      |                                   |   |



**Table A.11.2.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter  | Unit         | Cell 1   |           |           | Cell 2   |        |               |
|--|--------------|--|-----------|-----------|--|--------|---------------|
|  |              | T1   | T2        | T3        | T1   | T2     | T3            |
| TDD configuration  |              | TDDConf.1.1 CCA                                |           |           | TDDConf.1.1 CCA                                |        |               |
| DL CCA probability<br>$P_{CCA\_DL}$ for dynamic<br>channel access <sup>Note</sup><br>4,6   | -            | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |           |           | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |        |               |
| DL CCA probability<br>$P_{CCA\_DL}$ for semi-<br>static channel access<br><sup>Note</sup> 5,6  | -            | $P_{CCA\_DL}=0.9375$                           |           |           | $P_{CCA\_DL}=0.9375$                           |        |               |
| UL CCA probability<br>$P_{CCA\_UL}$  | -            | 1  |           |           | 1  |        |               |
| PDSCH RMC<br>configuration   |              | SR.1.1 CCA                                     |           |           | SR.1.1 CCA                                     |        |               |
| RMSI CORESET<br>RMC configuration  |              | CR.1.1 CCA                                     |           |           | CR.1.1 CCA                                     |        |               |
| Dedicated CORESET<br>RMC configuration   |              | CCR.1.1 CCA                                    |           |           | CCR.1.1 CCA                                    |        |               |
| OCNG Pattern   |              | OP.1 defined in A.3.2.1                        |           |           | OP.1 defined in A.3.2.1                        |        |               |
| TRS configuration  |              | TRS.1.2 TDD                                    |           |           | N/A  |        |               |
| Initial DL BWP<br>configuration  |              | DLBWP.0.1                                      |           |           | DLBWP.0.1                                      |        |               |
| Initial UL BWP<br>configuration  |              | ULBWP.0.1                                      |           |           | ULBWP.0.1                                      |        |               |
| Active DL BWP<br>configuration   |              | DLBWP.<br>1.1                                  | N/A       | N/A       | N/A  | N/A    | DLBW<br>P.1.1 |
| Active UL BWP<br>configuration   |              | ULBWP.<br>1.1                                  | N/A       | N/A       | N/A  | N/A    | ULBW<br>P.1.1 |
| RLM-RS   |              | SSB  |           |           | SSB  |        |               |
| $\hat{E}_s/I_{ot}$   | dB           | 1.54   | -infinity | -infinity | -3.79  | 4      | 4             |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS      | [-101]   |           |           |  |        |               |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz   | [-104]   |           |           |  |        |               |
| $\hat{E}_s/N_{oc}$   | dB           | 7  | -infinity | -infinity | 4  | 4      | 4             |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS      | -88  | -infinity | -infinity | -91  | -91    | -91           |
| $I_o$  | dBm/9.36 MHz | -54.65   | -58.50    | -58.50    | -54.65   | -58.50 | -58.50        |
| Propagation<br>Condition   |              | AWGN   |           |           |  |        |               |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |              |  |           |           |  |        |               |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |  |           |           |  |        |               |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |  |           |           |  |        |               |
| NOTE 4: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |              |  |           |           |  |        |               |
| NOTE 5: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |              |  |           |           |  |        |               |
| NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.  |              |  |           |           |  |        |               |

**A.11.2.2.1.2.2 Test Requirements**

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than TBD s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish_{delay_{CCA}}} = T_{UE_{re-establish_{delay_{CCA}}} + T_{UL_{grant}}$$

Where:

$T_{UL_{grant}}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL_{grant}}$  is not used.

$$T_{UE_{re-establish_{delay_{CCA}}} = 50 \text{ ms} + T_{identify_{intra_{NR_{CCA}}} + \sum_{i=1}^{N_{freq}-1} T_{identify_{inter_{NR_{CCA},i}} + T_{SI-NR_{CCA}} + T_{PRACH_{CCA}}$$

Where

$T_{identify_{intra_{NR_{CCA}}}$ : 0 ms

$T_{identify_{inter_{NR_{CCA},i}}$ : MAX (200 ms, ((6)+K<sub>2,i</sub>) x T<sub>SMTC</sub>, i),

where

K<sub>2,i</sub> is the number of SMTC not available at the UE during RRC re-establishment period on the “i” th carrier with CCA

T<sub>SMTC,i</sub>: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*.

$N_{freq} = 2$

$T_{SI-NR_{CCA}} = 1280$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

$T_{PRACH_{CCA}} = (1 + K_3) * T_{SSB,RO} + 10$  ms, where:

- $T_{SSB,RO}$  is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [39].
- [-  $K_3$  is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure.  $K_3 = 0$  for Type 2C UL channel access procedure as defined in TS 37.213 [57].]

This gives a total of TBD ms.

#### A.11.2.2.1.3 Intra-frequency RRC Re-establishment with CCA in FR1 without serving cell timing

##### A.11.2.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay with CCA in FR1 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1A.

The test parameters are given in table A.11.2.2.1.3.1-1, table A.11.2.2.1.3.1-2 and table A.11.2.2.1.3.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell with CCA, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

**Table A.11.2.2.1.3.1-1: Supported test configurations**

| Configuration | Description                                       |
|---------------|---|
| 1             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.2.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter   |   | Unit | Value                             | Comment   |
|---|---|------|-----------------------------------|---|
| Initial Condition   | Active cell                                     | -    | Cell1                             | Cell 1 is with CCA.   |
|   | Neighbour cells                                 | -    | Cell2                             | Cell 2 is with CCA.   |
| Final condition   | Active cell                                     | -    | Cell2                             |   |
| RF Channel Number   |   | -    | 1                                 |   |
| DL CCA model  | Dynamic channel access <sup>Note 1,3</sup>      | -    | As specified in clause A.3.26.2.1 |   |
|   | Semi-static channel access <sup>Note 2,3</sup>  | -    |                                   |   |
| UL CCA model  | Dynamic channel access <sup>Note 1,3</sup>      | -    | As specified in clause A.3.26.2.2 |   |
|   | Semi-static channel access <sup>Note 2,3</sup>  | -    |                                   |   |
| Time offset between cells   |   | -    | 3 $\mu$ s                         | Synchronous cells   |
| N310  |   | -    | 1                                 | Maximum consecutive out-of-sync indications from lower layers |
| N311  |   | -    | 1                                 | Minimum consecutive in-sync indications from lower layers     |
| T310  |   | ms   | 0                                 | Radio link failure timer; T310 is disabled                    |
| T311  |   | ms   | 3000                              | RRC re-establishment timer                                    |
| Access Barring Information  |   | -    | Not Sent                          | No additional delays in random access procedure.              |
| SSB configuration   | Dynamic channel access <sup>Note 1, 3</sup>     | -    | SSB.2 CCA                         | Table A.3.10A.1.2-1   |
|   | Semi-static channel access <sup>Note 2, 3</sup> | -    | SSB.1 CCA                         | Table A.3.10A.1.1-1   |
| DBT window configuration  |   | -    | DBT.1                             | Table A.3.28.1-1  |
| SMTC configuration  |   | -    | SMTC pattern 1                    |   |
| DRX cycle length  |   | s    | OFF                               |   |
| PRACH configuration   |   | -    | FR1 PRACH configuration 1         | Table A.3.8A.2.1-1  |
| T1  |   | s    | 5                                 |   |
| T2  |   | ms   | 6                                 | Time for the UE to detect RLF                                 |
| T3  |   | s    | 3                                 |   |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |      |                                   |   |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |      |                                   |   |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |      |                                   |   |

**Table A.11.2.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter  | Unit          | Cell 1   |           |           | Cell 2   |           |               |
|--|---------------|--|-----------|-----------|--|-----------|---------------|
|  |               | T1   | T2        | T3        | T1   | T2        | T3            |
| TDD configuration  |               | TDDConf.1.1 CCA                                |           |           | TDDConf.1.1 CCA                                |           |               |
| DL CCA probability<br>$P_{CCA\_DL}$ for dynamic<br>channel access <sup>Note</sup><br>4,6   | -             | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |           |           | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |           |               |
| DL CCA probability<br>$P_{CCA\_DL}$ for semi-<br>static channel access<br><sup>Note</sup> 5,6  | -             | $P_{CCA\_DL}=0.9375$                           |           |           | $P_{CCA\_DL}=0.9375$                           |           |               |
| UL CCA probability<br>$P_{CCA\_UL}$  | -             | 1  |           |           | 1  |           |               |
| PDSCH RMC<br>configuration   |               | SR.1.1 CCA                                     |           |           | SR.1.1 CCA                                     |           |               |
| RMSI CORESET<br>RMC configuration  |               | CR.1.1 CCA                                     |           |           | CR.1.1 CCA                                     |           |               |
| Dedicated CORESET<br>RMC configuration   |               | CCR.1.1 CCA                                    |           |           | CCR.1.1 CCA                                    |           |               |
| OCNG Pattern   |               | OP.1 defined in A.3.2.1                        |           |           | OP.1 defined in A.3.2.1                        |           |               |
| TRS configuration  |               | TRS.1.2 TDD                                    |           |           | N/A  |           |               |
| Initial DL BWP<br>configuration  |               | DLBWP.0.1                                      |           |           | DLBWP.0.1                                      |           |               |
| Initial UL BWP<br>configuration  |               | ULBWP.0.1                                      |           |           | ULBWP.0.1                                      |           |               |
| Active DL BWP<br>configuration   |               | DLBWP.<br>1.1                                  | N/A       | N/A       | N/A  | N/A       | DLBW<br>P.1.1 |
| Active UL BWP<br>configuration   |               | ULBWP.<br>1.1                                  | N/A       | N/A       | N/A  | N/A       | ULBW<br>P.1.1 |
| RLM-RS   |               | SSB  |           |           | SSB  |           |               |
| $\hat{E}_s/I_{ot}$   | dB            | 4  | -infinity | -infinity | -infinity                                      | -infinity | 4             |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | -95  |           |           |  |           |               |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | -98  |           |           |  |           |               |
| $\hat{E}_s/N_{oc}$   | dB            | 7  | -infinity | -infinity | -infinity                                      | -infinity | 4             |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | -91  | -infinity | -infinity | -infinity                                      | -infinity | -91           |
| $I_o$  | dBm/38.16 MHz | -58.50   | -63.94    | -63.94    | -63.94   | -63.94    | -58.50        |
| Propagation<br>Condition   |               | AWGN   |           |           |  |           |               |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |               |  |           |           |  |           |               |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |               |  |           |           |  |           |               |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |               |  |           |           |  |           |               |
| NOTE 4: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |               |  |           |           |  |           |               |
| NOTE 5: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |               |  |           |           |  |           |               |
| NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.  |               |  |           |           |  |           |               |

**A.11.2.2.1.3.2 Test Requirements**

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than  $1350 + \text{MAX}(800 \text{ ms}, (10 + K_1) \times 20) \text{ ms}$ .

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish\_delay\_CCA} = T_{UE\_re-establish\_delay\_CCA} + T_{UL\_grant}$$

Where:

$T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$\begin{aligned} T_{UE\_re-establish\_delay\_CCA} &= 50 \text{ ms} + T_{identify\_intra\_NR\_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify\_inter\_NR\_CCA,i} + T_{SI-NR\_CCA} \\ &+ T_{PRACH\_CCA} \end{aligned}$$

Where,

$$N_{freq} = 1$$

$$T_{identify\_intra\_NR} = \text{MAX}(800 \text{ ms}, (10 + K_1) \times T_{SMTC}), \text{ where}$$

$K_1$  is the number of SMTC occasions not available at the UE due to DL CCA failures during RRC re-establishment period on the carrier with CCA.

$T_{SMTC}$  is the SMTC periodicity which is 20 ms.

$$T_{identify\_inter\_NR\_CCA} = 0 \text{ ms}$$

$T_{SI-NR\_CCA} = 1280 \text{ ms}$ ; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

$$T_{PRACH\_CCA} = (1 + K_3) \times T_{SSB,RO} + 10 \text{ ms}, \text{ where:}$$

- $T_{SSB,RO}$  is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [39]. It is 10 ms for FR1 PRACH configuration 1 under CCA.
- $K_3 = 0$ .

This gives total  $T_{UE\_re-establish\_delay\_CCA} = 1350 + \text{MAX}(800 \text{ ms}, (10 + K_1) \times 20) \text{ ms}$ .

#### A.11.2.2.1.4 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA

##### A.11.2.2.1.4.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay requirement for RRC re-establishment from NR FR1 carrier without CCA to NR FR1 inter-frequency carrier under CCA with unknown target cell. These tests will verify the requirements in clause 6.2.1A.

The test parameters are given in table A.11.2.2.1.4.1-1, table A.11.2.2.1.4.1-2 and table A.11.2.2.1.4.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

**Table A.11.2.2.1.4.1-1: Supported test configurations inter-frequency RRC re-establishment from NR FR1 without under CCA to NR FR1 inter-frequency carrier under CCA**

| Configuration  | Source cell without CCA               | Target cell with CCA                  |
|--|---------------------------------------|---------------------------------------|
| 1  | 15 kHz SSB SCS, 10 MHz bandwidth, FDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 2  | 15 kHz SSB SCS, 10 MHz bandwidth, TDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 3  | 30 kHz SSB SCS, 40 MHz bandwidth, TDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations |                                       |                                       |

**Table A.11.2.2.1.4.1-2: General test parameters for NR inter-frequency RRC Re-establishment test case from NR FR1 carrier without CCA to NR FR1 intrer-frequency carrier under CCA**

| Parameter   |  | Unit | Value                                   | Comment   |
|---|--|------|---|---|
| Initial condition   | Active cell                                    |      | Cell1                                   |   |
|   | Neighbour cells                                |      | Cell2                                   |   |
| Final condition   | Active cell                                    |      | Cell2                                   |   |
| RF Channel Number   |  |      | 1, 2                                    |   |
| Time offset between cells   |  |      | 3 $\mu$ s                               | Synchronous cells   |
| DL CCA model  | Dynamic channel access <sup>Note 1,3</sup>     | -    | As specified in clause A.3.26.2.1       |   |
|   | Semi-static channel access <sup>Note 2,3</sup> | -    |   |   |
| UL CCA model  | Dynamic channel access <sup>Note 1,3</sup>     | -    | As specified in clause A.3.26.2.2       |   |
|   | Semi-static channel access <sup>Note 2,3</sup> | -    |   |   |
| N310  |  | -    | 1                                       | Maximum consecutive out-of-sync indications from lower layers |
| N311  |  | -    | 1                                       | Minimum consecutive in-sync indications from lower layers     |
| T310  |  | ms   | 0                                       | Radio link failure timer; T310 is disabled                    |
| T311  |  | ms   | 5000                                    | RRC re-establishment timer                                    |
| Access Barring Information  |  | -    | Not Sent                                | No additional delays in random access procedure.              |
| DRX cycle length  |  | s    | OFF                                     |   |
| PRACH configuration   |  |      | FR1 PRACH configuration 1               | Table A.3.8A.2.1-1  |
| T1  |  | s    | 5                                       |   |
| T2  |  | ms   | 480                                     | Time for the UE to detect RLF                                 |
| T3  |  | s    | $\geq T_{UE\_re-establish\_delay\_CCA}$ | As defined in clause 6.2.1A                                   |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |  |      |   |   |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |  |      |   |   |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |  |      |   |   |

**Table A.11.2.2.1.4.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case from NR FR1 carrier without CCA to NR FR1 intrer-frequency carrier under CCA**

| Parameter  |                            | Test config | Unit          | Cell 1                  |           |           | Cell 2                  |           |            |
|--|----------------------------|-------------|---------------|-------------------------|-----------|-----------|-------------------------|-----------|------------|
|  |                            |             |               | T1                      | T2        | T3        | T1                      | T2        | T3         |
| TDD configuration  |                            | 1           |               | N/A                     |           |           | TDDConf.1.1.CCA         |           |            |
|  |                            | 2           |               | TDDConf.1.1             |           |           | TDDConf.1.1.CCA         |           |            |
|  |                            | 3           |               | TDDConf.2.1             |           |           | TDDConf.1.1.CCA         |           |            |
| PDSCH RMC configuration  |                            | 1           |               | SR.1.1 FDD              |           |           | SR.1.1 CCA              |           |            |
|  |                            | 2           |               | SR.1.1 TDD              |           |           | SR.1.1 CCA              |           |            |
|  |                            | 3           |               | SR.2.1 TDD              |           |           | SR.1.1 CCA              |           |            |
| RMSI CORESET RMC configuration   |                            | 1           |               | CR.1.1 FDD              |           |           | CR.1.1 CCA              |           |            |
|  |                            | 2           |               | CR.1.1 TDD              |           |           | CR.1.1 CCA              |           |            |
|  |                            | 3           |               | CR.2.1 TDD              |           |           | CR.1.1 CCA              |           |            |
| Dedicated CORESET RMC configuration  |                            | 1           |               | CCR.1.1 FDD             |           |           | CCR.1.1 CCA             |           |            |
|  |                            | 2           |               | CCR.1.1 TDD             |           |           | CCR.1.1 CCA             |           |            |
|  |                            | 3           |               | CCR.2.1 TDD             |           |           | CCR.1.1 CCA             |           |            |
| OCNG Pattern   |                            | 1           |               | OP.1 defined in A.3.2.1 |           |           | OP.1 defined in A.3.2.1 |           |            |
| TRS configuration  |                            | 1           |               | TRS.1.1 FDD             |           |           | TRS.1.2 TDD             |           |            |
|  |                            | 2           |               | TRS.1.1 TDD             |           |           | TRS.1.2 TDD             |           |            |
|  |                            | 3           |               | TRS.1.2 TDD             |           |           | TRS.1.2 TDD             |           |            |
| SMTC configuration   |                            | 1,2,3       |               | SMTC.1                  |           |           | SMTC.1                  |           |            |
| SSB configuration  | Semi- static channel acces | 1,2         |               | SSB.1 FR1               |           |           | SSB.1 CCA               |           |            |
|  | Semi- static channel acces | 3           |               | SSB.2 FR1               |           |           | SSB.1 CCA               |           |            |
|  | Dymamic channel acces      | 1,2         |               | SSB.1 FR1               |           |           | SSB.2 CCA               |           |            |
|  | Dymamic channel acces      | 3           |               | SSB.2 FR1               |           |           | SSB.2 CCA               |           |            |
| Initial DL BWP configuration   |                            | 1,2,3       |               | DLBWP.0.1               |           |           | DLBWP.0.1               |           |            |
| Initial UL BWP configuration   |                            | 1,2,3       |               | ULBWP.0.1               |           |           | ULBWP.0.1               |           |            |
| Active DL BWP configuration  |                            | 1,2,3       |               | DLBWP.1.1               | N/A       | N/A       | N/A                     | N/A       | DLBW P.1.1 |
| Active UL BWP configuration  |                            | 1,2,3       |               | ULBWP.1.1               | N/A       | N/A       | N/A                     | N/A       | ULBW P.1.1 |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )  |                            | 1,2,3       |               | N/A                     | N/A       | N/A       | 1                       | 1         | 0.9375     |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_1}$ )  |                            | 1,2,3       |               | N/A                     | N/A       | N/A       | 1                       | 1         | 0.75       |
| DL CCA probability for for dynamic static channel access ( $P_{CCA\_DL\_2}$ )  |                            | 1,2,3       |               | N/A                     | N/A       | N/A       | 1                       | 1         | 0.75       |
| UL CCA probability ( $P_{CCA\_UL}$ )   |                            | 1,2,3       |               | N/A                     | N/A       | N/A       | 1                       | 1         | 1          |
| RLM-RS   |                            | 1,2,3       |               | SSB                     |           |           | SSB                     |           |            |
| $\hat{E}_s/I_{ot}$   |                            | 1,2,3       | dB            | 4                       | -infinity | -infinity | -infinity               | -infinity | 7          |
| $N_{oc}$ Note2   |                            | 1,2,3       | dBm/15 KHz    | -98                     |           |           |                         |           |            |
| $N_{oc}$ Note2   |                            | 1,2         | dBm/SCS       | -98                     |           |           |                         |           |            |
|  |                            | 3           |               | -95                     |           |           |                         |           |            |
| $\hat{E}_s/N_{oc}$   |                            | 1,2,3       | dB            | 4                       | -infinity | -infinity | -infinity               | -infinity | 7          |
| SS-RSRP Note3  |                            | 1, 2        | dBm/SCS       | -94                     | -infinity | -infinity | -infinity               | -infinity | -91        |
|  |                            | 3           |               | -91                     | -infinity | -infinity | -infinity               | -infinity | -88        |
| Io   |                            | 1,2         | dBm/9.36 MHz  | -64.59                  | -70.05    | -70.05    | -70.05                  | -70.05    | -62.26     |
|  |                            | 3           | dBm/38.16 MHz | -58.50                  | -63.94    | -63.94    | -63.94                  | -63.94    | -56.15     |
| Propagation Condition  |                            | 1,2,3       |               | AWGN                    |           |           |                         |           |            |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                            |             |               |                         |           |           |                         |           |            |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                            |             |               |                         |           |           |                         |           |            |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                            |             |               |                         |           |           |                         |           |            |
| Note 4: Parameters $P_{CCA\_DL}$ , $P_{CCA\_DL\_1}$ , $P_{CCA\_DL\_2}$ and $P_{CCA\_UL}$ are defined in clause A.3.20.2.   |                            |             |               |                         |           |           |                         |           |            |
| Note 5: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |                            |             |               |                         |           |           |                         |           |            |

#### A.11.2.2.1.4.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less  $T_{UE\_re-establish\_delay\_CCA}$ .

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish\_delay\_CCA} = T_{UE\_re-establish\_delay\_CCA} + T_{UL\_grant}$$

Where:

$T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay\_CCA} = 50 \text{ ms} + T_{identify\_intra\_NR\_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify\_inter\_NR\_CCA,i} + T_{SI-NR\_CCA} + T_{PRACH\_CCA}$$

$$N_{freq} = 2$$

$$T_{identify\_intra\_NR\_CCA} = \text{MAX} (800 \text{ ms}, (10+ K_1) \times 20) \text{ ms}$$

$$T_{identify\_inter\_NR\_CCA} = \text{MAX} (800 \text{ ms}, ([13]+K_{2,2}) \times 20) \text{ ms}$$

$T_{SI} = 1280$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

$T_{PRACH\_CCA}$  = It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell.  
 $T_{PRACH\_CCA} = (1+ K_3) \times T_{SSB,RO} + 10$  ms; where  $K_3=0$  and  $T_{SSB,RO}=10$  ms for FR1 PRACH configuration 1 under CCA.

$K_1$  is the number of SMTC occasions not available at the UE due during RRC re-establishment period on the carrier with CCA and with RF channel number # 1.

$K_{2,2}$  is the number of SMTC occasions not available at the UE during RRC re-establishment period on the carrier with CCA and with RF channel number # 2.

This gives total  $T_{UE\_re-establish\_delay\_CCA}=1350+\text{MAX} (800 \text{ ms}, (10+ K_1) \times 20) \text{ ms}+\text{MAX} (800 \text{ ms}, ([13]+K_{2,2}) \times 20) \text{ ms}$ .

### A.11.2.2.2 Random Access

#### A.11.2.2.2.1 4-step RA type contention-based random access for NR PCell with CCA

##### A.11.2.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 6.2.2A.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.1.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.1.1-2.



**Table A.11.2.2.1.1-1: Supported test configurations for contention based random access test for FR1 PCell with CCA**

| <b>Config</b> | <b>Description</b>                                   |
|---------------|--|
| 1             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:         | Void   |

**Table A.11.2.2.1.1-2: General test parameters for contention based random access test for FR1 PCell with CCA**

| Parameter   |                      | Unit     | Test-1                     | Comments                            |  |
|---|----------------------|----------|----------------------------|-------------------------------------|--|
| SSB Configuration   | Note 4, 6            | Config 1 | SSB.3 CCA                  | As defined in A.3.10A               |  |
|   | Note 5, 6            | Config 1 | SSB.4 CCA                  | As defined in A.3.10A               |  |
| DBT Window Configuration                                      |                      | Config 1 | DBT.1                      | As specified in A.3.28.1            |  |
| DL CCA model  |                      | Config 1 | As specified in A.3.26.2.1 |                                     |  |
| UL CCA model  |                      | Config 1 | As specified in A.3.26.2.2 |                                     |  |
| Duplex Mode for Cell 2  |                      | Config 1 | TDD                        |                                     |  |
| TDD Configuration   |                      | Config 1 | TDDConf.1.1 CCA            |                                     |  |
| OCNG Pattern <sup>Note 1</sup>                                |                      |          | OCNG pattern 1             | As defined in A.3.2.1.              |  |
| PDSCH parameters <sup>Note 3</sup>                            |                      | Config 1 | SR.1.1 CCA                 | As defined in A.3.1A.1.             |  |
| NR RF Channel Number  |                      |          | 1                          |                                     |  |
| EPRE ratio of PSS to SSS                                      |                      | dB       | 0                          |                                     |  |
| EPRE ratio of PBCH_DMRS to SSS                                |                      | dB       |                            |                                     |  |
| EPRE ratio of PBCH to PBCH_DMRS                               |                      | dB       |                            |                                     |  |
| EPRE ratio of PDCCH_DMRS to SSS                               |                      | dB       |                            |                                     |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                             |                      | dB       |                            |                                     |  |
| EPRE ratio of PDSCH_DMRS to SSS                               |                      | dB       |                            |                                     |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                             |                      | dB       |                            |                                     |  |
| SSB with index 0  | $\hat{E}_s / I_{ot}$ |          | dB                         | 3                                   | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                  | -101                                |  |
|   | $\hat{E}_s / N_{oc}$ |          | dB                         | 3                                   |  |
|   | SS-RSRP              |          | dBm/ SCS                   | -95                                 |  |
| SSB with index 1  | $\hat{E}_s / I_{ot}$ |          | dB                         | -17                                 | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                  | -101                                |  |
|   | $\hat{E}_s / N_{oc}$ |          | dB                         | -17                                 |  |
|   | SS-RSRP              |          | dBm/ SCS                   | -115                                |  |
| $I_o$ <sup>Note 2</sup>                                       |                      | Config 1 | dBm                        | -62.2/38.16MHz                      | For symbols without SSB index 1  |
| ss-PBCH-BlockPower  |                      |          | dBm/ SCS                   | -5                                  | As defined in clause 6.3.2 in TS 38.331 [2].                                     |
| Configured UE transmitted power ( $P_{CMAX,f,c}$ )            |                      |          | dBm                        | 23                                  | As defined in clause 6.2.4 in TS 38.101-1.                                       |
| PRACH Configuration   |                      |          |                            | FR1 PRACH configuration 1 under CCA | As defined in A.3.8A.2.  |
| DL CCA probability  | Note 4, 6            |          |                            | 0.9375                              |  |
| $P_{CCA\_DL}$   | Note 5, 6            |          |                            | 0.75 / 0.75                         |  |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                               |                      |          |                            | 4                                   |  |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                               |                      |          |                            | Inf                                 |  |
| UL CCA probability  | Note 4, 6            |          |                            | 0.87                                |  |
| $P_{CCA\_UL}$   | Note 5, 6            |          |                            | 0.75                                |  |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                               |                      |          |                            | 5                                   |  |
| $W_{CCA\_UL}$ <sup>Note 8</sup>                               |                      |          |                            | Inf                                 |  |
| Semi-static channel access config period <sup>Note 4, 6</sup> |                      | ms       |                            | 2                                   |  |
| Propagation Condition   |                      | -        |                            | AWGN                                |  |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |
| Note 2: | SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.   |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |
| Note 7: | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |
| Note 8: | A window $W_{CCA\_DL}=W_{CCA\_UL}=\text{Inf}$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.  |

#### A.11.2.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.11.2.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2A.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*, if the UL CCA is successful.

The three requirements below are relevant for all cases of PRACH transmissions described within the whole clause A.11.2.2.2.1.2:

- The System Simulator shall implement the UL CCA model of A.3.26.2 for the RACH occasions where PRACH transmissions are expected. The System Simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
- In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.11.2.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 transmission is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.11.2.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.11.2.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2A.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

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

#### A.11.2.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2A.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### A.11.2.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2A.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

The UE shall send ACK if the Contention Resolution is successful.

#### A.11.2.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2A.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

### A.11.2.2.2.2 4-step RA type non-contention based random access for NR PSCell with CCA

#### A.11.2.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 6.2.2A.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.1-2.

**Table A.11.2.2.2.1-1: Supported test configurations for non-contention based random access test for FR1 PCell with CCA**

| <b>Config</b> | <b>Description</b>                                   |
|---------------|--|
| 1             | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:         | Void.  |

**Table A.11.2.2.2.1-2: General test parameters for non-contention based random access test for FR1 PCell with CCA**

| Parameter   |                      | Unit     | Test-1                              | Comments                                     |  |
|---|----------------------|----------|-------------------------------------|--|--|
| SSB Configuration   | Note 4, 6            | Config 1 | SSB.3 CCA                           | As defined in A.3.10A                        |  |
|   | Note 5, 6            | Config 1 | SSB.4 CCA                           | As defined in A.3.10A                        |  |
| DBT Window Configuration                                      |                      | Config 1 | DBT.1                               | As specified in A.3.28.1                     |  |
| DL CCA model  |                      | Config 1 | As specified in A.3.26.2.1          |  |  |
| UL CCA model  |                      | Config 1 | As specified in A.3.26.2.2          |  |  |
| Duplex Mode for Cell 2  |                      | Config 1 | TDD                                 |  |  |
| TDD Configuration   |                      | Config 1 | TDDConf.1.1 CCA                     |  |  |
| OCNG Pattern <sup>Note 1</sup>                                |                      |          | OCNG pattern 1                      | As defined in A.3.2.1.                       |  |
| PDSCH parameters <sup>Note 3</sup>                            |                      | Config 1 | SR.1.1 CCA                          | As defined in A.3.1A.1.                      |  |
| NR RF Channel Number  |                      |          | 1                                   |  |  |
| EPRE ratio of PSS to SSS                                      |                      | dB       | 0                                   |  |  |
| EPRE ratio of PBCH_DMRS to SSS                                |                      | dB       |                                     |  |  |
| EPRE ratio of PBCH to PBCH_DMRS                               |                      | dB       |                                     |  |  |
| EPRE ratio of PDCCH_DMRS to SSS                               |                      | dB       |                                     |  |  |
| EPRE ratio of PDCCH to PDCCH_DMRS                             |                      | dB       |                                     |  |  |
| EPRE ratio of PDSCH_DMRS to SSS                               |                      | dB       |                                     |  |  |
| EPRE ratio of PDSCH to PDSCH_DMRS                             |                      | dB       |                                     |  |  |
| SSB with index 0  | $\hat{E}_s / I_{ot}$ |          | dB                                  | 3  | Power of SSB with index 0 is set to be above configured <i>rsrp-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                           | -101   |  |
|   | $\hat{E}_s / N_{oc}$ |          | dB                                  | 3  |  |
|   | SS-RSRP              |          | dBm/SCS                             | -95  |  |
| SSB with index 1  | $\hat{E}_s / I_{ot}$ |          | dB                                  | -17  | Power of SSB with index 1 is set to be below configured <i>rsrp-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                           | -101   |  |
|   | $\hat{E}_s / N_{oc}$ |          | dB                                  | -17  |  |
|   | SS-RSRP              |          | dBm/SCS                             | -115   |  |
| $I_0$ <sup>Note 2</sup>                                       |                      | Config 1 | dBm                                 | -62.2/38.16MHz                               | For symbols without SSB index 1  |
| ss-PBCH-BlockPower  |                      | dBm/SCS  | -5                                  | As defined in clause 6.3.2 in TS 38.331 [2]. |  |
| Configured UE transmitted power ( $P_{CMAX, f, c}$ )          |                      | dBm      | 23                                  | As defined in clause 6.2.4 in TS 38.101-1.   |  |
| PRACH Configuration   |                      |          | FR1 PRACH configuration 2 under CCA | As defined in A.3.8A.2.                      |  |
| DL CCA probability  | Note 4, 6            |          | 0.9375                              |  |  |
| $P_{CCA\_DL}$   | Note 5, 6            |          | 0.75 / 0.75                         |  |  |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                               |                      |          | 4                                   |  |  |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                               |                      |          | Inf                                 |  |  |
| UL CCA probability  | Note 4, 6            |          | 0.87                                |  |  |
| $P_{CCA\_UL}$   | Note 5, 6            |          | 0.75                                |  |  |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                               |                      |          | 5                                   |  |  |
| $W_{CCA\_UL}$ <sup>Note 8</sup>                               |                      |          | Inf                                 |  |  |
| Semi-static channel access config period <sup>Note 4, 6</sup> |                      | ms       | 2                                   |  |  |
| Propagation Condition   |                      | -        | AWGN                                |  |  |



|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |
| Note 2: | SS-RSRP, Es/lot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.   |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |
| Note 7: | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |
| Note 8: | A window $W_{CCA\_DL}=W_{CCA\_UL}=\text{Inf}$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.  |

#### A.11.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.11.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2A.2.2.1 for SSB-based Random Access Preamble transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

The three requirements below are relevant for all cases of PRACH transmissions described within the clause A.11.2.2.2.2:

- The System Simulator shall implement the UL CCA model of A.3.26.2 for the RACH occasions where PRACH transmissions are expected. The System Simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.
- In case of UL CCA failure The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.11.2.2.2.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2A.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.11.2.2.2.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2A.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of Random Access Response.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.2. The power of the first preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.11.2.2.2.3 2-step RA type contention-based random access for NR PCell with CCA

##### A.11.2.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 6.2.2A.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.3.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.3.1-2.

**Table A.11.2.2.2.3.1-1: Supported test configurations for 2-step RA type contention based random access with successRAR test for FR1 PCell with CCA**

| Config | Description  |
|--------|--|
| 1      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | Void.  |

**Table A.11.2.2.3.1-2: General test parameters for 2-step RA type contention based random access with successRAR test for FR1 PCell with CCA**

| Parameter   |                      | Unit     | Test-1                             | Comments   |   |
|---|----------------------|----------|------------------------------------|--|---|
| SSB Configuration   | Note 4, 6            | Config 1 | SSB.3 CCA                          | As defined in A.3.10A  |   |
|   | Note 5, 6            | Config 1 | SSB.4 CCA                          | As defined in A.3.10A  |   |
| DBT Window Configuration                                      |                      | Config 1 | DBT.1                              | As specified in A.3.28.1   |   |
| DL CCA model  |                      | Config 1 | As specified in A.3.26.2.1         |  |   |
| UL CCA model  |                      | Config 1 | As specified in A.3.26.2.2         |  |   |
| Duplex Mode for Cell 2  |                      | Config 1 | TDD                                |  |   |
| TDD Configuration   |                      | Config 2 | TDDConf.1.1 CCA                    |  |   |
| OCNG Pattern <sup>Note 1</sup>                                |                      |          | OCNG pattern 1                     | As defined in A.3.2.1.   |   |
| PDSCH parameters <sup>Note 3</sup>                            |                      | Config 1 | SR.1.1 CCA                         | As defined in A.3.1A.1.  |   |
| NR RF Channel Number  |                      |          | 1                                  |  |   |
| EPRE ratio of PSS to SSS                                      |                      | dB       | 0                                  |  |   |
| EPRE ratio of PBCH_DMRS to SSS                                |                      | dB       |                                    |  |   |
| EPRE ratio of PBCH to PBCH_DMRS                               |                      | dB       |                                    |  |   |
| EPRE ratio of PDCCH_DMRS to SSS                               |                      | dB       |                                    |  |   |
| EPRE ratio of PDCCH to PDCCH_DMRS                             |                      | dB       |                                    |  |   |
| EPRE ratio of PDSCH_DMRS to SSS                               |                      | dB       |                                    |  |   |
| EPRE ratio of PDSCH to PDSCH_DMRS                             |                      | dB       |                                    |  |   |
| SSB with index 0  | $\hat{E}_s / I_{ot}$ |          | dB                                 | 3  | Power of SSB with index 0 is set to be above configured <i>msgA-RSRP-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                          | -101   |   |
|   | $\hat{E}_s / N_{oc}$ |          | dB                                 | 3  |   |
|   | SS-RSRP              |          | dBm/ SCS                           | -95  |   |
| SSB with index 1  | $\hat{E}_s / I_{ot}$ |          | dB                                 | -17  | Power of SSB with index 1 is set to be below configured <i>msgA-RSRP-ThresholdSSB</i> |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                          | -101   |   |
|   | $\hat{E}_s / N_{oc}$ |          | dB                                 | -17  |   |
|   | SS-RSRP              |          | dBm/ SCS                           | -115   |   |
| $I_0$ <sup>Note 2</sup>                                       |                      | Config 1 | dBm                                | -62.2/38.16MHz   | For symbols without SSB index 1   |
| ss-PBCH-BlockPower  |                      | dBm/ SCS | -5                                 | As defined in clause 6.3.2 in TS 38.331 [2].                               |   |
| Configured UE transmitted power ( $P_{CMAX,f,c}$ )            |                      | dBm      | 23                                 | As defined in clause 6.2.4 in TS 38.101-1.                                 |   |
| MsgA Configuration  |                      |          | FR1 MsgA configuration 1 under CCA | As defined in A.3.20A.2.   |   |
| <i>msgA-RSRP-ThresholdSSB</i>                                 |                      | dBm      | RSRP_51                            | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |   |
| DL CCA probability $P_{CCA\_DL}$                              | Note 4, 6            |          | 0.9375                             |  |   |
|   | Note 5, 6            |          | 0.75 / 0.75                        |  |   |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                               |                      |          | 4                                  |  |   |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                               |                      |          | Inf                                |  |   |
| UL CCA probability $P_{CCA\_UL}$                              | Note 4, 6            |          | 0.87                               |  |   |
|   | Note 5, 6            |          | 0.75                               |  |   |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                               |                      |          | 5                                  |  |   |
| $W_{CCA\_UL}$ <sup>Note 8</sup>                               |                      |          | Inf                                |  |   |
| Semi-static channel access config period <sup>Note 4, 6</sup> |                      | ms       | 2                                  |  |   |
| Propagation Condition   |                      | -        | AWGN                               |  |   |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |
| Note 2: | SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.   |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |
| Note 7: | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |
| Note 8: | A window $W_{CCA\_DL}=W_{CCA\_UL}=Inf$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.   |

#### A.11.2.2.3.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

##### A.11.2.2.3.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2A.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*, if the UL CCA is successful.

The three requirements below are relevant for all cases of MsgA transmissions described within the clause A.11.2.2.3.2:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.
- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble transmission shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.11.2.2.3.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2A.3.1.2 the System Simulator shall transmit a MsgB containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB(s) and shall transmit an ACK if the MsgB with a successRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble and if the Contention Resolution is successful and if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting

ACK in the case of CCA UL failure. If ACK transmission is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 if the MsgB with a fallbackRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB(s) contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.11.2.2.2.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.1.3 the System Simulator shall transmit a MsgB containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.11.2.2.2.4 2-step RA type non-contention-based random access for NR PCell with CCA

##### A.11.2.2.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 6.2.2A.3 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1, which operates on a carrier frequency with CCA. Supported test parameters are shown in Table A.11.2.2.2.4.1-1. UE capable of SA with PCell in FR1 needs to be tested by using the parameters in Table A.11.2.2.2.4.1-2.

**Table A.11.2.2.2.4.1-1: Supported test configurations for non-contention based random access test for FR1 PCell with CCA**

| Config | Description  |
|--------|--|
| 1      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | Void.  |

**Table A.11.2.2.4.1-2: General test parameters for non-contention based random access test for FR1 PCell with CCA**

| Parameter   |                      | Unit     | Test-1                             | Comments   |      |
|---|----------------------|----------|------------------------------------|--|------|
| SSB Configuration   | Note 4, 6            | Config 1 | SSB.3 CCA                          | As defined in A.3.10A  |      |
|   | Note 5, 6            | Config 1 | SSB.4 CCA                          | As defined in A.3.10A  |      |
| DBT Window Configuration                                      |                      | Config 1 | DBT.1                              | As specified in A.3.28.1   |      |
| DL CCA model  |                      | Config 1 | As specified in A.3.26.2.1         |  |      |
| UL CCA model  |                      | Config 1 | As specified in A.3.26.2.2         |  |      |
| Duplex Mode for Cell 1  |                      | Config 1 | TDD                                |  |      |
| TDD Configuration   |                      | Config 1 | TDDConf.1.1 CCA                    |  |      |
| OCNG Pattern <sup>Note 1</sup>                                |                      |          | OCNG pattern 1                     | As defined in A.3.2.1.   |      |
| PDSCH parameters <sup>Note 3</sup>                            |                      | Config 1 | SR.1.1 CCA                         | As defined in A.3.1A.1.  |      |
| NR RF Channel Number  |                      |          | 1                                  |  |      |
| EPRE ratio of PSS to SSS                                      |                      | dB       | 0                                  |  |      |
| EPRE ratio of PBCH_DMRS to SSS                                |                      | dB       |                                    |  |      |
| EPRE ratio of PBCH to PBCH_DMRS                               |                      | dB       |                                    |  |      |
| EPRE ratio of PDCCH_DMRS to SSS                               |                      | dB       |                                    |  |      |
| EPRE ratio of PDCCH to PDCCH_DMRS                             |                      | dB       |                                    |  |      |
| EPRE ratio of PDSCH_DMRS to SSS                               |                      | dB       |                                    |  |      |
| EPRE ratio of PDSCH to PDSCH_DMRS                             |                      | dB       |                                    |  |      |
| msgA-RSRP-ThresholdSSB  |                      | dBm      | RSRP_51                            | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].     |      |
| SSB with index 0  | $\hat{E}_s / I_{ot}$ | dB       | 3                                  | Power of SSB with index 0 is set to be above configured msgA-RSRP-ThresholdSSB |      |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                          |  | -101 |
|   | $\hat{E}_s / N_{oc}$ | dB       | 3                                  |  |      |
|   | SS-RSRP              | dBm/ SCS | -95                                |  |      |
| SSB with index 1  | $\hat{E}_s / I_{ot}$ | dB       | -17                                | Power of SSB with index 1 is set to be below configured msgA-RSRP-ThresholdSSB |      |
|   | $N_{oc}$             | Config 1 | dBm/15kHz                          |  | -101 |
|   | $\hat{E}_s / N_{oc}$ | dB       | -17                                |  |      |
|   | SS-RSRP              | dBm/ SCS | -115                               |  |      |
| $I_o$ <sup>Note 2</sup>                                       | Config 1             | dBm      | -62.2/38.16MHz                     | For symbols without SSB index 1  |      |
| ss-PBCH-BlockPower  |                      | dBm/ SCS | -5                                 | As defined in clause 6.3.2 in TS 38.331 [2].                                   |      |
| Configured UE transmitted power ( $P_{CMAX, f, c}$ )          |                      | dBm      | 23                                 | As defined in clause 6.2.4 in TS 38.101-1.                                     |      |
| MsgA Configuration  |                      |          | FR1 MsgA configuration 2 under CCA | As defined in A.3.20A.2.   |      |
| DL CCA probability $P_{CCA\_DL}$                              | Note 4, 6            |          | 0.9375                             |  |      |
|   | Note 5, 6            |          | 0.75 / 0.75                        |  |      |
| $L_{CCA\_DL}$ <sup>Note 7</sup>                               |                      |          | 4                                  |  |      |
| $W_{CCA\_DL}$ <sup>Note 8</sup>                               |                      |          | Inf                                |  |      |
| UL CCA probability $P_{CCA\_UL}$                              | Note 4, 6            |          | 0.87                               |  |      |
|   | Note 5, 6            |          | 0.75                               |  |      |
| $L_{CCA\_UL}$ <sup>Note 7</sup>                               |                      |          | 5                                  |  |      |
| $W_{CCA\_UL}$ <sup>Note 8</sup>                               |                      |          | Inf                                |  |      |
| Semi-static channel access config period <sup>Note 4, 6</sup> |                      | ms       | 2                                  |  |      |
| Propagation Condition   |                      | -        | AWGN                               |  |      |



|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. |
| Note 2: | SS-RSRP, Es/lot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.   |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA\_DL1}$ and the second value corresponds to the $P_{CCA\_DL2}$ .  |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.   |
| Note 7: | $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are chosen such that $preambleTransMax > 5 + L_{CCA\_DL} + L_{CCA\_UL}$ .  |
| Note 8: | A window $W_{CCA\_DL}=W_{CCA\_UL}=\text{Inf}$ is used to indicate that $L_{CCA\_DL}$ and $L_{CCA\_UL}$ are considered during the entire duration of a test run.  |

#### A.11.2.2.4.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### A.11.2.2.4.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2A.3.2.1, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA PRACH on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

The three requirements below are relevant for all cases of MsgA transmissions described within the clause A.11.2.2.4.2:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.
- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated PRACH transmission power in case of UL CCA failure.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

##### A.11.2.2.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2A.3.2.2 the System Simulator shall transmit a MsgB containing a fallbackRAR containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 containing the payload of MsgA PUSCH if the MsgB with a fallbackRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble if UL CCA is successful. The System Simulator shall monitor if the UE is transmitting msg3 when CCA UL failure. If a msg3 is detected on a grant expected to have UL CCA failure, the test is considered as failed. The UE shall monitor contention resolution as described in clause 8.2A in TS 38.213 [3].

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The system simulator shall implement the UL CCA model of A.3.26.2 for the MsgA occasions where MsgA System Simulator transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on a MsgA occasion that is expected to have UL CCA failure, the test is considered as failed.

In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power in case UL CCA failure.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA and msg3 transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.11.2.2.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2A.3.2.3 the System Simulator shall transmit a MsgB containing a successRAR message and a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles. In case of CCA DL failure, the test equipment should delay the transmission of MsgB.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

The System Simulator shall implement the UL CCA model of A.3.26.2 for the MsgA occasions where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on a MsgA occasion that is expected to have UL CCA failure, the test is considered as failed.

In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power in case UL CCA failure.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2A.3. The power of the first MsgA preamble shall be -16 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be  $0.6 + 3(\mu + 2)$  dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where  $\mu$  indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.11.2.2.3 RRC connection release with redirection

#### A.11.2.2.3.1 Redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA

##### A.11.2.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA specified in clause 6.2.3.2.3.

##### A.11.2.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.11.2.2.3.1.2-1. The time delay is tested by using the parameters in table A.11.2.2.3.1.2-2, and A.11.2.2.3.1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

**Table A.11.2.2.3.1.2-1: Redirection from NR to NR test configurations**

| Config | Description  |
|--------|--|
| 1      | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.2.2.3.1.2-2: General test parameters for Redirection from NR to NR test case**

| Parameter   | Unit  | Value  | Comment  |
|---|---|--|--|
| Initial conditions  | Active cell                                     | Cell 1   | On the carrier under CCA   |
|   | Neighbouring cell                               | Cell 2   | On the carrier under CCA   |
| Final condition   | Active cell                                     | Cell 2   | On the carrier under CCA   |
| Filter coefficient  |   | 0  | L3 filtering is not used   |
| Access Barring Information  | -   | Not Sent   | No additional delays in random access procedure.                                   |
| Time offset between cells   |   | 3 $\mu$ s  | Synchronous cells  |
| DL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     | As specified in clause A.3.26.2.1                        |  |
|   | Semi-static channel access <sup>Note 2, 3</sup> |  |  |
| UL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     | As specified in clause A.3.26.2.2                        |  |
|   | Semi-static channel access <sup>Note 2,3</sup>  |  |  |
| T1  | s   | 5  |  |
| T2  | s   | $\geq T_{\text{connection\_release\_redirect\_NR\_CCA}}$ | $T_{\text{connection\_release\_redirect\_NR\_CCA}}$ is defined in clause 6.2.3.2.3 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |  |  |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |  |  |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |  |  |

**Table A.11.2.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter  |                  | Unit         | Cell 1   |        | Cell 2   |        |
|--|------------------|--------------|--|--------|--|--------|
|  |                  |              | T1   | T2     | T1   | T2     |
| NR RF Channel Number   |                  |              | 1  |        | 2  |        |
| P <sub>CCA_DL</sub> for dynamic channel access <small>Note 4,6</small>     |                  | -            | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |        | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |        |
| P <sub>CCA_DL</sub> for semi-static channel access <small>Note 5,6</small> |                  | -            | P <sub>CCA_DL</sub> =0.9375                                |        | P <sub>CCA_DL</sub> =0.9375                                |        |
| P <sub>CCA_UL</sub> for dynamic channel access <small>Note 4,6</small>     |                  | -            | 1  |        | 1  |        |
| P <sub>CCA_UL</sub> for semi-static channel access <small>Note 5,6</small> |                  | -            | 1  |        | 1  |        |
| L <sub>CCA_DL</sub> <small>Note 7</small>                                  |                  |              | N/A  |        | 8  |        |
| W <sub>CCA_DL</sub> <small>Note 7</small>                                  |                  | ms           | N/A  |        | T <sub>Identify-NR_CCA</sub>                               |        |
| TDD configuration  | Config 1         |              | TDDConf.1.1 CCA  |        |  |        |
| BW <sub>channel</sub>  | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |        |  |        |
| BWP BW   | Config 1         |              | 40: N <sub>RB,c</sub> = 106                                |        |  |        |
| DRX Cycle  |                  | ms           | Not Applicable   |        |  |        |
| PDSCH Reference  | Config 1         |              | SR.1.1 CCA   |        |  |        |
| RMSI CORESET Reference Channel   | Config 1         |              | CR.1.1 CCA   |        |  |        |
| Dedicated CORESET RMC configuration  | Config 1         |              | CCR.1.1 CCA  |        |  |        |
| TRS configuration  | Config 1         |              | TRS.1.2 TDD  |        |  |        |
| OCNG Patterns  |                  |              | OP.1   |        |  |        |
| SMTc Configuration   |                  |              | SMTc.1   |        |  |        |
| DBT configuration  |                  |              | DBT.1  |        |  |        |
| SSB configuration for semi-static channel access <small>Note 4, 6</small>  | Config 1         |              | SSB.1 CCA  |        |  |        |
| SSB configuration for dynamic channel access <small>Note 5, 6</small>      | Config 1         |              | SSB.2 CCA  |        |  |        |
| ssb-PositionQCL  | Config 1         |              | [1]  |        |  |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |        |  |        |
| PUCCH/PUSCH subcarrier spacing   | Config 1         | kHz          | 30 kHz   |        |  |        |
| PRACH configuration  |                  |              | FR1 PRACH configuration 1 under CCA                        |        |  |        |
| BWP configuration  | Initial DL BWP   |              | DLBWP.0.1  |        |  |        |
|  | Dedicated DL BWP |              | DLBWP.1.1  |        |  |        |
|  | Initial UL BWP   |              | ULBWP.0.1  |        |  |        |
|  | Dedicated UL BWP |              | ULBWP.1.1  |        |  |        |
| EPRE ratio of PSS to SSS   | dB               |              | 0  |        |  |        |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |        |  |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |        |  |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |        |  |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |              |  |        |  |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |        |  |        |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |        |  |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                     |                  |              |  |        |  |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |              |  |        |  |        |
| N <sub>oc</sub> <small>Note2</small>                                       |                  |              | dBm/15kHz  | -98    |  |        |
| N <sub>oc</sub> <small>Note2</small>                                       | Config 1         | dBm/SCS      | -95  |        |  |        |
| $\hat{E}_s / I_{ot}$   |                  | dB           | 4  | 4      | -infinity  | 4      |
| $\hat{E}_s / N_{oc}$   |                  | dB           | 4  | 4      | -infinity  | 4      |
| Io <sup>Note3</sup>  | Config 1         | dBm/38.16MHz | -58.49   | -58.49 | -63.94   | -58.49 |
| Propagation condition  |                  | -            | AWGN   |        | AWGN   |        |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 6: | For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.  |
| Note 7: | As defined in clause 6.2.3.2.3 for $T_{rs} \leq 40$ ms.  |

### A.11.2.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{\text{connection\_release\_redirect\_NR\_CCA}}$  ms from the beginning of time period T2, where  $T_{\text{connection\_release\_redirect\_NR\_CCA}}$  is defined in clause 6.2.3.2.3.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{\text{connection\_release\_redirect\_NR\_CCA}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-NR\_CCA}} + T_{\text{SI-NR\_CCA}} + T_{\text{RACH\_CCA}},$$

where:

$T_{\text{RRC\_procedure\_delay}} = 110$  ms in the test.

$T_{\text{identify-NR\_CCA}} = \text{MAX}(680 \text{ ms}, (L_1+11) \times 20 \text{ ms})$  in the test.

$T_{\text{SI-NR}} = 1280$  ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

$T_{\text{RACH\_CCA}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell.

$L_1$  is the number of SMTC occasions not available at the UE due to DL CCA failures. The test equipment ensure that number of  $L_1$  in target cell does not exceed  $L_{1,\text{max}}$  using the configured  $L_{\text{CCA\_DL}}$  as in clause A.3.26.2.1;

### A.11.2.2.3.2 Redirection from NR FR1 carrier without CCA to NR FR1 carrier with CCA

#### A.11.2.2.3.2.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR FR1 carrier without CCA to NR FR1 carrier with CCA specified in clause 6.2.3.2.3.

#### A.11.2.2.3.2.2 Test Parameters

Supported test configurations are shown in table A.11.2.2.3.2.2-1. The time delay is tested by using the parameters in table A.11.2.2.3.2.2-2, and A.11.2.2.3.2.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

**Table A.11.2.2.3.2.2-1: Redirection from NR to NR test configurations**

| Configuration | Source cell without CCA  | Target cell with CCA                  |
|---------------|--|---------------------------------------|
| 1             | 15 kHz SSB SCS, 10 MHz bandwidth, FDD  | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 2             | 15 kHz SSB SCS, 10 MHz bandwidth, TDD  | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 3             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD  | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| Note:         | The UE is only required to be tested in one of the supported test configurations |                                       |

**Table A.11.2.3.2.2-2: General test parameters for Redirection from NR to NR test case**

| Parameter   |   | Unit | Value  | Comment  |
|---|---|------|--|--|
| Initial conditions  | Active cell                                     |      | Cell 1   | On the carrier without CCA   |
|   | Neighbouring cell                               |      | Cell 2   | On the carrier under CCA   |
| Final condition   | Active cell                                     |      | Cell 2   | On the carrier under CCA   |
| Filter coefficient  |   |      | 0  | L3 filtering is not used   |
| Access Barring Information  |   | -    | Not Sent   | No additional delays in random access procedure.                                   |
| Time offset between cells   |   |      | 3 $\mu$ s  | Synchronous cells  |
| DL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.26.2.1                        |  |
|   | Semi-static channel access <sup>Note 2, 3</sup> |      |  |  |
| UL CCA model  | Dynamic channel access <sup>Note 1, 3</sup>     |      | As specified in clause A.3.26.2.2                        |  |
|   | Semi-static channel access <sup>Note 2,3</sup>  |      |  |  |
| T1  |   | s    | 5  |  |
| T2  |   | s    | $\geq T_{\text{connection\_release\_redirect\_NR\_CCA}}$ | $T_{\text{connection\_release\_redirect\_NR\_CCA}}$ is defined in clause 6.2.3.2.3 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.                               |   |      |  |  |
| NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.                       |   |      |  |  |
| NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |      |  |  |

**Table A.11.2.3.2.2-3: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter | Unit | Cell 1 |    | Cell 2 |    |
|-----------|------|--------|----|--------|----|
|           |      | T1     | T2 | T1     | T2 |
|           |      |        |    |        |    |

| NR RF Channel Number   |                           |            | 1   | 2  |
|--|---------------------------|------------|---|--|
| P <sub>CCA_DL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                           |            | N/A   | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |
| P <sub>CCA_DL</sub> for semi-static channel access <sup>Note 5,6</sup> |                           |            | N/A   | P <sub>CCA_DL</sub> =0.9375                                |
| P <sub>CCA_UL</sub> for dynamic channel access <sup>Note 4,6</sup>     |                           |            | N/A   | 1  |
| P <sub>CCA_UL</sub> for semi-static channel access <sup>Note 5,6</sup> |                           |            | N/A   | 1  |
| L <sub>CCA_DL</sub> <sup>Note 7</sup>                                  |                           |            | N/A   | 8  |
| W <sub>CCA_DL</sub> <sup>Note 7</sup>                                  |                           |            | N/A   | T <sub>identify-NR_CCA</sub>                               |
| Duplex mode  | Config 1                  |            | FDD   | TDD  |
|  | Config 2,3                |            | TDD   |  |
| TDD configuration  | Config 1                  |            | Not Applicable  | TDDConf.1.1 CCA  |
|  | Config 2                  |            | TDDConf.1.1   | TDDConf.1.1 CCA  |
|  | Config 3                  |            | TDDConf.2.1   | TDDConf.1.1 CCA  |
| BW <sub>channel</sub>  | Config 1                  | MHz        | 10: N <sub>RB,c</sub> = 52                                | 40: N <sub>RB,c</sub> = 106                                |
|  | Config 2                  |            | 10: N <sub>RB,c</sub> = 52                                | 40: N <sub>RB,c</sub> = 106                                |
|  | Config 3                  |            | 40: N <sub>RB,c</sub> = 106                               |  |
| BWP BW   | Config 1                  | MHz        | 10: N <sub>RB,c</sub> = 52                                | 40: N <sub>RB,c</sub> = 106                                |
|  | Config 2                  |            | 10: N <sub>RB,c</sub> = 52                                | 40: N <sub>RB,c</sub> = 106                                |
|  | Config 3                  |            | 40: N <sub>RB,c</sub> = 106                               |  |
| DRX Cycle  |                           | ms         | Not Applicable  |  |
| PDSCH Reference measurement channel                                    | Config 1                  |            | SR.1.1 FDD  | SR.1.1 CCA   |
|  | Config 2                  |            | SR.1.1 TDD  | SR.1.1 CCA   |
|  | Config 3                  |            | SR2.1 TDD   | SR.1.1 CCA   |
| RMSI CORESET RMC configuration   | Config 1                  |            | CR.1.1 FDD  | CR.1.1 CCA   |
|  | Config 2                  |            | CR.1.1 TDD  | CR.1.1 CCA   |
|  | Config 3                  |            | CR2.1 TDD   | CR.1.1 CCA   |
| Dedicated CORESET RMC configuration                                    | Config 1                  |            | CCR.1.1 FDD   | CCR.1.1 CCA  |
|  | Config 2                  |            | CCR.1.1 TDD   | CCR.1.1 CCA  |
|  | Config 3                  |            | CCR.2.1 TDD   | CCR.1.1 CCA  |
| OCNG Patterns  |                           |            | OCNG pattern 1  |  |
| SSB Configuration  | Semi-static channel acces | Config 1,2 | SSB.1 FR1   | SSB.1 CCA  |
|  | Dymamic channel acces     | Config 3   | SSB.2 FR1   | SSB.2 CCA  |
|  | Semi-static channel acces | Config 1,2 | SSB.1 FR1   | SSB.1 CCA  |
|  | Dymamic channel acces     | Config 3   | SSB.2 FR1   | SSB.2 CCA  |
| SMTc configuration   | Config 1,2                |            | SMTc.1 FR1  | SMTc.2 FR1   |
|  | Config 3                  |            | SMTc.2 FR1  |  |
| PDSCH/PDCCH subcarrier spacing   | Config 1,2                | kHz        | 15 kHz  | 30 kHz   |
|  | Config 3                  |            | 30 kHz  |  |
| PUCCH/PUSCH subcarrier spacing   | Config 1,2                | kHz        | 15 kHz  | 30 kHz   |
|  | Config 3                  |            | 30 kHz  |  |
| PRACH configuration  |                           |            | FR1 PRACH configuration 1 under CCA in Table A.3.8A.2.1-1 |  |
| BWP configuration  | Initial DL BWP            |            | DLBWP.0.1   |  |
|  | Dedicated DL BWP          |            | DLBWP.1.1   |  |
|  | Initial UL BWP            |            | ULBWP.0.1   |  |
|  | Dedicated UL BWP          |            | ULBWP.1.1   |  |
| EPRE ratio of PSS to SSS   |                           |            | dB  | 0  |
| EPRE ratio of PBCH DMRS to SSS   |                           |            |   |  |
| EPRE ratio of PBCH to PBCH DMRS  |                           |            |   |  |
| EPRE ratio of PDCCH DMRS to SSS  |                           |            |   |  |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |                           |            |   |  |
| EPRE ratio of PDSCH DMRS to SSS  |                           |            |   |  |



|  |            |               |        |        |           |        |
|--|------------|---------------|--------|--------|-----------|--------|
| EPRE ratio of PDSCH to PDSCH   |            |               |        |        |           |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |            |               |        |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |            |               |        |        |           |        |
| $N_{oc}^{Note2}$   |            | dBm/15kHz     | -98    |        |           |        |
| $N_{oc}^{Note2}$   | Config 1,2 | dBm/SCS       | -98    |        | -95       |        |
|  | Config 3   |               | -95    |        |           |        |
| $\hat{E}_s/I_{ot}$   |            | dB            | 4      | 4      | -infinity | 4      |
| $\hat{E}_s/N_{oc}$   |            | dB            | 4      | 4      | -infinity | 4      |
| $I_o^{Note3}$  | Config 1,2 | dBm/9.36 MHz  | -64.59 | -64.59 | N/A       | N/A    |
|  | Config 3   | dBm/38.16 MHz | -58.49 | -58.49 | -63.94    | -58.49 |
| Propagation condition  |            | -             | AWGN   |        |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> <p>Note 7: As defined in clause 6.2.3.2.3 for <math>T_{rs} \leq 40</math> ms.</p> |            |               |        |        |           |        |

#### A.11.2.2.3.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than  $T_{\text{connection\_release\_redirect\_NR\_CCA}}$  ms from the beginning of time period T2, where  $T_{\text{connection\_release\_redirect\_NR\_CCA}}$  is defined in clause 6.2.3.2.3.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{\text{connection\_release\_redirect\_NR\_CCA}} = T_{\text{RRC\_procedure\_delay}} + T_{\text{identify-NR\_CCA}} + T_{\text{SI-NR\_CCA}} + T_{\text{RACH\_CCA}},$$

where:

$T_{\text{RRC\_procedure\_delay}} = 110$  ms in the test.

$T_{\text{identify-NR\_CCA}} = \text{MAX}(680 \text{ ms}, (L_1+11) \times 20 \text{ ms})$  in the test.

$T_{\text{SI-NR\_CCA}} = 1280$  ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

$T_{\text{RACH\_CCA}}$  is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell.

$T_{\text{RACH\_CCA}} = (1+L_2) \times T_{\text{SSB,RO}} + 10$  ms; where  $T_{\text{SSB,RO}} = 10$  ms for FR1 PRACH configuration 1.

$L_1$  is the number of SMTC occasions not available at the UE due to DL CCA failures. The test equipment shall ensure that  $L_1$  does not exceed  $L_{1,\text{max}}$ . In the test  $L_{1,\text{max}} = L_{\text{CCA\_DL}}$  which is defined in clause A.3.26.2.1.

$L_2$  is the consecutive number of SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failures.  $L_2 = 0$  in the test.

The total delay,  $T_{\text{connection\_release\_redirect\_NR\_CCA}}$ , shall be less than  $1410 + \text{MAX}(680, (L_1+11) \times 20)$  ms.

## A.11.3 Timing

### A.11.3.1 UE transmit timing

#### A.11.3.1.1 UE Transmit Timing Test with PCell under DL CCA

##### A.11.3.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeB when PCell is subject to DL CCA and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 11.3.1.1.1-1

**Table A.11.3.1.1.1-1: Supported test configuration for UE transmit timing test**

| Configuration | Description  |
|---------------|--|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

For this test a single NR cell is used. Table A.11.3.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.11.3.1.1.1-3.

Table A.11.3.1.1.1-2: Cell Specific Test Parameters for UE transmit timing test

| Parameter  |                            | Unit        | Configuration | Test1                             | Test2                      |
|--|----------------------------|-------------|---------------|-----------------------------------|----------------------------|
| SSB ARFCN  |                            |             | 1             | 1                                 | 1                          |
| TDD configuration  |                            |             | 1             | TDDConf.1.1 CCA                   |                            |
| BW <sub>channel</sub>  |                            | MHz         | 1             | 40: N <sub>RB,c</sub> = 106       |                            |
| Initial BWP Configuration  |                            |             | 1             | DLBWP.0.1<br>ULBWP.0.1            |                            |
| Dedicated BWP Configuration  |                            |             | 1             | DLBWP.1.1<br>ULBWP.1.1            |                            |
| DRX Cycle  |                            | ms          | 1             | N/A                               | DRX.8 <sup>Note5</sup>     |
| DL CCA model   |                            |             | 1             | As specified in clause A.3.26.2.1 |                            |
| UL CCA model   |                            |             | 1             | As specified in clause A.3.26.2.2 |                            |
| PDSCH Reference measurement channel  |                            |             | 1             | SR.1.1 CCA                        |                            |
| RMSI CORESET Reference Channel   |                            |             | 1             | CR.1.1 CCA                        |                            |
| Dedicated CORESET Reference Channel  |                            |             | 1             | CCR.1.1 CCA                       |                            |
| OCNG Patterns  |                            |             | 1             | OP.1                              |                            |
| SSB configuration  | Semi- static channel acces |             | 1             | SSB.1 CCA                         |                            |
|  | Dynamic channel acces      |             | 1             | SSB.2 CCA                         |                            |
| SMTC Configuration   |                            |             | 1             | SMTC.1 FR1                        |                            |
| TRS configuration  |                            |             | 1             | TRS.1.2 TDD                       |                            |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )  |                            |             | 1             | 0.9375                            | 0.9375                     |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_1}$ )  |                            |             | 1             | 0.75                              | 0.75                       |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_2}$ )  |                            |             | 1             | 0.75                              | 0.75                       |
| UL CCA probability ( $P_{CCA\_UL}$ )   |                            |             | 1             | 1                                 | 1                          |
| EPRE ratio of PSS to SSS   |                            | dB          | 1             | 0                                 | 0                          |
| EPRE ratio of PBCH DMRS to SSS   |                            |             |               |                                   |                            |
| EPRE ratio of PBCH to PBCH DMRS  |                            |             |               |                                   |                            |
| EPRE ratio of PDCCH DMRS to SSS  |                            |             |               |                                   |                            |
| EPRE ratio of PDCCH to PDCCH DMRS  |                            |             |               |                                   |                            |
| EPRE ratio of PDSCH DMRS to SSS  |                            |             |               |                                   |                            |
| EPRE ratio of PDSCH to PDSCH   |                            |             |               |                                   |                            |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |                            |             |               |                                   |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                            |             |               |                                   |                            |
| $N_{oc}$ <sup>Note2</sup>  |                            |             |               |                                   |                            |
| $\hat{E}_s / I_{ot}$   |                            |             | 1             | 3                                 | 3                          |
| $\hat{E}_s / N_{oc}$   |                            |             | 1             | 3                                 | 3                          |
| SS-RSRP <sup>Note3</sup>   |                            | dBm/30 kHz  | 1             | -92                               | -92                        |
| I <sub>o</sub> <sup>Note3</sup>  |                            | dBm/38.1MHz | 1             | -59.2                             | -59.2                      |
| Propagation condition  |                            |             | 1             | AWGN                              |                            |
| SRS Config   |                            |             | 1             | SRSConf.1 <sup>Note6</sup>        | SRSConf.2 <sup>Note6</sup> |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |                            |             |               |                                   |                            |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |                            |             |               |                                   |                            |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |                            |             |               |                                   |                            |
| Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |                            |             |               |                                   |                            |
| Note 5: DRX related parameters are given in Table A.3.3.8-1  |                            |             |               |                                   |                            |
| Note 6: SRS configs are given in Table A.11.3.1.1.1-3  |                            |             |               |                                   |                            |
| Note 7: Parameters $P_{CCA\_DL}$ , $P_{CCA\_DL\_1}$ , $P_{CCA\_DL\_2}$ and $P_{CCA\_UL}$ are defined in clause A.3.26.2.   |                            |             |               |                                   |                            |
| Note 8: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |                            |             |               |                                   |                            |

**Table A.11.3.1.1.1-3: SRS Configuration for UE transmit timing test**

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

**A.11.3.1.1.2 Test requirements**

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Setup NR PCell according to parameters given in Table A.11.3.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.11.3.1.1.2-1

**Table A.11.3.1.1.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (KHz) | Adjustment Value  |                   |
|--------------------------|-------------------|-------------------|
|                          | Test1             | Test2             |
| 30                       | $+32 \cdot 64T_c$ | $+16 \cdot 64T_c$ |

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.

- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

## A.11.3.2 UE timing advance

### A.11.3.2.1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA

#### A.11.3.2.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

#### A.11.3.2.1.2 Test Parameters

Supported test configurations are shown in table A.11.3.2.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.11.3.2.1.2-2, A.11.3.2.1.2-3 and A.11.3.2.1.2-4.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.11.3.2.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.11.3.2.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.3.2.1, the UE adjusts its uplink timing at slot  $n+k$  for a timing advance command received in slot  $n$ . This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

**Table A.11.3.2.1.2-1: Supported test configuration for timing advance test**

| Config | Description  |
|--------|--|
| 1      | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE supporting SA operation only on NR band(s) with shared spectrum access is required to be tested |

Table A.11.3.2.1.2-2: General test parameters for timing advance test

| Parameter  | Unit | Value     | Comment   |
|--|------|-----------|---|
| RF channel number                                |      | 1         |   |
| Initial DL BWP                                   |      | DLBWP.0.1 | As specified in Table A.3.9.2.1-1   |
| Dedicated DL BWP                                 |      | DLBWP.1.1 | As specified in Table A.3.9.2.2-1   |
| Initial UL BWP                                   |      | ULBWP.0.1 | As specified in Table A.3.9.3.1-1   |
| Dedicated UL BWP                                 |      | ULBWP.1.1 | As specified in Table A.3.9.3.2-1   |
| Timing Advance Command ( $T_A$ ) value during T1 |      | 31        | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ( $T_A$ ) value during T2 |      | 39        | For 30 kHz SCS $N_{TA\_new} = N_{TA\_old} + 4096 * T_c$<br>(based on equation in clause 4.2 of TS 38.213 [3])   |
| T1   | s    | 5         |   |
| T2   | s    | 5         |   |

Table A.11.3.2.1.2-3: Cell specific test parameters for timing advance test

| Parameter   |                            | Unit         | Test1                             |    |
|---|----------------------------|--------------|-----------------------------------|----|
|   |                            |              | T1                                | T2 |
| TDD configuration   | Config 1                   |              | TDDConf.1.1 CCA                   |    |
| BW <sub>channel</sub>   | Config 1                   | MHz          | 40: N <sub>RB,c</sub> = 106       |    |
| BWP BW  | Config 1                   | MHz          | 40: N <sub>RB,c</sub> = 106       |    |
| DRX Cycle   | Config 1                   | ms           | Not Applicable                    |    |
| DL CCA model  | Config 1                   |              | As specified in clause A.3.26.2.1 |    |
| UL CCA model  | Config 1                   |              | As specified in clause A.3.26.2.2 |    |
| PDSCH Reference measurement channel   | Config 1                   |              | SR.1.1 CCA                        |    |
| CORESET Reference Channel   | Config 1                   |              | CR.1.1 CCA                        |    |
| TRS configuration   | Config 1                   |              | TRS.1.2 TDD                       |    |
| OCNG Patterns   | Config 1                   |              | OCNG pattern 1                    |    |
| SMTC configuration  | Config 1                   |              | SMTC.1 FR1                        |    |
| SSB configuration   | Semi-static channel access | Config 1     | SSB.1 CCA                         |    |
|   | Dynamic channel access     | Config 1     | SSB.2 CCA                         |    |
| DL CCA probability for semi-static channel access (P <sub>CCA_DL</sub> )  | Config 1                   |              | 1                                 |    |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_1</sub> )   | Config 1                   |              | 1                                 |    |
| DL CCA model probability for dynamic static channel access (P <sub>CCA_DL_2</sub> )   | Config 1                   |              | 1                                 |    |
| UL CCA probability P <sub>CCA</sub>   | Config 1                   |              | 1                                 |    |
| EPRE ratio of PSS to SSS  |                            | dB           | 0                                 |    |
| EPRE ratio of PBCH DMRS to SSS  |                            |              |                                   |    |
| EPRE ratio of PBCH to PBCH DMRS   |                            |              |                                   |    |
| EPRE ratio of PDCCH DMRS to SSS   |                            |              |                                   |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |                            |              |                                   |    |
| EPRE ratio of PDSCH DMRS to SSS   |                            |              |                                   |    |
| EPRE ratio of PDSCH to PDSCH  |                            |              |                                   |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                            |              |                                   |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                            |              |                                   |    |
| N <sub>oc</sub> <sup>Note2</sup>  | Config 1                   |              |                                   |    |
| $\hat{E}_s / I_{ot}$  |                            | dB           | 3                                 |    |
| $\hat{E}_s / N_{oc}$  |                            | dB           | 3                                 |    |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1                   | dBm/38.16MHz | -62.58                            |    |
| Propagation condition   |                            | -            | AWGN                              |    |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                            |              |                                   |    |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                            |              |                                   |    |
| Note 3: I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                            |              |                                   |    |
| Note 4: Parameters P <sub>CCA_DL</sub> , P <sub>CCA_DL_1</sub> , P <sub>CCA_DL_2</sub> and P <sub>CCA_UL</sub> are defined in clause A.3.26.2.  |                            |              |                                   |    |
| Note 5: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.   |                            |              |                                   |    |

**Table A.11.3.2.1.2-4: Sounding Reference Symbol Configuration for Timing Advance Accuracy Test**

| Field  | Value                  | Comment  |
|--|------------------------|--|
| c-SRS  | 24                     | Frequency hopping is disabled  |
| b-SRS  | 0                      |  |
| b-hop  | 0                      |  |
| freqDomainPosition   | 0                      | Frequency domain position of SRS   |
| freqDomainShift  | 0                      |  |
| groupOrSequenceHopping   | neither                | No group or sequence hopping   |
| SRS-PeriodicityAndOffset   | sl5=4 for SCS<br>30kHz | Once every 5 slots   |
| pathlossReferenceRS  | ssb-Index=0            | SSB #0 is used for SRS path loss estimation  |
| usage  | Codebook               | Codebook based UL transmission   |
| startPosition  | 0                      | resourceMapping setting: SRS on last symbol of slot, and 1 symbols for SRS without repetition. |
| nrofSymbols  | n1                     |  |
| repetitionFactor   | n1                     |  |
| combOffset-n2  | 0                      | transmissionComb setting   |
| cyclicShift-n2   | 0                      |  |
| nrofSRS-Ports  | port1                  | Number of antenna ports used for SRS transmission  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. |                        |  |

### A.11.3.2.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e.  $k+1$  slots after the reception of the timing advance command, where  $k=5$ .

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3.2.2.

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

## A.11.4 Signalling characteristics

### A.11.4.1 Radio link monitoring

#### A.11.4.1.1 Introduction

In the test cases specified in clause A.11.4.1, any uplink signal transmitted by the UE is used for detecting the in-/out-of-sync state of the UE. In terms of measurement, the uplink signal is verified based on the UE output power:

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means no uplink signal.

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

#### A.11.4.1.2 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

##### A.11.4.1.2.1 Test purpose and environment

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 PCell radio link monitoring requirements in clause 8.1A.



In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.11.4.1.2.1-1. The test parameters are given in Tables A.11.4.1.2.1-2, A.11.4.1.2.1-3, and A.11.4.1.2.1-4 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure A.11.4.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

**Table A.11.4.1.2.1-1: Supported test configurations.**

| Configuration | Description  |
|---------------|--|
| 1             | TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.4.1.2.1-2: General test parameters for PCell out-of-sync testing in non-DRX mode.**

| Parameter   |  | Unit | Value                               |
|---|--|------|-------------------------------------|
|   |  |      | Test 1                              |
| Active PCell  |  |      | Cell 1                              |
| RF Channel Number   |  |      | 1                                   |
| DL CCA model  |  |      | As specified in clause A.3.26.2.1   |
| UL CCA model  |  |      | As specified in clause A.3.26.2.2   |
| Duplex mode   | Config 1   |      | TDD                                 |
| BW <sub>channel</sub>   | Config 1   | MHz  | 40: N <sub>RB,c</sub> = 106         |
| DL initial BWP configuration  | Config 1   |      | [DLBWP.0.1]                         |
| DL dedicated BWP configuration  | Config 1   |      | [DLBWP.1.1]                         |
| UL initial BWP configuration  | Config 1   |      | [ULBWP.0.1]                         |
| UL dedicated BWP configuration  | Config 1   |      | [ULBWP.1.1]                         |
| TDD configuration   | Config 1   |      | TDDConf.1.1 CCA                     |
| CORESET Reference Channel   | Config 1   |      | CR.1.1 CCA                          |
| SSB configuration for semi-static channel access <sup>Note 3, 5</sup> | Config 1   |      | SSB.1 CCA                           |
| SSB configuration for dynamic channel access <sup>Note 4, 5</sup>     | Config 1   |      | SSB.2 CCA                           |
| DBT window configuration  | Config 1   |      | DBT.1                               |
| PDSCH/PDCCH subcarrier spacing  | Config 1   |      | 30 kHz                              |
| PRACH Configuration   | Config 1   |      | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM RS  |  |      | 0                                   |
| OCNG parameters   |  |      | [OP.1]                              |
| CP length   |  |      | Normal                              |
| Correlation Matrix and Antenna Configuration                          |  |      | 2x2 Low                             |
| Out of sync transmission parameters                                   | DCI format   |      | [1-0]                               |
|   | Number of Control OFDM symbols                                   |      | [2]                                 |
|   | Aggregation level  | CCE  | [8]                                 |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | [4]                                 |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | [4]                                 |
|   | DMRS precoder granularity  |      | REG bundle size                     |
|   | REG bundle size  |      | [6]                                 |
| DRX   |  |      | OFF                                 |
| Gap pattern ID  |  |      | gp0                                 |
| Layer 3 filtering   |  |      | Enabled                             |
| T310 timer  |  | ms   | 0                                   |
| T311 timer  |  | ms   | 1000                                |
| N310  |  |      | 1                                   |
| N311  |  |      | 1                                   |
| CSI-RS configuration for CSI reporting                                | Config 1   |      | [CSI-RS.2.1 TDD]                    |
| CSI-RS for tracking   | Config 1   |      | [TRS.1.2 TDD]                       |
| T1  |  | s    | 0.2                                 |
| T2  |  | s    | 1.04                                |
| T3  |  | s    | 1.04                                |
| D1  |  | s    | 1                                   |

NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.  
 NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.  
 Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  
 Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  
 Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table A.11.4.1.2.1-3: Cell-specific test parameters for PCell out-of-sync testing in non-DRX mode.**

| Parameter  |          | Unit    | Test 1   |      |     |
|--|----------|---------|--|------|-----|
|  |          |         | T1   | T2   | T3  |
| DL CCA probability<br>$P_{CCA\_DL}$  | Note 6,8 |         | $P_{CCA\_DL}=0.9375$                           |      |     |
|  | Note 7,8 |         | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |      |     |
| UL CCA probability $P_{CCA\_UL}$   |          |         | 1  |      |     |
| EPRE ratio of PDCCH DMRS to SSS  |          | dB      | 4  |      |     |
| EPRE ratio of PDCCH to PDCCH DMRS  |          | dB      | 0  |      |     |
| EPRE ratio of PBCH DMRS to SSS   |          | dB      | 0  |      |     |
| EPRE ratio of PBCH to PBCH DMRS  |          | dB      |  |      |     |
| EPRE ratio of PSS to SSS   |          | dB      |  |      |     |
| EPRE ratio of PDSCH DMRS to SSS  |          | dB      |  |      |     |
| EPRE ratio of PDSCH to PDSCH DMRS  |          | dB      |  |      |     |
| EPRE ratio of OCNG DMRS to SSS   |          | dB      |  |      |     |
| EPRE ratio of OCNG to OCNG DMRS  |          | dB      |  |      |     |
| SNR <sup>Note 3,4</sup> on RLM-RS  | Config 1 | dB      | 1  | [-7] | -15 |
| SNR on other channels and signals  | Config 1 | dB      | 1  |      |     |
| $N_{oc}$   | Config 1 | dBm/SCS | -95  |      |     |
| Propagation condition  |          |         | TDL-C 300 ns 100 Hz                            |      |     |
| <p>NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.</p> <p>NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.</p> <p>NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3, respectively, in Figure A.10.3.1.2.1-1.</p> <p>NOTE 5: The SNR values are specified for testing a UE which supports 2 RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 is A.3.6.</p> <p>NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |          |         |  |      |     |

**Table A.11.4.1.2.1-4: Measurement gap configuration for PCell out-of-sync testing in non-DRX mode.**

| Field  | Test 1 |  |
|--|--------|--|
|  | Value  |  |
| <i>gapOffset</i>   | 0      |  |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap0 |        |  |

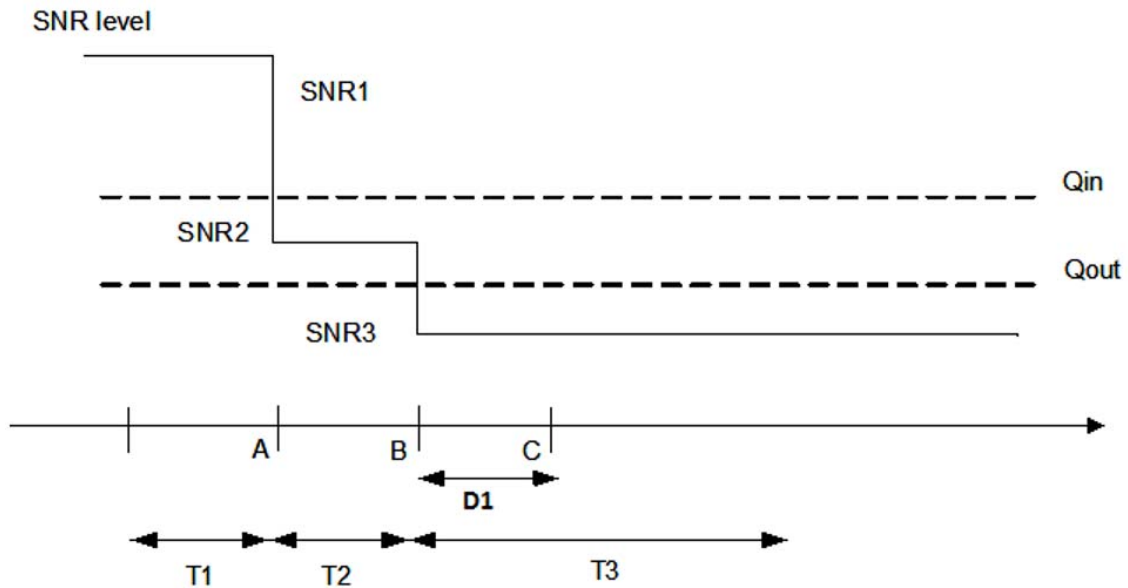


Figure A.11.4.1.2.1-1: SNR variation for out-of-sync testing.

A.11.4.1.2.2 Test requirements

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

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.
- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

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

A.11.4.1.3 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

A.11.4.1.3.1 Test purpose and environment

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 PCell radio link monitoring requirements in clause 8.1A.

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to 'rlf'. Supported test configurations are shown in table A.11.4.1.3.1-1. The test parameters are given in Tables A.11.4.1.3.1-2, and A.11.4.1.3.1-3 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure A.11.4.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model.

Table A.11.4.1.3.1-1: Supported test configurations.

| Configuration | Description  |
|---------------|--|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

**Table A.11.4.1.3.1-2: General test parameters for PCell in-sync testing in non-DRX mode.**

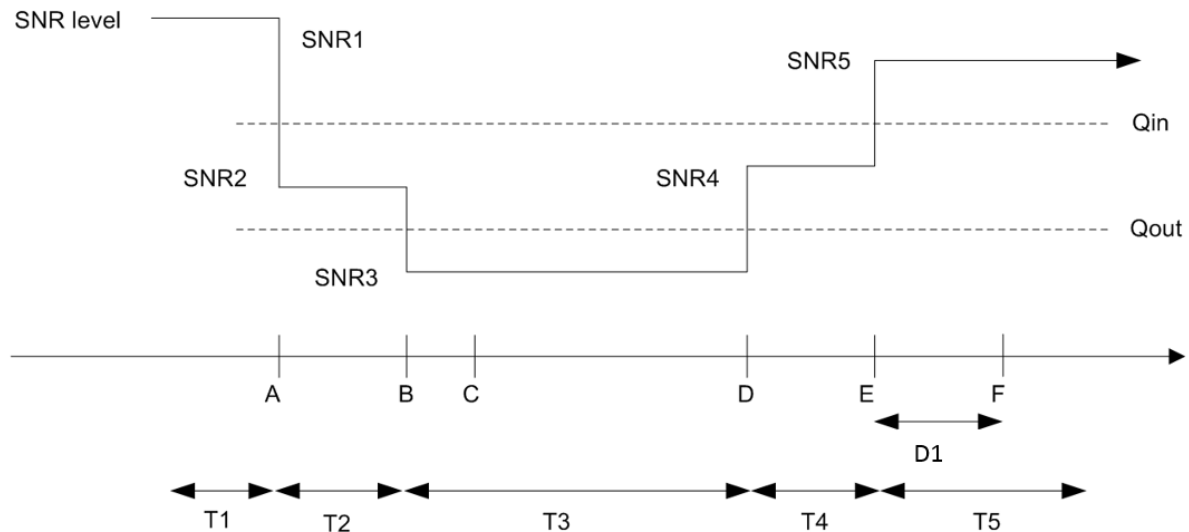
| Parameter   |  | Unit | Value                               |
|---|--|------|-------------------------------------|
|   |  |      | Test 1                              |
| Active PCell  |  |      | Cell 1                              |
| RF Channel Number   |  |      | 1                                   |
| DL CCA model  |  |      | As specified in clause A.3.26.2.1   |
| UL CCA model  |  |      | As specified in clause A.3.26.2.2   |
| Duplex mode   | Config 1   |      | TDD                                 |
| $BW_{\text{channel}}$   | Config 1   | MHz  | 40: $N_{\text{RB,C}} = 106$         |
| DL initial BWP configuration  | Config 1   |      | [DLBWP.0.1]                         |
| DL dedicated BWP configuration  | Config 1   |      | [DLBWP.1.1]                         |
| UL initial BWP configuration  | Config 1   |      | [ULBWP.0.1]                         |
| UL dedicated BWP configuration  | Config 1   |      | [ULBWP.1.1]                         |
| TDD Configuration   | Config 1   |      | TDDConf.1.1 CCA                     |
| CORESET Reference Channel   | Config 1   |      | CR.1.1 CCA                          |
| SSB configuration for semi-static channel access <sup>Note 3, 5</sup> | Config 1   |      | SSB.1 CCA                           |
| SSB configuration for dynamic channel access <sup>Note 4,5</sup>      | Config 1   |      | SSB.2 CCA                           |
| DBT window configuration  | Config 1   |      | DBT.1                               |
| PDSCH/PDCCH subcarrier spacing  | Config 1   |      | 30 kHz                              |
| PRACH Configuration   | Config 1   |      | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM RS  |  |      | 0                                   |
| OCNG parameters   |  |      | [OP.1]                              |
| CP length   |  |      | Normal                              |
| Correlation Matrix and Antenna Configuration                          |  |      | 2x2 Low                             |
| In sync transmission parameters                                       | DCI format   |      | [1-0]                               |
|   | Number of Control OFDM symbols                                   |      | [2]                                 |
|   | Aggregation level  | CCE  | [4]                                 |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | [0]                                 |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | [0]                                 |
|   | DMRS precoder granularity  |      | REG bundle size                     |
|   | REG bundle size  |      | [6]                                 |
| Out of sync transmission parameters                                   | DCI format   |      | [1-0]                               |
|   | Number of Control OFDM symbols                                   |      | [2]                                 |
|   | Aggregation level  | CCE  | [8]                                 |
|   | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | [4]                                 |
|   | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | [4]                                 |

|   |                           |    |                 |
|---|---------------------------|----|-----------------|
|   | DMRS precoder granularity |    | REG bundle size |
|   | REG bundle size           |    | [6]             |
| DRX   |                           |    | OFF             |
| Gap pattern ID  |                           |    | N/A             |
| Layer 3 filtering   |                           |    | Enabled         |
| T310 timer  |                           | ms | 2000            |
| T311 timer  |                           | ms | 1000            |
| N310  |                           |    | 1               |
| N311  |                           |    | 1               |
| CSI-RS configuration for CSI reporting  | Config 1                  |    | CSI-RS.2.1 TDD  |
| CSI-RS for tracking   | Config 1                  |    | TRS.1.2 TDD     |
| T1  |                           | s  | 0.2             |
| T2  |                           | s  | 0.2             |
| T3  |                           | s  | 0.52            |
| T4  |                           | s  | 0.2             |
| T5  |                           | s  | 2.04            |
| D1  |                           | s  | 2               |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.   |                           |    |                 |
| NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.   |                           |    |                 |
| NOTE 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |                           |    |                 |
| NOTE 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |                           |    |                 |
| NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |                           |    |                 |



**Table A.11.4.1.3.1-3: Cell-specific test parameters for PCell in-sync testing in non-DRX mode.**

| Parameter   |          | Unit    | Test 1   |    |    |    |    |
|---|----------|---------|--|----|----|----|----|
|   |          |         | T1   | T2 | T3 | T4 | T5 |
| DL CCA probability<br>$P_{CCA\_DL}$   | Note 6,8 |         | $P_{CCA\_DL}=0.9375$                           |    |    |    |    |
|   | Note 7,8 |         | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    |    |    |    |
| UL CCA probability $P_{CCA\_UL}$  |          |         | 1  |    |    |    |    |
| $L_{CCA\_DL}$   |          |         | 7  |    |    |    |    |
| $W_{CCA\_DL}$   |          | ms      | $T_{Evaluate\_in\_SSB\_CCA}$ NOTE 9            |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS   |          | dB      | 4  |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS   |          | dB      | 0  |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS  |          | dB      | 0  |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS   |          | dB      |  |    |    |    |    |
| EPRE ratio of PSS to SSS  |          | dB      |  |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS   |          | dB      |  |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH DMRS   |          | dB      |  |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS  |          | dB      |  |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS   |          | dB      |  |    |    |    |    |
| SNR on RLM-RS   |          | dB      |  |    |    |    |    |
| SNR on other channels and signals   |          | dB      | 1  |    |    |    |    |
| $N_{oc}$  |          | dBm/SCS | -95  |    |    |    |    |
| Propagation condition   |          |         | TDL-C 300ns 100Hz                              |    |    |    |    |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows. |          |         |  |    |    |    |    |
| NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.   |          |         |  |    |    |    |    |
| NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.   |          |         |  |    |    |    |    |
| NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.11.4.1.3.1-1.  |          |         |  |    |    |    |    |
| NOTE 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.   |          |         |  |    |    |    |    |
| NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.   |          |         |  |    |    |    |    |
| NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.   |          |         |  |    |    |    |    |
| NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.   |          |         |  |    |    |    |    |
| NOTE 9: As defined in Table 8.1A.2.2-1.   |          |         |  |    |    |    |    |



**Figure A.11.4.1.3.1-1: SNR variation for in-sync testing.**

#### A.11.4.1.3.2 Test requirements

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

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

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

#### A.11.4.1.4 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode

##### A.11.4.1.4.1 Test purpose and environment

##### A.11.4.1.4.2 Test requirements

#### A.11.4.1.5 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode

##### A.11.4.1.5.1 Test purpose and environment

##### A.11.4.1.5.2 Test requirements

### A.11.4.2 Interruption

#### A.11.4.2.1 NR interruptions during Scell operations with CCA on PCell and SCell

##### A.11.4.2.1.1 Test Purpose and Environment

The purpose of this test is to verify NR PCell interruptions during Scell operations on an NR SCC with CCA. This test will verify the interruption requirements for NR PCell in NR SA specified in TS 38.133 clause 8.2.2 and 8.3A. Supported test configurations are shown in table A.11.4.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.11.4.2.1.1-2 and A.11.4.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 and Cell2 are PCell and SCell. Both of cell 1 and cell 2 are subject to CCA. The test consists of five time periods, with duration of T1, T2, T3, T4 and T5. Prior to the start of the

time duration T1, the UE is connected to Cell1 and Cell2. Throughout the test, the PCell are continuously scheduled in DL. The power of signals on cell 1 and 2 is not modified during the test.

Prior to T1, a connection is started with cell 1 as the PCell, and measurements of cell 2 are configured with gap pattern 0, such that cell 2 is reported. This ensures that cell 2 is known at the start of time period T1 and is not itself part of the tested requirement.

The point in time at which the RRC message implying SCell addition is received at the UE antenna connector, defines the start of time period T1. Measurement gap pattern 0 shall be stopped when the SCell is configured.

The point in time at which the MAC-CE message implying SCell activation is received at the UE antenna connector, defines the start of time period T2.

The point in time at which the MAC-CE message implying SCell deactivation is received at the UE antenna connector, defines the start of time period T3.

The point in time at which deactivation delay requirement in section 8.3A are satisfied defines the start of time period T4

The point in time at which the RRC message implying SCell release is received at the UE antenna connector, defines the start of time period T5.

**Table A.11.4.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.4.2.1.1-2: General test parameters for Interruptions during measurements on deactivated NR SCC**

| Parameter                                | Unit | Value  | Comment                                      |
|--|------|--------|--|
| RF Channel Number                        |      | 1, 2   |  |
| Active PCell                             |      | Cell1  | PCell on RF channel number 1.                |
| Configured SCell                         |      | Cell2  | Deactivated SCell on NR RF channel number 2. |
| CP length                                |      | Normal | Applicable to Cell1, Cell2                   |
| DRX                                      |      | OFF    |  |
| Measurement gap pattern Id               |      | OFF    |  |
| SCell measurement cycle (measCycleSCell) | ms   | 160    |  |
| T1                                       | s    | <10    |  |
| T2                                       | s    | <10    |  |
| T3                                       | s    | <10    |  |
| T4                                       | s    | <10    |  |
| T5                                       | s    | <10    |  |

**Table A.11.4.2.1.1-3: NR cell specific test parameters for Interruptions during measurements on deactivated NR SCC**

| Parameter  |                       | Unit         | Cell1                             |    |    |    |    | Cell2                             |    |    |    |    |
|--|-----------------------|--------------|-----------------------------------|----|----|----|----|-----------------------------------|----|----|----|----|
|  |                       |              | T1                                | T2 | T3 | T4 | T5 | T1                                | T2 | T3 | T4 | T5 |
| TDD configuration  | Config 1              |              | TDDConf.1.1 CCA                   |    |    |    |    | TDDConf.1.1 CCA                   |    |    |    |    |
| BW <sub>channel</sub>  | Config 1              | MHz          | 40: N <sub>RB,c</sub> = 106       |    |    |    |    | 40: N <sub>RB,c</sub> = 106       |    |    |    |    |
| DL CCA model   | Config 1              |              | As specified in clause A.3.20.2.1 |    |    |    |    | As specified in clause A.3.20.2.1 |    |    |    |    |
| DL CCA probability for semi-static channel access <sup>Note6,8</sup> | P <sub>CCA_DL</sub>   |              | 0.9375                            |    |    |    |    | 0.9375                            |    |    |    |    |
| DL CCA probability for dynamic channel access <sup>Note7,8</sup>     | P <sub>CCA_DL_1</sub> |              | 0.75                              |    |    |    |    | 0.75                              |    |    |    |    |
|  | P <sub>CCA_DL_2</sub> |              | 0.75                              |    |    |    |    | 0.75                              |    |    |    |    |
| UL CCA model   | Config 1              |              | As specified in clause A.3.20.2.2 |    |    |    |    | ---                               |    |    |    |    |
| UL CCA probability for semi-static channel access                    | P <sub>CCA_UL</sub>   |              | 0.87                              |    |    |    |    | ---                               |    |    |    |    |
| UL CCA probability for dynamic channel access                        | P <sub>CCA_UL</sub>   |              | 0.75                              |    |    |    |    | ---                               |    |    |    |    |
| Initial BWP Configuration  | Config 1              |              | DLBWP.0.1                         |    |    |    |    | DLBWP.0.1                         |    |    |    |    |
| Dedicated DL BWP Configuration                                       | Config 1              |              | DLBWP.1.1                         |    |    |    |    | DLBWP.1.1                         |    |    |    |    |
| Initial UL BWP Configuration   | Config 1              |              | ULBWP.0.1                         |    |    |    |    | ULBWP.0.1                         |    |    |    |    |
| Dedicated UL BWP Configuration                                       | Config 1              |              | ULBWP.1.1                         |    |    |    |    | ULBWP.1.1                         |    |    |    |    |
| PDSCH reference measurement channel                                  | Config 1              |              | SR.1.1 CCA                        |    |    |    |    | ---                               |    |    |    |    |
| RMSI CORESET parameters  | Config 1              |              | CR.1.1 CCA                        |    |    |    |    | CR.1.1 CCA                        |    |    |    |    |
| PDCCH CORESET parameters   | Config 1              |              | CCR.1.1 CCA                       |    |    |    |    | CCR.1.1 CCA                       |    |    |    |    |
| TRS configuration  | Config 1              |              | TRS.1.2 TDD                       |    |    |    |    | TRS.1.2 TDD                       |    |    |    |    |
| OCNG Patterns  |                       |              | OP.1                              |    |    |    |    | OP.1                              |    |    |    |    |
| SSB configuration for semi-static channel access <sup>Note6,8</sup>  | Config 1              |              | SSB.1 CCA                         |    |    |    |    | SSB.1 CCA                         |    |    |    |    |
| SSB configuration for dynamic channel access <sup>Note7,8</sup>      | Config 1              |              | SSB.2 CCA                         |    |    |    |    | SSB.2 CCA                         |    |    |    |    |
| SMTc Configuration   | Config 1              |              | SMTc.1                            |    |    |    |    | SMTc.1                            |    |    |    |    |
| DBT window configuration   | Config 1              |              | DBT.1                             |    |    |    |    | DBT.1                             |    |    |    |    |
| TCI state  |                       |              | TCI.State.0                       |    |    |    |    | TCI.State.0                       |    |    |    |    |
| Correlation Matrix and Antenna Configuration                         |                       |              | 1x2 Low                           |    |    |    |    | 1x2 Low                           |    |    |    |    |
| EPRE ratio of PSS to SSS   |                       |              | 0                                 |    |    |    |    | 0                                 |    |    |    |    |
| EPRE ratio of PBCH DMRS to SSS                                       |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS                                      |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS                                      |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS                                    |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS                                      |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of PDSCH to PDSCH   |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                               |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                             |                       |              |                                   |    |    |    |    |                                   |    |    |    |    |
| N <sub>oc</sub> <sup>Note 2</sup>                                    |                       | dBm/15 kHz   |                                   |    |    |    |    |                                   |    |    |    |    |
| SS-RSRP <sup>Note 3</sup>  |                       | dBm/15 kHz   | -87                               |    |    |    |    | -87                               |    |    |    |    |
| $\bar{E}_s/I_{ot}$   |                       | dB           | 17                                |    |    |    |    | 17                                |    |    |    |    |
| $\bar{E}_s/N_{oc}$   |                       | dB           | 17                                |    |    |    |    | 17                                |    |    |    |    |
| I <sub>o</sub> <sup>Note3</sup>                                      | Config 1              | dBm/38.16MHz | -52.86                            |    |    |    |    | -52.86                            |    |    |    |    |
| Time offset to Cell1 <sup>Note 4</sup>                               |                       | ms           | 3                                 |    |    |    |    | 3                                 |    |    |    |    |
| Time offset to Cell2 <sup>Note 5</sup>                               |                       | μs           | -                                 |    |    |    |    | 3                                 |    |    |    |    |
| Propagation Condition  |                       |              | AWGN                              |    |    |    |    | AWGN                              |    |    |    |    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells   |
| Note 5: | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.   |
| Note 6: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 7: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 8: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |

#### A.11.4.2.1.2 Test Requirements

The UE shall meet the interruption requirements for SCell addition on the victim Pcell in clause 8.2.1 during time T1

The UE shall meet the interruption requirements for SCell activation on the victim Pcell in clause 8.2.1 during time T2. There shall be a single interruption with time window as specified in clause 8.3A.2

The UE shall meet the interruption requirements for SCell deactivation on the victim PCell in clause 8.2.1 during time T3. There shall be a single interruption with time window as specified in clause 8.3A.3

The UE shall meet the interruption requirements for deactivated SCell measurements on the victim PCell in clause 8.2.1 during time T4. The interruptions shall be within the time window as specified in clause 8.3A.3

The UE shall meet the interruption requirements for SCell release on the victim PCell in clause 8.2.1 during time T5.

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

### A.11.4.3 SCell activation and deactivation delay

#### A.11.4.3.1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle

##### A.11.4.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell both under CCA, are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 160 ms.

The supported test configurations are shown in Table A.11.4.3.1.1-1.

The test parameters are given in Table A.11.4.3.1.1-2 and cell-specific parameters in Table A.11.4.3.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two carriers, each with one cell: Cell 1 (PCell) on radio channel 1 (PCC) in NR with CCA, and Cell2 (SCell) on radio channel 2 (SCC) in NR with CCA. Before the test starts the UE is connected to Cell 1, but is not aware of Cell 2, as the UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. At the end of T1, the test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted  $m$ , defines the start of time period T2. The UE shall be able to report a valid CSI in PCell for the activated SCell at latest in slot  $m + (T_{HARQ} + T_{activation\_time\_withCCA} + T_{CSI\_Reporting\_withCCA}) / NR\_slot\_length$ , as defined in clause 8.3A.2. The UE shall start reporting CSI in PCell in first available uplink resource for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting following slot  $m + \frac{T_{HARQ} + 3ms}{NR\_slot\_length}$  and shall report CQI index 0 (out-of-

range) until the SCell activation has been completed. Any PCell interruption shall fall within the time window specified in clause 8.3.2.

The point in time at which the MAC message is received by at the UE antenna connector, in a slot # denoted  $n$ , defines the start of time period T3. The UE shall complete the activation at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ . Any PCell interruption shall fall within the time window specified in clause 8.3A.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received, while taking into account CCA failures on SCC.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

**Table A.11.4.3.1.1-1: Supported test configurations for SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Configuration | Description   |
|---------------|---|
| 1             | With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.4.3.1.1-2: General test parameters for known SCell activation with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Parameter  | Unit          | Value   | Comment   |
|--|---------------|---|---|
| RF Channel Number                                  |               | 1,2   | Two radio channels (1, 2) are used for this test  |
| Active PCell                                       |               | Cell 1  | Primary cell on NR RF channel number 1.   |
| Configured deactivated SCell                       |               | Cell 2  | Configured deactivated secondary cell on NR RF channel number 2   |
| CP length  |               | Normal  |   |
| DRX  |               | OFF   | Continuous monitoring of primary cell   |
| CQI/PMI periodicity and offset configuration index |               | 0   | CQI reporting for SCell every second subframe   |
| SCell measurement cycle (measCycleSCell)           | ms            | 160   |   |
| Cell2 timing offset to cell1                       | $\mu\text{s}$ | 0   |   |
| Time alignment error between cell2 and cell1       | $\mu\text{s}$ | $\leq$ TAE as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.   |
| T1   | s             | 7   | During this time the PCell shall be known and the SCell configured and detected.  |
| T2   | s             | 1   | During this time the UE shall activate the SCell.   |
| T3   | s             | 1   | During this time the UE shall deactivate the SCell.   |
| $T_{\text{HARQ}}$                                  | ms            | $k_1 \times \text{NR slot length}$                        | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by <i>dl-DataToUL-ACK</i> , the value of $k$ should be the minimum value defined in TS 38.213 [3] depends on UE's capability   |
| $T_{\text{CSI\_Reporting}}$                        | ms            | $10 + 5 \cdot 2^{\mu_{\text{DL}}}$                        | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]<br>$\mu_{\text{DL}}$ is the subcarrier spacing configuration for DL |

**Table A.11.4.3.1.1-3: Cell specific test parameters for known SCell activation case with PCell and SCell under CCA, 160 ms SCell measurement cycle**



| Parameter  |                       | Unit         | Cell 1                               |    |    | Cell 2                               |    |    |
|--|-----------------------|--------------|--------------------------------------|----|----|--------------------------------------|----|----|
|  |                       |              | T1                                   | T2 | T3 | T1                                   | T2 | T3 |
| Duplex mode  | Config 1              |              | TDD                                  |    |    | TDD                                  |    |    |
| TDD configuration  | Config 1              |              | TDDConf.1.1 CCA                      |    |    | TDDConf.1.1 CCA                      |    |    |
| BW <sub>channel</sub>  | Config 1              | MHz          | 40: N <sub>RB,c</sub> = 106          |    |    | 40: N <sub>RB,c</sub> = 106          |    |    |
| DL CCA model   |                       |              | As specified in clause A.3.26.2.1    |    |    | As specified in clause A.3.26.2.1    |    |    |
| UL CCA model   |                       |              | As specified in clause A.3.26.2.2    |    |    | As specified in clause A.3.26.2.2    |    |    |
| DL CCA probability for semi-static channel access <sup>Note5,7</sup> | P <sub>CCA_DL</sub>   |              | 0.9375                               |    |    | 0.9375                               |    |    |
| DL CCA probability for dynamic channel access <sup>Note6,7</sup>     | P <sub>CCA_DL_1</sub> |              | 0.75                                 |    |    | 0.75                                 |    |    |
|  | P <sub>CCA_DL_2</sub> |              | 0.75                                 |    |    | 0.75                                 |    |    |
| UL CCA probability for semi-static channel access                    | P <sub>CCA_UL</sub>   |              | 0.87                                 |    |    | 0.87                                 |    |    |
| UL CCA probability for dynamic channel access                        | P <sub>CCA_UL</sub>   |              | 0.75                                 |    |    | 0.75                                 |    |    |
| L <sub>CCA_DL</sub> <sup>Note 8</sup>                                |                       |              | 2                                    |    |    | 2                                    |    |    |
| W <sub>CCA_DL</sub> <sup>Note 8</sup>                                |                       | ms           | T <sub>activation_time_withCCA</sub> |    |    | T <sub>activation_time_withCCA</sub> |    |    |
| Initial downlink BWP configuration                                   |                       |              | DLBWP.0.2                            |    |    | DLBWP.0.2                            |    |    |
| Initial uplink BWP configuration                                     |                       |              | ULBWP.0.1                            |    |    | ULBWP.0.1                            |    |    |
| Dedicated downlink BWP configuration                                 |                       |              | DLBWP.0.2                            |    |    | DLBWP.0.2                            |    |    |
| Dedicated uplink BWP configuration                                   |                       |              | ULBWP.0.1                            |    |    | ULBWP.0.1                            |    |    |
| TCI state  |                       |              | TCI.State.0                          |    |    | TCI.State.0                          |    |    |
| TRS Configuration  | Config 1              |              | TRS.1.2 TDD                          |    |    | TRS.1.2 TDD                          |    |    |
| PDSCH Reference measurement channel                                  | Config 1              |              | SR.1.1 CCA                           |    |    | SR.1.1 CCA                           |    |    |
| Dedicated CORESET parameters   | Config 1              |              | CCR.1.3 CCA                          |    |    | CCR.1.3 CCA                          |    |    |
| RMSI CORESET parameters  | Config 1              |              | CR.1.1 CCA                           |    |    | CR.1.1 CCA                           |    |    |
| OCNG Patterns <sup>Note1</sup>                                       |                       |              | OP.1                                 |    |    | OP.1                                 |    |    |
| SSB Configuration for semi-static channel access <sup>Note5,7</sup>  | Config 1              |              | SSB.1 CCA                            |    |    | SSB.1 CCA                            |    |    |
| SSB Configuration for dynamic channel access <sup>Note6,7</sup>      | Config 1              |              | SSB.2 CCA                            |    |    | SSB.2 CCA                            |    |    |
| SMTC configuration   |                       |              | SMTC.1                               |    |    | SMTC.1                               |    |    |
| EPRE ratio of PSS to SSS   |                       | dB           | 0                                    |    |    | 0                                    |    |    |
| EPRE ratio of PBCH DMRS to SSS                                       |                       |              |                                      |    |    |                                      |    |    |
| EPRE ratio of PBCH to PBCH DMRS                                      |                       |              |                                      |    |    |                                      |    |    |
| EPRE ratio of PDCCH DMRS to SSS                                      |                       |              |                                      |    |    |                                      |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS                                    |                       |              |                                      |    |    |                                      |    |    |
| EPRE ratio of PDSCH DMRS to SSS                                      |                       |              |                                      |    |    |                                      |    |    |
| EPRE ratio of PDSCH to PDSCH   |                       |              |                                      |    |    |                                      |    |    |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>                      |                       |              |                                      |    |    |                                      |    |    |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>                     |                       |              |                                      |    |    |                                      |    |    |
| N <sub>oc</sub> <sup>Note2</sup>                                     | Config 1              | dBm/15kHz    | -104                                 |    |    | -104                                 |    |    |
| N <sub>oc</sub> <sup>Note2</sup>                                     | Config 1              | dBm/SCS      | -101                                 |    |    | -101                                 |    |    |
| $\bar{E}_s/I_{ot}$   |                       | dB           | 17                                   |    |    | 17                                   |    |    |
| $\bar{E}_s/N_{oc}$   |                       | dB           | 17                                   |    |    | 17                                   |    |    |
| SS-RSRP <sup>Note3</sup>   | Config 1              | dBm/SCS      | -84                                  |    |    | -84                                  |    |    |
| I <sub>o</sub> <sup>Note3</sup>                                      | Config 1              | dBm/38.16MHz | -52.87                               |    |    | -52.87                               |    |    |
| Propagation condition  |                       | -            | AWGN                                 |    |    |                                      |    |    |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |
| Note 3: | SS-RSRP, SCH_RP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.  |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |
| Note 8: | As specified in clause 8.3A for $L_{1,max}$ , $L_{2,1,max}$ , $L_{2,2,max}$ , $L_{3,1,max}$ , and $L_{3,2,max}$  |

#### A.11.4.3.1.2 Test Requirements

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [3] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot  $m + (T_{HARQ} + T_{activation\_time\_withCCA} + T_{CSI\_Reporting\_withCCA}) / NR\_slot\_length$ , where  $T_{activation\_time\_withCCA} = T_{FirstSSB} + L_1 * T_{rs} + 5ms$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{HARQ} + 3ms}{NR\_slot\_length}$ , as defined in clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot  $m + 1 + \frac{T_{HARQ}}{NR\_slot\_length}$  to slot  $m + 1 + \frac{T_{HARQ} + 3 + T_X}{NR\_slot\_length}$  with  $T_X = T_{FirstSSB}$ .

During T3, interruption on PCell shall not occur outside slot  $n + 1 + T_{HARQ} / NR\_slot\_length$  to slot  $n + 1 + (T_{HARQ} + 3ms) / NR\_slot\_length$ .

The interruption on PCell shall not be more than specified for SA in clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

#### A.11.4.3.2 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 320 ms SCell measurement cycle

##### A.11.4.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell under CCA, are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 320 ms.

The supported test configurations are same as in Table A.11.4.3.1.1-1 above.

The test parameters are same as in Table A.11.4.3.1.1-2 above, except for parameters listed below in Table A.11.4.3.2.1-1. The cell-specific parameters are same as in Table A.11.4.3.1.1-3 above.

The test execution is the same as described in clause A.11.4.3.1 above.

**Table A.11.4.3.2.1-1: General test parameters for known SCell activation with PCell and SCell under CCA, 320 ms SCell measurement cycle**

| Parameter                                | Unit | Value | Comment |
|--|------|-------|---------|
| SCell measurement cycle (measCycleSCell) | ms   | 320   |         |

### A.11.4.3.2.2 Test Requirements

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [3] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot  $m + (T_{\text{HARQ}} + T_{\text{activation\_time\_withCCA}} + T_{\text{CSI\_Reporting\_withCCA}}) / \text{NR\_slot\_length}$ , where  $T_{\text{activation\_time\_withCCA}} = T_{\text{FirstSSB\_MAX}} + L_{2,1} * T_{\text{SMTC\_MAX}} + (1 + L_{2,2}) * T_{\text{rs}} + 5\text{ms}$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR\_slot\_length}}$ , as defined in clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR\_slot\_length}}$  to slot  $m + 1 + \frac{T_{\text{HARQ}} + 3 + T_{\text{X}}}{\text{NR\_slot\_length}}$  with  $T_{\text{X}} = T_{\text{FirstSSB\_MAX}} + L_{2,1} * T_{\text{SMTC\_MAX}}$ .

During T3, interruption on PCell shall not occur outside slot  $n + 1 + T_{\text{HARQ}} / \text{NR\_slot\_length}$  to slot  $n + 1 + (T_{\text{HARQ}} + 3\text{ms}) / \text{NR\_slot\_length}$ .

The interruption on PCell shall not be more than specified for SA in clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

### A.11.4.3.3 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA

#### A.11.4.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell under CCA, are within the requirements stated in clause 8.3A, when the SCell is unknown to the UE at the time of activation.

The supported test configurations are same as in Table A.11.4.3.1.1-1 above.

The test parameters are same as in Table A.11.4.3.1.1-2 above, except for parameters listed below in Table A.11.4.3.3.1-1. The cell-specific parameters are same as in Table A.11.4.3.1.1-3 above.

The test execution is the same as described in clause A.11.4.3.1 above.

**Table A.11.4.3.3.1-1: General test parameters for unknown SCell activation with PCell and SCell under CCA**

| Parameter | Unit | Value | Comment  |
|-----------|------|-------|--|
| T1        | s    | 0.1   | During this time period the PCell shall be known and the SCell configured, but not detected. |

#### A.11.4.3.3.2 Test Requirements

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [3] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot  $m + (T_{\text{HARQ}} + T_{\text{activation\_time\_withCCA}} + T_{\text{CSI\_Reporting\_withCCA}}) / \text{NR\_slot\_length}$ , where  $T_{\text{activation\_time\_withCCA}} = T_{\text{FirstSSB\_MAX}} + (1 + L_{3,1}) * T_{\text{SMTC\_MAX}} + (2 + L_{3,2}) * T_{\text{rs}} + 5\text{ms}$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR\_slot\_length}}$ , as defined in clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR\_slot\_length}}$  to slot  $m + 1 + \frac{T_{\text{HARQ}} + 3 + T_{\text{X}}}{\text{NR\_slot\_length}}$  with  $T_{\text{X}} = T_{\text{FirstSSB\_MAX}} + L_{3,1} * T_{\text{SMTC\_MAX}}$ .

During T3, interruption on PCell shall not occur outside slot  $n + 1 + T_{\text{HARQ}}/\text{NR\_slot\_length}$  to slot  $n + 1 + (T_{\text{HARQ}} + 3\text{ms})/\text{NR\_slot\_length}$ .

The interruption on PCell shall not be more than specified for SA in clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## A.11.4.4 Beam failure detection and link recovery procedures

### A.11.4.4.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode

#### A.11.4.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.11.4.4.1.1-1, A.11.4.4.1.1-2, A.11.4.4.1.1-3 and A.11.4.4.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.11.4.4.1.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.11.4.4.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1.

**Table A.11.4.4.1.1-1: Supported test configurations for FR1 PCell with CCA**

| Configuration | Description                                       |
|---------------|---|
| 1             | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| Note:         | void  |

**Table A.11.4.4.1.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

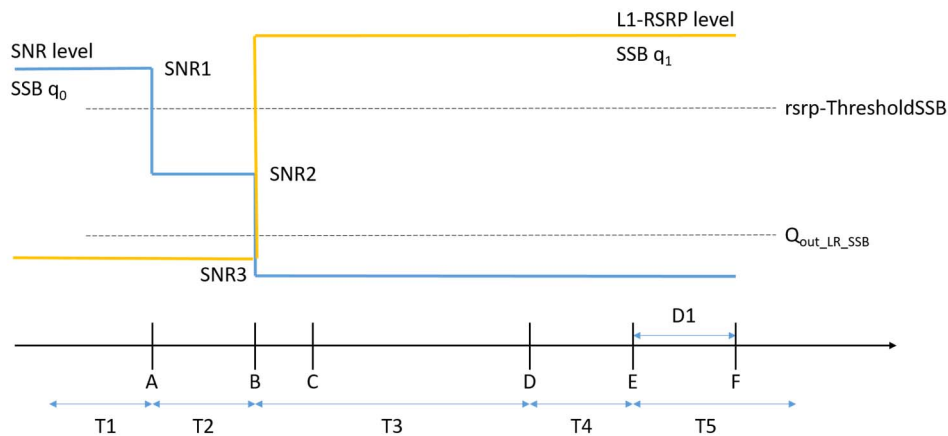
| Parameter                                      |  | Unit | Value  |  | Comment |
|--|--|------|--|--|---------|
|  |  |      | Test 1   |  |         |
| Active PSCell                                  |  |      | Cell 1   |  |         |
| RF Channel Number                              |  |      | 1  |  |         |
| DL CCA model                                   |  |      | As specified in A.3.26.2.1   |  |         |
| UL CCA model                                   |  |      | As specified in A.3.26.2.2   |  |         |
| Duplex mode                                    | Config 1   |      | TDD  |  |         |
| BWchannel                                      | Config 1   | MHz  | 40: NRB,c = 106  |  |         |
| DL initial BWP configuration                   | Config 1   |      | DLBWP.0.1  |  |         |
| DL dedicated BWP configuration                 | Config 1   |      | DLBWP.1.1  |  |         |
| UL initial BWP configuration                   | Config 1   |      | ULBWP.0.1  |  |         |
| UL dedicated BWP configuration                 | Config 1   |      | ULBWP.1.1  |  |         |
| TDD Configuration                              | Config 1   |      | TDDConf.1.1 CCA  |  |         |
| CORESET Reference Channel                      | Config 1   |      | CR.1.1 CCA   |  |         |
| SSB Configuration                              | Config 1   |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |  |         |
| DBT Window Configuration                       | Config 1   |      | DBT.1  |  |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1   |      | 30 KHz   |  |         |
| PRACH Configuration                            | Config 1   |      | Table A.3.8.2.2-1  |  |         |
| SSB Index assigned as BFD RS ( $q_0$ )         |  |      | 0  |  |         |
| SSB Index assigned as CBD RS ( $q_1$ )         |  |      | 1  |  |         |
| OCNG parameters                                |  |      | OP.1   |  |         |
| CP length                                      |  |      | Normal   |  |         |
| Correlation Matrix and Antenna Configuration   |  |      | 2x2 Low  |  |         |
| Beam failure detection transmission parameters | DCI format   |      | 1-0  |  |         |
|  | Number of Control OFDM symbols                                   |      | 2  |  |         |
|  | Aggregation level  | CCE  | 8  |  |         |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0  |  |         |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0  |  |         |
|  | DMRS precoder granularity  |      | REG bundle size  |  |         |
|  | REG bundle size  |      | 6  |  |         |
| DRX  |  |      | OFF  |  |         |
| Gap pattern ID                                 |  |      | gp0  |  |         |
| gapOffset                                      |  |      | 0  |  |         |

|   |          |             |                |  |  |
|---|----------|-------------|----------------|--|--|
| rlmInSyncOutOfSyncThreshold   |          |             | absent         |  | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1 | dBm/SCS kHz | -95            |  | Threshold used for $Q_{in\_LR\_SSB}$                                   |
| powerControlOffsetSS  |          |             | db0            |  | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount   |          |             | n1             |  | see clause 5.17 of TS 38.321 [7]                                       |
| beamFailureDetectionTimer   |          |             | pbfd4          |  | see clause 5.17 of TS 38.321 [7]                                       |
| CSI-RS configuration for CSI reporting  | Config 1 |             | CSI-RS.2.1 TDD |  |  |
| CSI-RS for tracking   | Config 1 |             | TRS.1.2 TDD    |  |  |
| SSB Index assigned as RLM RS  |          |             | 0, 1           |  |  |
| T310 Timer  |          | ms          | 1000           |  |  |
| N310  |          |             | 2              |  |  |
| T1  |          | s           | 0.2            |  | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |          | s           | 0.93           |  |  |
| T3  |          | s           | 0.52           |  |  |
| T4  |          | s           | 0              |  |  |
| T5  |          | s           | 0.45           |  |  |
| D1  |          | s           | 0.41           |  |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |          |             |                |  |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |          |             |                |  |  |

**Table A.11.4.4.1.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter  |             | Unit            | Test 1            |                                       |               |               |               |
|--|-------------|-----------------|-------------------|---------------------------------------|---------------|---------------|---------------|
|  |             |                 | T1                | T2                                    | T3            | T4            | T5            |
| DL CCA probability $P_{CCA,DL}$  | Note 10, 12 |                 | 1.0               | 0.9375                                | 0.9375        | 0.9375        | 0.9375        |
|  | Note 11, 12 |                 | 1.0/1.0           | 0.75/0.7<br>5                         | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability $P_{CCA,UL}$  |             |                 | 1.0               | 1.0                                   | 1.0           | 1.0           | 1.0           |
| $L_{CCA,DL}$   |             |                 | N/A               | 7                                     |               |               |               |
| $W_{CCA,DL}$   |             | ms              | N/A               | $T_{Evaluate\_CBD\_SSB\_CCA}$ Note 13 |               |               |               |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB              | 0                 |                                       |               |               |               |
| EPRE ratio of PDCCH to PDCCH DMRS  |             | dB              |                   |                                       |               |               |               |
| EPRE ratio of PBCH DMRS to SSS   |             | dB              |                   |                                       |               |               |               |
| EPRE ratio of PBCH to PBCH DMRS  |             | dB              |                   |                                       |               |               |               |
| EPRE ratio of PSS to SSS   |             | dB              |                   |                                       |               |               |               |
| EPRE ratio of PDSCH DMRS to SSS  |             | dB              |                   |                                       |               |               |               |
| EPRE ratio of PDSCH to PDSCH DMRS  |             | dB              |                   |                                       |               |               |               |
| EPRE ratio of OCNG DMRS to SSS   |             | dB              |                   |                                       |               |               |               |
| EPRE ratio of OCNG to OCNG DMRS  |             | dB              |                   |                                       |               |               |               |
| SNR_SSB of set $q_0$   | Config 1    | dB              | 5                 | -3                                    | -12           | -12           | -12           |
| SNR_SSB of set $q_1$   | Config 1    | dB              | -10               | -10                                   | 10            | 10            | 10            |
| SSB_RP of set $q_1$  | Config 1    | dBm/S<br>CS kHz | -105              | -105                                  | -85           | -85           | -85           |
| $N_{oc}$   | Config 1    | dBm/15<br>KHz   | -98               |                                       |               |               |               |
| Propagation condition  |             |                 | TDL-C 300ns 100Hz |                                       |               |               |               |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio the transmitted SSS REs during DBT window.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6A.</p> <p>Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA,DL1}</math> and the second value corresponds to the <math>P_{CCA,DL2}</math>.</p> <p>Note 12: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> <p>Note 13: As defined in Table 8.5A.5.2-1.</p> |             |                 |                   |                                       |               |               |               |





**Figure A.11.4.4.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.11.4.4.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 410$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.11.4.4.2 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode

##### A.11.4.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.11.4.4.2.1-1, A.11.4.4.2.1-2, and A.11.4.4.2.1-3 below. There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.11.4.4.2.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.11.4.4.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

**Table A.11.4.4.2.1-1: Supported test configurations for FR1 PCell with CCA**

| <b>Configuration</b> | <b>Description</b>                                |
|----------------------|---|
| 1                    | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| Note:                | Void  |

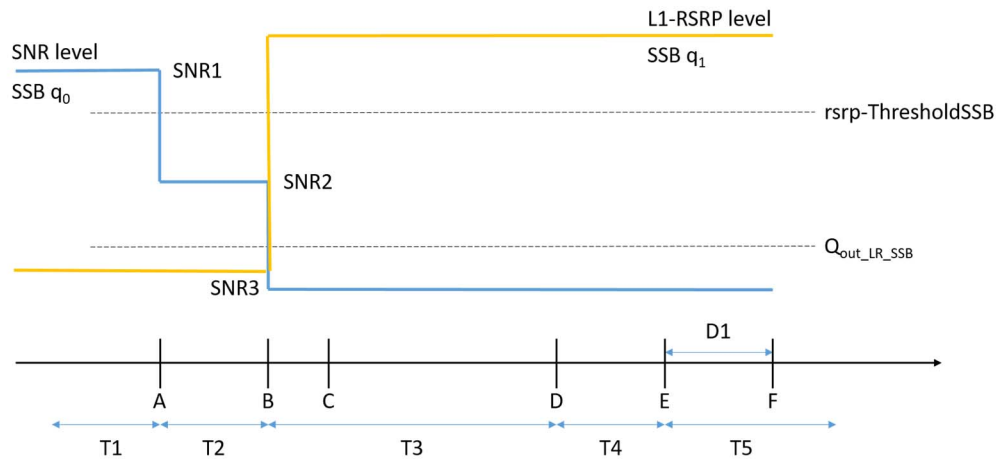
**Table A.11.4.4.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter                                      |  | Unit | Value  |  | Comment |
|--|--|------|--|--|---------|
|  |  |      | Test 1   |  |         |
| Active PSCell                                  |  |      | Cell 1   |  |         |
| RF Channel Number                              |  |      | 1  |  |         |
| DL CCA model                                   |  |      | As specified in A.3.20.2.1   |  |         |
| UL CCA model                                   |  |      | As specified in A.3.20.2.2   |  |         |
| Duplex mode                                    | Config 1   |      | TDD  |  |         |
| BWchannel                                      | Config 1   | MHz  | 40: NRB,c = 106  |  |         |
| DL initial BWP configuration                   | Config 1   |      | DLBWP.0.1  |  |         |
| DL dedicated BWP configuration                 | Config 1   |      | DLBWP.1.1  |  |         |
| UL initial BWP configuration                   | Config 1   |      | ULBWP.0.1  |  |         |
| UL dedicated BWP configuration                 | Config 1   |      | ULBWP.1.1  |  |         |
| TDD Configuration                              | Config 1   |      | TDDConf.1.1 CCA  |  |         |
| CORESET Reference Channel                      | Config 1   |      | CR.1.1 CCA   |  |         |
| SSB Configuration                              | Config 1   |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |  |         |
| DBT Window Configuration                       | Config 1   |      | DBT.1  |  |         |
| PDSCH/PDCCH subcarrier spacing                 | Config 1   |      | 30 KHz   |  |         |
| PRACH Configuration                            | Config 1   |      | Table A.3.8.2.2-1  |  |         |
| SSB Index assigned as BFD RS ( $q_0$ )         |  |      | 0  |  |         |
| SSB Index assigned as CBD RS ( $q_1$ )         |  |      | 1  |  |         |
| OCNG parameters                                |  |      | OP.1   |  |         |
| CP length                                      |  |      | Normal   |  |         |
| Correlation Matrix and Antenna Configuration   |  |      | 2x2 Low  |  |         |
| Beam failure detection transmission parameters | DCI format   |      | 1-0  |  |         |
|  | Number of Control OFDM symbols                                   |      | 2  |  |         |
|  | Aggregation level  | CCE  | 8  |  |         |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy   | dB   | 0  |  |         |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB   | 0  |  |         |
|  | DMRS precoder granularity  |      | REG bundle size  |  |         |
|  | REG bundle size  |      | 6  |  |         |
| DRX  |  |      | DRX.7  |  | A.3.3.7 |
| Gap pattern ID                                 |  |      | N.A.   |  |         |
| gapOffset                                      |  |      | 0  |  |         |

|   |          |             |                |  |  |
|---|----------|-------------|----------------|--|--|
| rlmInSyncOutOfSyncThreshold   |          |             | absent         |  | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB   | Config 1 | dBm/SCS kHz | -95            |  | Threshold used for $Q_{in\_LR\_SSB}$                                   |
| powerControlOffsetSS  |          |             | db0            |  | Used for deriving rsrp-ThresholdCSI-RS                                 |
| beamFailureInstanceMaxCount   |          |             | n1             |  | see clause 5.17 of TS 38.321 [7]                                       |
| beamFailureDetectionTimer   |          |             | pbfd4          |  | see clause 5.17 of TS 38.321 [7]                                       |
| CSI-RS configuration for CSI reporting  | Config 1 |             | CSI-RS.2.1 TDD |  |  |
| CSI-RS for tracking   | Config 1 |             | TRS.1.2 TDD    |  |  |
| SSB Index assigned as RLM RS  |          |             | 0, 1           |  |  |
| T310 Timer  |          | ms          | 1000           |  |  |
| N310  |          |             | 2              |  |  |
| T1  |          | s           | 1              |  | During this time the the UE shall be fully synchronized to cell 1      |
| T2  |          | s           | 9.01           |  |  |
| T3  |          | s           | 5.16           |  |  |
| T4  |          | s           | 0              |  |  |
| T5  |          | s           | 3.89           |  |  |
| D1  |          | s           | 3.85           |  |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1. |          |             |                |  |  |
| Note 2: UE-specific PDCCH is not transmitted after T1 starts.                           |          |             |                |  |  |

**Table A.11.4.4.2.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter  |             | Unit            | Test 1            |               |               |               |               |
|--|-------------|-----------------|-------------------|---------------|---------------|---------------|---------------|
|  |             |                 | T1                | T2            | T3            | T4            | T5            |
| DL CCA probability $P_{CCA}$   | Note 10, 12 |                 | 1.0               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
|  | Note 11, 12 |                 | 1.0/1.0           | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability $P_{CCA}$   |             |                 | 1.0               | 1.0           | 1.0           | 1.0           | 1.0           |
| EPRE ratio of PDCCH DMRS to SSS  |             | dB              | 0                 |               |               |               |               |
| EPRE ratio of PDCCH to PDCCH DMRS  |             | dB              |                   |               |               |               |               |
| EPRE ratio of PBCH DMRS to SSS   |             | dB              |                   |               |               |               |               |
| EPRE ratio of PBCH to PBCH DMRS  |             | dB              |                   |               |               |               |               |
| EPRE ratio of PSS to SSS   |             | dB              |                   |               |               |               |               |
| EPRE ratio of PDSCH DMRS to SSS  |             | dB              |                   |               |               |               |               |
| EPRE ratio of PDSCH to PDSCH DMRS  |             | dB              |                   |               |               |               |               |
| EPRE ratio of OCNG DMRS to SSS   |             | dB              |                   |               |               |               |               |
| EPRE ratio of OCNG to OCNG DMRS  |             | dB              |                   |               |               |               |               |
| SNR_SSB of set $q_0$   | Config 1    | dB              | 5                 | -3            | -12           | -12           | -12           |
| SNR_SSB of set $q_1$   | Config 1    | dB              | -10               | -10           | 10            | 10            | 10            |
| SSB_RP of set $q_1$  | Config 1    | dBm/S<br>CS kHz | -105              | -105          | -85           | -85           | -85           |
| $N_{oc}$   | Config 1    | dBm/15<br>KHz   | -98               |               |               |               |               |
| Propagation condition  |             |                 | TDL-C 300ns 100Hz |               |               |               |               |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.</p> <p>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.</p> <p>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.</p> <p>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.</p> <p>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.</p> <p>Note 7: SNR levels correspond to the signal to noise ratio the transmitted SSS REs during DBT window.</p> <p>Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.</p> <p>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6A.</p> <p>Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> <p>Note 12: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |             |                 |                   |               |               |               |               |



**Figure A.11.4.4.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### A.11.4.4.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than  $D1 = 3850$  ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.11.4.5 Active BWP switching

#### A.11.4.5.1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA

##### A.11.4.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the UL BWP switch delay requirement defined in clause 8.6.4.

The supported test configurations are shown in Table A.11.4.5.1.1-1. The test scenario comprises of one cell (Cell 1), which is Pcell as given in Table A.11.4.5.1.1-2. Cell-specific parameters of the cell are specified in Table A.11.4.5.1.1-3 below. SRS configuration used in the test is specified in Table A.11.4.5.1.1-4.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific downlink and uplink bandwidth parts: DL BWP-1, DL BWP-2, UL BWP-1 and UL BWP-2 before starting the test. DL BWP-1 and DL BWP-2 always include bandwidth of the initial DL BWP and SSB. UL BWP-1 and UL BWP-2 always include bandwidth of the SRS.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is DL BWP-1.
- UE is indicated in *firstActiveUplinkBWP-Id* that the active UL BWP is UL BWP-1.

- UE is configured with *LBT-FailureRecoveryConfig* parameters for Cell 1.

The cell has constant signal levels throughout the test. The test consists of 2 successive time periods, with durations of T1 and T2, respectively.

During T1,

- Time period T1 starts when the UE has received the SRS configuration for periodic SRS transmission on active UL BWP-1.
- The UE shall perform UL CCA before SRS transmission.
- The parameter UL CCA probability  $P_{CCA}$  is set to 0 during T1. This requires the test system to set energy level above the detection level during portion of the UL slot where the UE performs UL CCA. This in turn forces the UE to fail the UL CCA. The UE consistently fails UL CCA during T1 and is therefore unable to transmit SRS.

During T2,

- T2 starts when the UE detects consistent UL LBT failures i.e. when total number of UL LBT failures in cell1 on active UL BWP-1 exceeds *lbt-FailureInstanceMaxCount* during *lbt-FailureDetectionTimer*.
- The UE upon detected consistent UL LBT failure starts the LBT recovery mechanism, which requires the UE to switch to active UL BWP-2 in Cell 1 and to send PRACH in the active UL BWP-2.
- Starting from T2, the UE shall be able to send PRACH in the active UL BWP-2 within the delay specified in clause 8.6.4.

**Table A.11.4.5.1.1-1: Supported test configurations for UL BWP switch test in SA**

| Config  | Description  |
|---------|--|
| 1       | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: | void   |

**Table A.11.4.5.1.1-2: General test parameters for UL BWP switch test in SA**

| Parameter                              | Unit | Value  | Comment  |
|--|------|--------|--|
| NR RF Channel Number                   |      | 1      | One NR radio channel is used for this test                       |
| Active Cell                            |      | Cell 1 | Cell1 on RF channel number 1.                                    |
| CP length                              |      | Normal |  |
| DRX                                    |      | OFF    |  |
| <i>lbt-FailureDetectionTimer</i> [2]   | ms   | 80     | Parameter configured by IE: <i>LBT-FailureRecoveryConfig</i> [1] |
| <i>lbt-FailureInstanceMaxCount</i> [2] |      | 4      | Parameter configured by IE: <i>LBT-FailureRecoveryConfig</i> [1] |
| T1                                     | s    | 0.1    | During T1 consistent LBT failure is detected on active UL BWP-1  |
| T2                                     | s    | 0.1    | During T2 UE sends PRACH on active UL BWP-2                      |



**Table A.11.4.5.1.1-3: NR Cell specific test parameters for UL BWP switch test in SA**

| Parameter  |                            | Unit             | Cell 1                            |                                       |
|--|----------------------------|------------------|-----------------------------------|---------------------------------------|
|  |                            |                  | T1                                | T2                                    |
| TDD configuration  |                            | Config 1         | TDDConf.1.1 CCA                   |                                       |
| $BW_{channel}$   |                            | Config 1         | 40 MHz: $N_{RB,c} = 106$          |                                       |
| DL CCA model   |                            | Config 1         | As specified in clause A.3.26.2.1 |                                       |
| UL CCA model   |                            | Config 1         | As specified in clause A.3.26.2.2 |                                       |
| Active BWP ID  |                            | Config 1         | 1, 2                              |                                       |
| Initial DL BWP Configuration   |                            | Config 1         | DLBWP.0.2 <sup>Note 4</sup>       |                                       |
| Active DL BWP-1 Configuration  |                            | Config 1         | DLBWP.1.1 <sup>Note 4</sup>       |                                       |
| Active DL BWP-2 Configuration  |                            | Config 1         | DLBWP.1.3 <sup>Note 4</sup>       |                                       |
| Initial UL BWP Configuration   |                            | Config 1         | ULBWP.0.2 <sup>Note 4</sup>       |                                       |
| Active UL BWP-1 Configuration  |                            | Config 1         | ULBWP.1.1 <sup>Note 4</sup>       |                                       |
| Active UL BWP-2 Configuration  |                            | Config 1         | ULBWP.1.3 <sup>Note 4</sup>       |                                       |
| PDSCH Reference measurement channel  |                            | Config 1         | SR.1.1 CCA                        |                                       |
| RMSI CORESET parameters  |                            | Config 1         | CR.1.1 CCA                        |                                       |
| Dedicated CORESET parameters   |                            | Config 1         | CCR.1.3 CCA                       |                                       |
| OCNG Patterns  |                            | Config 1         | OP.1                              |                                       |
| SSB Configuration  | Semi- static channel acces | Config 1         | SSB.1 CCA                         |                                       |
|  | Dynamic channel acces      | Config 1         | SSB.2 CCA                         |                                       |
| SMTTC Configuration  |                            | Config 1         | SMTTC.1 FR1                       |                                       |
| Correlation Matrix and Antenna Configuration   |                            | Config 1         | 1x2 Low                           |                                       |
| TRS Configuration  |                            | Config 1         | TRS.1.2 TDD                       |                                       |
| DL CCA probability for semi-static channel access ( $P_{CCA\_DL}$ )  |                            | Config 1         | 1                                 | 1                                     |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_1}$ )  |                            | Config 1         | 1                                 | 1                                     |
| DL CCA model probability for dynamic static channel access ( $P_{CCA\_DL\_2}$ )  |                            | Config 1         | 1                                 | 1                                     |
| UL CCA probability ( $P_{CCA\_UL}$ )   |                            | Config 1         | 0                                 | 1                                     |
| PRACH configuration  |                            | Config 1         | N/A                               | Configuration #1 in Table A.3.8.2.1-1 |
| EPRE ratio of PSS to SSS   |                            | dB               | 0                                 |                                       |
| EPRE ratio of PBCH DMRS to SSS   |                            |                  |                                   |                                       |
| EPRE ratio of PBCH to PBCH DMRS  |                            |                  |                                   |                                       |
| EPRE ratio of PDCCH DMRS to SSS  |                            |                  |                                   |                                       |
| EPRE ratio of PDCCH to PDCCH DMRS  |                            |                  |                                   |                                       |
| EPRE ratio of PDSCH DMRS to SSS  |                            |                  |                                   |                                       |
| EPRE ratio of PDSCH to PDSCH   |                            |                  |                                   |                                       |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                            |                  |                                   |                                       |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                            |                  |                                   |                                       |
| $N_{oc}$ <sup>Note 2</sup>   | Config 1                   | dBm/SCS          | -101                              |                                       |
| SS-RSRP <sup>Note 3</sup>  | Config 1                   | dBm/SCS          | -84                               |                                       |
| $\bar{E}_s/I_{ot}$   | Config 1                   | dB               | 17                                |                                       |
| $\bar{E}_s/N_{oc}$   | Config 1                   | dB               | 17                                |                                       |
| $I_o$ <sup>Note3</sup>   | Config 1                   | dBm/<br>38.16MHz | -52.86                            |                                       |
| Propagation Condition  |                            |                  | AWGN                              |                                       |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> <p>Note 5: Parameters <math>P_{CCA\_DL}</math>, <math>P_{CCA\_DL\_1}</math>, <math>P_{CCA\_DL\_2}</math> and <math>P_{CCA\_UL}</math> are defined in clause A.3.26.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                            |                  |                                   |                                       |

**Table A.11.4.5.1.1-4: Sounding Reference Symbol Configuration for UL BWP Switch Test**

| Field                    | Value  | Comment  |
|--------------------------|--|--|
| c-SRS                    | 24   | Frequency hopping is disabled  |
| b-SRS                    | 0  |  |
| b-hop                    | 0  |  |
| freqDomainPosition       | 0  | Frequency domain position of SRS   |
| freqDomainShift          | 0  |  |
| groupOrSequenceHopping   | neither  | No group or sequence hopping   |
| SRS-PeriodicityAndOffset | sl5=4 for SCS<br>30kHz                                     | Once every 5 slots   |
| pathlossReferenceRS      | ssb-Index=0  | SSB #0 is used for SRS path loss estimation  |
| usage                    | Codebook   | Codebook based UL transmission   |
| startPosition            | 0  | resourceMapping setting: SRS on last symbol of slot, and 1 symbols for SRS without repetition. |
| nrofSymbols              | n1   |  |
| repetitionFactor         | n1   |  |
| combOffset-n2            | 0  | transmissionComb setting   |
| cyclicShift-n2           | 0  |  |
| nrofSRS-Ports            | port1  | Number of antenna ports used for SRS transmission  |
| Note:                    | For further information see clause 6.3.2 in TS 38.331 [2]. |  |

#### A.11.4.5.1.2 Test Requirements

The UE capable of *bwp-SwitchingDelay type1* [2] shall start to transmit the PRACH on active UL BWP-2 of Cell 1 (PCell) less than 21.5 ms from the beginning of time period T1.

The UE capable of *bwp-SwitchingDelay type2* [2] shall start to transmit the PRACH on active UL BWP-2 of Cell 1 (PCell) less than 23 ms from the beginning of time period T1.

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

NOTE: The above delay is calculated as follows:'

The active UL BWP switch delay from UL BWP-1 to UL BWP-2 can be expressed as:

$$T_{\text{BWPswitchDelay}} * T_{\text{slot}} + 1 * T_{\text{slot}} + (1 + L_3) * T_{\text{SSB,RO}} + 10 \text{ ms}$$

Where:

- $T_{\text{BWPswitchDelay}} = 1 \text{ ms}$  (2 slots) and  $2.5 \text{ ms}$  (5 slots) for *bwp-SwitchingDelay* [2] *type1* and *type2* UE capabilities according to clause 8.6.4.
- $T_{\text{slot}} =$  It is the slot length. It is 0.5 ms for 30 kHz.
- $L_3 =$  It is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure.  $L_3 = 0$  during T2 since  $P_{\text{CCA}} = 1$ .
- $T_{\text{SSB,RO}} = 10 \text{ ms}$  according to FR1 PRACH configuration 1.

This gives a total of 21.5 ms and 23 ms for *type1* and *type2* UE respectively.

#### A.11.4.5.2 DCI-based and Timer-based Active BWP Switch

##### A.11.4.5.2.1 NR FR1- NR FR1 DL active BWP switch of PCell with non-DRX in SA

###### A.11.4.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.11.4.5.2.1.1-1 below. The test scenario comprises of one PCell (Cell 1) and one SCell (Cell 2) as given in Table A.11.4.5.2.1.1-2. NR Cell-specific parameters are specified in Table A.11.4.5.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for SCell, BWP-0 in Cell 2 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in SCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of PCell's DL slot ( $i+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than the first UL slot that occurs after the beginning of slot ( $i+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PCell's BWP-2 no later than the first DL slot that occurs after the beginning of slot ( $i+T_{BWPswitchDelay}$ ).

The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell (Cell 1).

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of PCell's slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on PCell's BWP-1 no later than the first DL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}$ ).

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

**Table A.11.4.5.2.1.1-1: DL BWP switch supported test configurations**

| Config  | Description   |
|---------|---|
| 1       | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: | Void  |
| Note 2: | The UE supporting SA operation with only NR band(s) with shared spectrum access is required to be tested. |

**Table A.11.4.5.2.1.1-2: General test parameters for DL BWP switch in SA**

| Parameter   | Unit | Value                             | Comment   |
|---|------|-----------------------------------|---|
| NR RF Channel Number                                    |      | 1, 2                              | Two NR radio channels are used in this test                         |
| Active PCell  |      | Cell 1                            | PCell on RF channel number 1.                                       |
| Active SCell  |      | Cell 2                            | SCell on RF channel number 2.                                       |
| CP length   |      | Normal                            |   |
| DRX   |      | OFF                               | For both PCell and SCell  |
| DL CCA model  |      | As specified in clause A.3.26.2.1 |   |
| UL CCA model  |      | As specified in clause A.3.26.2.2 |   |
| <i>bwp-InactivityTimer</i>                              | ms   | 200                               |   |
| Cell-individual offset for cells on RF channel number 1 | dB   | 0                                 | Individual offset for cells on PCC.                                 |
| Cell-individual offset for cells on RF channel number 2 | dB   | 0                                 | Individual offset for cells on SCC.                                 |
| Cell2 timing offset to cell1                            | μs   | 3                                 | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1  | s    | 0.2                               |   |
| T2  | s    | 0.2                               |   |
| T3  | s    | 0.2                               |   |

Table A.11.4.5.2.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

| Parameter   |                            | Unit         | Cell 1                          | Cell2                      |
|---|----------------------------|--------------|---------------------------------|----------------------------|
| Frequency Range   |                            |              | FR1                             |                            |
| Duplex mode   | Config 1                   |              | TDD                             |                            |
| TDD configuration   | Config 1                   |              | TDDConf.1.1 CCA                 |                            |
| BW <sub>channel</sub>   | Config 1                   |              | 40 MHz: N <sub>RB,c</sub> = 106 |                            |
| Active BWP ID   |                            |              | 1, 2                            | 0                          |
| Initial DL BWP Configuration  |                            |              | DLBWP.0.2 <sup>Note4</sup>      |                            |
| Initial UL BWP Configuration  |                            |              | ULBWP.0.2 <sup>Note4</sup>      |                            |
| Active DL BWP-0 Configuration   |                            |              | N.A.                            | DLBWP.0.2 <sup>Note4</sup> |
| Active DL BWP-1 Configuration   |                            |              | DLBWP.1.1 <sup>Note4</sup>      | N.A.                       |
| Active DL BWP-2 Configuration   |                            |              | DLBWP.1.3 <sup>Note4</sup>      | N.A.                       |
| Active UL BWP-0 Configuration   |                            |              | N.A.                            | ULBWP.0.2 <sup>Note4</sup> |
| Active UL BWP-1 Configuration   |                            |              | ULBWP.1.1 <sup>Note4</sup>      | N.A.                       |
| Active UL BWP-2 Configuration   |                            |              | ULBWP.1.3 <sup>Note4</sup>      | N.A.                       |
| PDSCH Reference measurement channel   | Config 1                   |              | SR.1.1 CCA                      |                            |
| RMSI CORESET parameters   | Config 1                   |              | CR.1.1 CCA                      |                            |
| Dedicated CORESET parameters  | Config 1                   |              | CCR.1.3 CCA                     |                            |
| OCNG Patterns   |                            |              | OP.1                            |                            |
| SSB Configuration   | Semi- static channel acces | Config 1     | SSB.1 CCA                       |                            |
|   | Dynamic channel acces      | Config 1     | SSB.2 CCA                       |                            |
| SMTC Configuration  |                            | Config 1     | SMTC.1                          |                            |
| DL CCA probability (P <sub>CCA_DL</sub> )   | Config 1                   |              | 1                               | 1                          |
| UL CCA probability (P <sub>CCA_UL</sub> )   | Config 1                   |              | 1                               | 1                          |
| Correlation Matrix and Antenna Configuration  |                            |              | 1x2 Low                         |                            |
| EPRE ratio of PSS to SSS  |                            | dB           | 0                               | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |                            |              |                                 |                            |
| EPRE ratio of PBCH to PBCH DMRS   |                            |              |                                 |                            |
| EPRE ratio of PDCCH DMRS to SSS   |                            |              |                                 |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |                            |              |                                 |                            |
| EPRE ratio of PDSCH DMRS to SSS   |                            |              |                                 |                            |
| EPRE ratio of PDSCH to PDSCH  |                            |              |                                 |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                            |              |                                 |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                            |              |                                 |                            |
| N <sub>oc</sub> <sup>Note 2</sup>   | Config 1                   |              |                                 |                            |
| SS-RSRP <sup>Note 3</sup>   | Config 1                   | dBm/SCS      | -84                             | -84                        |
| $\hat{E}_s/I_{ot}$  | Config 1                   | dB           | 17                              | 17                         |
| $\hat{E}_s/N_{oc}$  | Config 1                   | dB           | 17                              | 17                         |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1                   | dBm/38.16MHz | -52.86                          | -52.86                     |
| Propagation Condition   |                            |              | AWGN                            | AWGN                       |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                            |              |                                 |                            |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                            |              |                                 |                            |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                            |              |                                 |                            |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].           |                            |              |                                 |                            |

## A.11.4.5.2.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+kI$ ).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ( $j+T_{BWPswitchDelay}+kI$ ).

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first DL slot that occurs after the beginning of DL slot  $(i + T_{BWPswitchDelay} + kI)$ ,  $(j + T_{BWPswitchDelay} + kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.11.4.5.2.2 NR FR1 DL active BWP switch with non-DRX in SA

##### A.11.4.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6.

The supported test configurations are shown in Table A.11.4.5.2.2.1-1. The test scenario comprises of one cell (Cell 1) as given in Table A.11.4.5.2.2.1-2. Cell-specific parameters of the cell are specified in Table A.11.4.5.2.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

The cell has constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1's slot # denoted  $i$ . The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's DL slot  $(i + T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 no later than the first UL slot that occurs after the beginning of slot  $(i + T_{BWPswitchDelay} + kI)$ . The UE shall be continuously scheduled on Cell1's BWP-2 starting from the first DL slot that occurs after the beginning of slot  $(i + T_{BWPswitchDelay})$ .

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell1.

During T3,

The time period T3 starts from the slot # $j$ , where  $j$  is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's slot ( $j+T_{BWPswitchDelay}$ ) as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 at latest on the first UL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}+kI$ ). The UE shall be continuously scheduled on Cell1's BWP-1 starting from the first DL slot that occurs after the beginning of slot ( $j+T_{BWPswitchDelay}$ ).

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

**Table A.11.4.5.2.1-1: DL BWP switch supported test configurations**

| Config  | Description   |
|---------|---|
| 1       | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: | The UE is only required to be tested in one of the supported test configurations.                         |
| Note 2: | A UE which fulfils the requirements in test case A.11.4.5.2.1 can skip the test cases in A.11.4.5.2.2.    |
| Note 3: | The UE supporting SA operation with only NR band(s) with shared spectrum access is required to be tested. |

**Table A.11.4.5.2.1-2: General test parameters for DL BWP switch in SA**

| Parameter                  | Unit | Value                             | Comment                                    |
|----------------------------|------|-----------------------------------|--|
| NR RF Channel Number       |      | 1                                 | One NR radio channel is used for this test |
| Active Cell                |      | Cell 1                            | Cell1 on RF channel number 1.              |
| CP length                  |      | Normal                            |  |
| DRX                        |      | OFF                               |  |
| DL CCA model               |      | As specified in clause A.3.26.2.1 |  |
| UL CCA model               |      | As specified in clause A.3.26.2.2 |  |
| <i>bwp-InactivityTimer</i> | ms   | 200                               |  |
| T1                         | s    | 0.2                               |  |
| T2                         | s    | 0.2                               |  |
| T3                         | s    | 0.2                               |  |



Table A.11.4.5.2.2.1-3: NR Cell specific test parameters for DL BWP switch in SA

| Parameter   |                            | Unit     | Cell 1                          |
|---|----------------------------|----------|---------------------------------|
| Frequency Range   |                            |          | FR1                             |
| Duplex mode   | Config 1                   |          | TDD                             |
| TDD configuration   | Config 1                   |          | TDDConf.1.1 CCA                 |
| BW <sub>channel</sub>   | Config 1                   |          | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID   |                            |          | 1, 2                            |
| Initial DL BWP Configuration  | Config 1                   |          | DLBWP.0.2 <sup>Note 4</sup>     |
| Active DL BWP-1 Configuration   | Config 1                   |          | DLBWP.1.1 <sup>Note 4</sup>     |
| Active DL BWP-2 Configuration   | Config 1                   |          | DLBWP.1.3 <sup>Note 4</sup>     |
| Initial UL BWP Configuration  | Config 1                   |          | ULBWP.0.2 <sup>Note 4</sup>     |
| Active UL BWP-1 Configuration   | Config 1                   |          | ULBWP.1.1 <sup>Note 4</sup>     |
| Active UL BWP-2 Configuration   | Config 1                   |          | ULBWP.1.3 <sup>Note 4</sup>     |
| PDSCH Reference measurement channel   |                            | Config 1 | SR.1.1 CCA                      |
| RMSI CORESET parameters   |                            | Config 1 | CR.1.1 CCA                      |
| Dedicated CORESET parameters  |                            | Config 1 | CCR.1.3 CCA                     |
| OCNG Patterns   |                            |          | OP.1                            |
| SSB Configuration   | Semi- static channel acces | Config 1 | SSB.1 CCA                       |
|   | Dynamic channel acces      | Config 1 | SSB.2 CCA                       |
| SMTTC Configuration   |                            | Config 1 | SMTTC.1                         |
| Correlation Matrix and Antenna Configuration  |                            |          | 1x2 Low                         |
| TRS Configuration   |                            | Config 1 | TRS.1.2 TDD                     |
| DL CCA probability (P <sub>CCA_DL</sub> )   |                            | Config 1 | 1                               |
| UL CCA probability (P <sub>CCA_UL</sub> )   |                            | Config 1 | 1                               |
| EPRE ratio of PSS to SSS  |                            | dB       | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |                            |          |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |                            |          |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |                            |          |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |                            |          |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |                            |          |                                 |
| EPRE ratio of PDSCH to PDSCH  |                            |          |                                 |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |                            |          |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                            |          |                                 |
| N <sub>oc</sub> <sup>Note 2</sup>   |                            |          |                                 |
| SS-RSRP <sup>Note 3</sup>   |                            | Config 1 | dBm/SCS                         |
| E <sub>s</sub> /I <sub>ot</sub>   |                            | Config 1 | dB                              |
| E <sub>s</sub> /N <sub>oc</sub>   |                            | Config 1 | dB                              |
| I <sub>o</sub> <sup>Note 3</sup>  |                            | Config 1 | dBm/38.16 MHz                   |
| Propagation Condition   |                            |          | AWGN                            |
| <p>Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].</p> |                            |          |                                 |

#### A.11.4.5.2.2.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+kI$ ).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ( $j+T_{BWPswitchDelay}+kI$ ).

Where,  $kI$  is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed Cell1 active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot  $(i+T_{BWPswitchDelay+kI})$ ,  $(j+T_{BWPswitchDelay+kI})$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.11.4.5.3 RRC-based Active BWP Switch

##### A.11.4.5.3.1 NR FR1 DL active BWP switch of Cell with non-DRX in SA

###### A.11.4.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.

The supported test configurations are shown in Table A.11.4.5.3.1.1-1. The test scenario comprises of one Cell (Cell 1) as given in Table A.11.4.5.3.1.1-2. Cell-specific parameters of Cell are specified in Table A.11.4.5.3.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in Cell 1.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PCell's slot # denoted  $i$ . The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$  as defined in clause 8.6.3 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length} + k1$  on BWP-1 of final condition. The UE shall be continuously scheduled on PCell's BWP-1 of final condition starting from the first DL slot right after slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ .

$T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

**Table A.11.4.5.3.1.1-1: DL BWP switch supported test configurations in SA scenario**

| Config  | Description   |
|---------|---|
| 1       | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note 1: | Void  |
| Note 2: | The UE supporting SA operation with only NR band(s) with shared spectrum access is required to be tested. |

**Table A.11.4.5.3.1.1-2: General test parameters for DL BWP switch in SA scenario**

| Parameter            | Unit | Value                             | Comment                                    |
|----------------------|------|-----------------------------------|--|
| NR RF Channel Number |      | 1                                 | One NR radio channel is used for this test |
| Active Cell          |      | Cell 1                            | Cell on RF channel number 1.               |
| CP length            |      | Normal                            |  |
| DL CCA model         |      | As specified in clause A.3.26.2.1 |  |
| UL CCA model         |      | As specified in clause A.3.26.2.2 |  |
| DRX                  |      | OFF                               |  |
| T1                   | s    | 0.2                               |  |

**Table A.11.4.5.3.1.1-3: NR Cell specific test parameters for DL BWP switch in SA scenario**

| Parameter   |                               | Unit     | Cell 1                          |
|---|-------------------------------|----------|---------------------------------|
| Frequency Range   |                               |          | FR1                             |
| Duplex mode   |                               | Config 1 | TDD                             |
| TDD configuration   |                               | Config 1 | TDDConf.1.1 CCA                 |
| BW <sub>channel</sub>   |                               | Config 1 | 40 MHz: N <sub>RB,c</sub> = 106 |
| Active BWP ID   |                               |          | 1                               |
| Initial DL BWP Configuration  |                               | Config 1 | DLBWP.0.2                       |
| Initial UL BWP Configuration  |                               | Config 1 | ULBWP.0.2                       |
| Initial Condition   | Active DL BWP-1 Configuration | Config 1 | DLBWP.1.3                       |
|   | Active UL BWP-1 Configuration | Config 1 | ULBWP.1.3                       |
| Final Condition   | Active DL BWP-1 Configuration | Config 1 | DLBWP.1.1                       |
|   | Active UL BWP-1 Configuration | Config 1 | ULBWP.1.1                       |
| PDSCH Reference measurement channel   |                               | Config 1 | SR.1.1 CCA                      |
| RMSI CORESET parameters   |                               | Config 1 | CR.1.1 CCA                      |
| Dedicated CORESET parameters  |                               | Config 1 | CCR.1.3 CCA                     |
| OCNG Patterns   |                               |          | OP.1                            |
| SSB Configuration   | Semi-static channel acces     | Config 1 | SSB.1 CCA                       |
|   | Dynamic channel acces         | Config 1 | SSB.2 CCA                       |
| SMTC Configuration  |                               |          | SMTC.1                          |
| TRS Configuration   |                               | Config 1 | TRS.1.2 TDD                     |
| DL CCA probability (P <sub>CCA_DL</sub> )   |                               | Config 1 | 1                               |
| UL CCA probability (P <sub>CCA_UL</sub> )   |                               | Config 1 | 1                               |
| Propagation Condition   |                               |          | AWGN                            |
| EPRE ratio of PSS to SSS  |                               | dB       | 0                               |
| EPRE ratio of PBCH DMRS to SSS  |                               |          |                                 |
| EPRE ratio of PBCH to PBCH DMRS   |                               |          |                                 |
| EPRE ratio of PDCCH DMRS to SSS   |                               |          |                                 |
| EPRE ratio of PDCCH to PDCCH DMRS   |                               |          |                                 |
| EPRE ratio of PDSCH DMRS to SSS   |                               |          |                                 |
| EPRE ratio of PDSCH to PDSCH  |                               |          |                                 |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |                               |          |                                 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                               |          |                                 |
| N <sub>oc</sub> Note 2  |                               |          |                                 |
| SS-RSRP Note 3  |                               | Config 1 | -84                             |
| E <sub>s</sub> /I <sub>ot</sub>   |                               | Config 1 | 17                              |
| E <sub>s</sub> /N <sub>oc</sub>   |                               | Config 1 | 17                              |
| I <sub>o</sub> Note3  |                               | Config 1 | -52.86                          |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |                               |          |                                 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |                               |          |                                 |
| Note 3: SS-RSRP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |                               |          |                                 |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].           |                               |          |                                 |

### A.11.4.5.3.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the beginning of slot  $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$  and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k1$ .

Where,  $k1$  is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

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

## A.11.4.6 Void

## A.11.5 Measurement procedure

### A.11.5.1 Intra-frequency measurements

#### A.11.5.1.1 Event-triggered reporting tests on PCC without gaps under non-DRX

##### A.11.5.1.1.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

##### A.11.5.1.1.2 Test parameters

Two cells are deployed in the test, which are PCell (Cell 1) and a neighbour cell (Cell 2) on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model. The test parameters for the two cells are given in Table A.11.5.1.1.2-1 and A.11.5.1.1.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.11.5.1.1.2-1: Supported test configurations**

| Configuration | Description                                       |
|---------------|---|
| 1             | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.5.1.1.2-2: General test parameters for intra-frequency event triggered reporting without gaps**

Editor's note: Table TBD

**Table A.11.5.1.1.2-3: Cell-specific test parameters for intra-frequency event-triggered reporting without gaps**

Editor's note: Table TBD

**A.11.5.1.1.3 Test Requirements**

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

**A.11.5.1.2 Event-triggered reporting tests on PCC without gaps under DRX**

**A.11.5.1.2.1 Test purpose and environment**

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

**A.11.5.1.2.2 Test parameters**

**A.11.5.1.2.3 Test Requirements**

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

**A.11.5.1.3 Event-triggered reporting tests on PCC with per-UE gaps under non-DRX**

**A.11.5.1.3.1 Test purpose and environment**

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

**A.11.5.1.3.2 Test parameters**

**A.11.5.1.3.3 Test Requirements**

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.11.5.1.4 Event-triggered reporting tests on PCC with per-UE gaps under DRX

##### A.11.5.1.4.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

##### A.11.5.1.4.2 Test parameters

##### A.11.5.1.4.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.11.5.1.5 Event-triggered reporting tests on SCC without gaps under non-DRX

##### A.11.5.1.5.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

##### A.11.5.1.5.2 Test parameters

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.11.5.1.6 Event-triggered reporting tests on SCC without gaps under DRX

##### A.11.5.1.6.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

#### A.11.5.1.6.2 Test parameters

#### A.11.5.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.11.5.1.7 Event-triggered reporting tests on SCC with per-UE gaps under non-DRX

#### A.11.5.1.7.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

#### A.11.5.1.7.2 Test parameters

#### A.11.5.1.7.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$ .*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.11.5.1.8 Event-triggered reporting tests on SCC with per-UE gaps under DRX

#### A.11.5.1.8.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

#### A.11.5.1.8.2 Test parameters

#### A.11.5.1.8.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than  $D1$  ms from the beginning of time period T2.

*Editor's note:  $D1=TBD$  ( $D1$  is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.11.5.1.9 RSSI measurement reporting on PCC

#### A.11.5.1.9.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the intra-frequency RSSI measurement reporting requirements in Section 9.2A.7.1.

#### A.11.5.1.9.2 Test parameters

In the test, the UE is configured to perform intra-frequency RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.11.5.1.9.2-1. There is one cell in the test: Cell 1 which is PCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1.

**Table A.11.5.1.9.2-1: Supported test configurations.**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.5.1.9.2-2: General test parameters.**

Editor's note: Table TBD

### A.11.5.1.10 Channel occupancy measurement reporting on PCC

#### A.11.5.1.10.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the intra-frequency channel occupancy measurement reporting requirements in Section 9.2A.7.2.

#### A.11.5.1.10.2 Test parameters

In the test, the UE is configured to perform intra-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.11.5.1.10.2-1. There is one cell in the test: Cell 1 which is PCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1.

**Table A.11.5.1.10.2-1: Supported test configurations.**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.5.1.10.2-2: General test parameters.**

Editor's note: Table is TBD

### A.11.5.1.11 RSSI measurement reporting on SCC

#### A.11.5.1.11.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the intra-frequency RSSI measurement reporting requirements in Section 9.2A.7.1.

#### A.11.5.1.11.2 Test parameters

In the test, the UE is configured to perform intra-frequency RSSI measurements on a carrier frequency under CCA.



Supported test configurations are shown in Table A.11.5.1.11.2-1. There are two cells in the test: Cell 1 which is PCell operating on a carrier frequency under CCA, and Cell 2 which is SCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2.

**Table A.11.5.1.11.2-1: Supported test configurations.**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.5.1.11.2-2: General test parameters.**

Editor's note: Tabs TBD

## A.11.5.1.12 Channel occupancy measurement reporting on SCC

### A.11.5.1.12.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the intra-frequency channel occupancy measurement reporting requirements in Section 9.2A.7.2.

### A.11.5.1.12.2 Test parameters

In the test, the UE is configured to perform intra-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.11.5.1.12.2-1. There are two cells in the test: Cell 1 which is PCell operating on a carrier frequency under CCA, and Cell 2 which is SCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2.

**Table A.11.5.1.12.2-1: Supported test configurations.**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.5.1.12.2-2: General test parameters.**

Editor's note: Table is TBD

## A.11.5.2 Inter-frequency measurements

### A.11.5.2.1 RSSI measurement reporting

#### A.11.5.2.1.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the inter-frequency RSSI measurement reporting requirements in Section 9.3A.8.

#### A.11.5.2.1.2 Test parameters

In the test, the UE is configured to perform inter-frequency RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.11.5.2.1.2-1. There is one cell in the test: Cell 1 which is PCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1. The RSSI measurement is performed on an inter-frequency under CCA.

**Table A.11.5.2.1.2-1: Supported test configurations.**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.5.2.1.2-2: General test parameters.**

Editor's note: Table TBD

## A.11.5.2.2 Channel occupancy measurement reporting

### A.11.5.2.2.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the inter-frequency channel occupancy measurement reporting requirements in Section 9.3A.9.

### A.11.5.2.2.2 Test parameters

In the test, the UE is configured to perform inter-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.11.5.2.2.2-1. There is one cell in the test: Cell 1 which is PCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1. The channel occupancy measurement is performed on an inter-frequency under CCA.

**Table A.11.5.2.2.2-1: Supported test configurations.**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.5.2.2.2-2: General test parameters.**

Editor's note: Table is TBD

## A.11.5.2.3 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is not used

### A.11.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.11.5.2.3.1-1, A.11.5.2.3.1-2 and A.11.5.2.3.1-3.

In test 1, measurement gap pattern configuration # 0 as defined in Table A.11.5.2.3.1-2 is provided for UE that does not support per-FR gap. In test 2, measurement gap pattern configuration #4 as defined in Table A.11.5.2.3.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.11.5.2.3.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1 with CCA**

| Config  | Description  |
|---------|--|
| 1       | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode              |
| Note 1: | The UE is only required to be tested in one of the supported test configurations |

**Table A.11.5.2.3.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        | Comment   |
|---|------|--------------------|-----------------------------------|--------|---|
|   |      |                    | Test 1                            | Test 2 |   |
| NR RF Channel Number                            |      | Config 1           | 1, 2                              |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells                                    |      | Config 1           | NR cell 1 with CCA (PCell)        |        | NR cell 1 is on NR RF channel number 1 with CCA.                        |
| Neighbour cell                                  |      | Config 1           | NR cell 2 with CCA                |        | NR cell 2 is on NR RF channel number 2 with CCA.                        |
| DL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.1 |        |   |
| UL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.2 |        |   |
| Gap Pattern Id                                  |      | Config 1           | 0                                 | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1           | 9                                 | 9      |   |
| A3-Offset                                       | dB   | Config 1           | -6                                |        |   |
| Hysteresis                                      | dB   | Config 1           | 0                                 |        |   |
| CP length                                       |      | Config 1           | Normal                            |        |   |
| TimeToTrigger                                   | s    | Config 1           | 0                                 |        |   |
| Filter coefficient                              |      | Config 1           | 0                                 |        | L3 filtering is not used  |
| DRX   |      | Config 1           | OFF                               |        | DRX is not used   |
| Time offset between serving and neighbour cells |      | Config 1           | 3 $\mu$ s                         |        | Synchronous cells.  |
| T1  | s    | Config 1           | 5                                 |        |   |
| T2  | s    | Config 1           | 1.7                               | 1.7    |   |

**Table A.11.5.2.3.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                 |  | Unit     | Test configuration | Cell 1   |    | Cell 2   |    |
|---|--|----------|--------------------|--|----|--|----|
|   |  |          |                    | T1   | T2 | T1   | T2 |
| NR RF Channel Number                      |  |          | Config 1           | 1  |    | 2  |    |
| Duplex mode                               |  |          | Config 1           | TDD  |    |  |    |
| TDD configuration                         |  |          | Config 1           | TDDConf.1.1 CCA  |    |  |    |
| BW <sub>channel</sub>                     |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| BWP BW                                    |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| BWP configuration                         | Initial DL BWP                                     | Config 1 | Config 1           | DLBWP.0.1  |    | NA   |    |
|   | Initial UL BWP                                     | Config 1 |                    | ULBWP.0.1  |    | NA   |    |
|   | Dedicated DL BWP                                   | Config 1 |                    | DLBWP.1.1  |    | NA   |    |
|   | Dedicated UL BWP                                   | Config 1 |                    | ULBWP.1.1  |    | NA   |    |
| TRS configuration                         |  |          | Config 1           | TRS.1.2 TDD  |    | NA   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |          | Config 1           | OP.1   |    | OP.1   |    |
| PDSCH Reference measurement channel       |  |          | Config 1           | SR.1.1 CCA   |    |  |    |
| CORESET Reference Channel                 |  |          | Config 1           | CR.1.1 CCA   |    |  |    |
| SSB parameters                            | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | SSB.1 CCA  |    | SSB.1 CCA  |    |
|   | Dynamic channel access <small>Note 6,7</small>     |          | Config 1           | SSB.2 CCA  |    | SSB.2 CCA  |    |
| DBT window configuration                  |  |          | Config 1           | As defined in A.3.28.1                                     |    | As defined in A.3.28.1                                     |    |
| SMTC configuration defined in A.3.11      |  |          | Config 1           | SMTC.1   |    | SMTC.4   |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | P <sub>CCA_DL</sub> =0.9375                                |    | P <sub>CCA_DL</sub> =0.9375                                |    |
|   | Dynamic channel access <small>Note 6,7</small>     |          | Config 1           | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
|   | Dynamic channel access <small>Note 6,7</small>     |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
| L <sub>CCA_DL</sub>                       |  |          | Config 1           | 12   |    | 12   |    |
| W <sub>CCA_DL</sub>                       |  | ms       | Config 1           | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz      | Config 1           | 30   |    |  |    |
| EPRE ratio of PSS to SSS                  |  |          | Config 1           | 0  |    | 0  |    |
| EPRE ratio of PBCH DMRS to SSS            |  |          |                    |  |    |  |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |          |                    |  |    |  |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |          |                    |  |    |  |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |          |                    |  |    |  |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |          |                    |  |    |  |    |
| EPRE ratio of PDSCH to PDSCH              |  |          |                    |  |    |  |    |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |  |          |                    |  |    |  |    |

|  |             |          |        |        |           |        |
|--|-------------|----------|--------|--------|-----------|--------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |             |          |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz  | Config 1 | -104   |        | -104      |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS    | Config 1 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS    | Config 1 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB          | Config 1 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB          | Config 1 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz | Config 1 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |             | Config 1 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |             |          |        |        |           |        |

#### A.11.5.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.11.5.2.4 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is used

##### A.11.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 as PCell in FR1 with CCA on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.11.5.2.4.1-1, A.11.5.2.4.1-2 and A.11.5.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.11.5.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.11.5.2.4.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.11.5.2.4.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.5.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        |        |        | Comment   |
|---|------|--------------------|-----------------------------------|--------|--------|--------|---|
|   |      |                    | Test 1                            | Test 2 | Test 3 | Test 4 |   |
| NR RF Channel Number                            |      | Config 1           | 1, 2                              |        |        |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells                                    |      | Config 1           | NR cell 1 with CCA (PCell)        |        |        |        | NR cell 1 is on NR RF channel number 1 with CCA.                        |
| Neighbour cell                                  |      | Config 1           | NR cell 2 with CCA                |        |        |        | NR cell 2 is on NR RF channel number 2 with CCA.                        |
| DL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.1 |        |        |        |   |
| UL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.2 |        |        |        |   |
| Gap Pattern Id                                  |      | Config 1           | 0                                 |        | 4      |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1           | 9                                 |        | 9      |        |   |
| A3-Offset                                       | dB   | Config 1           | -6                                |        |        |        |   |
| Hysteresis                                      | dB   | Config 1           | 0                                 |        |        |        |   |
| CP length                                       |      | Config 1           | Normal                            |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1           | 0                                 |        |        |        |   |
| Filter coefficient                              |      | Config 1           | 0                                 |        |        |        | L3 filtering is not used  |
| DRX   |      | Config 1           | DRX .1                            | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells |      | Config 1           | 3μs                               |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1           | 5                                 |        |        |        |   |
| T2  | s    | Config 1           | 2.5                               | 17     | 2.5    | 17     |   |

**Table A.11.5.2.4.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**



| Parameter                                 |  | Unit     | Test configuration | Cell 1   |    |    |    | Cell 2   |    |    |    |
|---|--|----------|--------------------|--|----|----|----|--|----|----|----|
|   |  |          |                    | T1   | T2 | T3 | T4 | T1   | T2 | T3 | T4 |
| NR RF Channel Number                      |  |          | Config 1           | 1  |    |    |    | 2  |    |    |    |
| Duplex mode                               |  |          | Config 1           | TDD  |    |    |    |  |    |    |    |
| TDD configuration                         |  |          | Config 1           | TDDConf.1.1 CCA  |    |    |    |  |    |    |    |
| BW <sub>channel</sub>                     |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| BWP BW                                    |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| BWP configuration                         | Initial DL BWP                                 | Config 1 | Config 1           | DLBWP.0.1  |    |    |    | NA   |    |    |    |
|   | Initial UL BWP                                 | Config 1 |                    | ULBWP.0.1  |    |    |    | NA   |    |    |    |
|   | Dedicated DL BWP                               | Config 1 |                    | DLBWP.1.1  |    |    |    | NA   |    |    |    |
|   | Dedicated UL BWP                               | Config 1 |                    | ULBWP.1.1  |    |    |    | NA   |    |    |    |
| TRS configuration                         |  |          | Config 1           | TRS.1.2 TDD  |    |    |    | NA   |    |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |          | Config 1           | OP.1   |    |    |    | OP.1   |    |    |    |
| PDSCH Reference measurement channel       |  |          | Config 1           | SR.1.1 CCA   |    |    |    |  |    |    |    |
| CORESET Reference Channel                 |  |          | Config 1           | CR.1.1 CCA   |    |    |    |  |    |    |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |          | Config 1           | SSB.1 CCA  |    |    |    | SSB.1 CCA  |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |          | Config 1           | SSB.2 CCA  |    |    |    | SSB.2 CCA  |    |    |    |
| DBT window configuration                  |  |          | Config 1           | As defined in A.3.28.1                                     |    |    |    | As defined in A.3.28.1                                     |    |    |    |
| SMTC configuration defined in A.3.11      |  |          | Config 1           | SMTC.1   |    |    |    | SMTC.4   |    |    |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |          | Config 1           | P <sub>CCA_DL</sub> =0.9375                                |    |    |    | P <sub>CCA_DL</sub> =0.9375                                |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |          | Config 1           | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz      | Config 1           | 30   |    |    |    |  |    |    |    |
| EPRE ratio of PSS to SSS                  |  |          | Config 1           | 0  |    |    |    | 0  |    |    |    |
| EPRE ratio of PBCH DMRS to SSS            |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH to PDSCH              |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |  |          |                    |  |    |    |    |  |    |    |    |

|  |             |          |        |        |           |        |
|--|-------------|----------|--------|--------|-----------|--------|
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz  | Config 1 | -104   |        | -104      |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS    | Config 1 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS    | Config 1 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB          | Config 1 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB          | Config 1 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz | Config 1 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |             | Config 1 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |             |          |        |        |           |        |

**Table A.11.5.2.4.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.11.5.2.4.1-5: TimeAlignmentTimer-Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

**A.11.5.2.4.2 Test Requirements**

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_inter\_cca\_without\_index}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_inter\_cca\_without\_index}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_inter\_cca\_without\_index}$  from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.11.5.2.5 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is not used

##### A.11.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 as PCell in FR1 with CCA on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.11.5.2.5.1-1, A.11.5.2.5.1-2 and A.11.5.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.11.5.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.11.5.2.5.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.11.5.2.5.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.5.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        | Comment   |
|---|------|--------------------|-----------------------------------|--------|---|
|   |      |                    | Test 1                            | Test 2 |   |
| NR RF Channel Number                            |      | Config 1           | 1, 2                              |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells                                    |      | Config 1           | NR cell 1 with CCA (PCell)        |        | NR cell 1 is on NR RF channel number 1 with CCA.                        |
| Neighbour cell                                  |      | Config 1           | NR cell 2 with CCA                |        | NR cell 2 is on NR RF channel number 2 with CCA.                        |
| DL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.1 |        |   |
| UL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.2 |        |   |
| Gap Pattern Id                                  |      | Config 1           | 0                                 | 4      | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1           | 9                                 | 9      |   |
| A3-Offset                                       | dB   | Config 1           | -6                                |        |   |
| Hysteresis                                      | dB   | Config 1           | 0                                 |        |   |
| CP length                                       |      | Config 1           | Normal                            |        |   |
| TimeToTrigger                                   | s    | Config 1           | 0                                 |        |   |
| Filter coefficient                              |      | Config 1           | 0                                 |        | L3 filtering is not used  |
| DRX   |      | Config 1           | OFF                               |        | DRX is not used   |
| Time offset between serving and neighbour cells |      | Config 1           | 3 $\mu$ s                         |        | Synchronous cells.  |
| T1  | s    | Config 1           | 5                                 |        |   |
| T2  | s    | Config 1           | 2                                 | 2      |   |

**Table A.11.5.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                 |  | Unit     | Test configuration | Cell 1   |    | Cell 2   |    |
|---|--|----------|--------------------|--|----|--|----|
|   |  |          |                    | T1   | T2 | T1   | T2 |
| NR RF Channel Number                      |  |          | Config 1           | 1  |    | 2  |    |
| Duplex mode                               |  |          | Config 1           | TDD  |    |  |    |
| TDD configuration                         |  |          | Config 1           | TDDConf.1.1 CCA  |    |  |    |
| BW <sub>channel</sub>                     |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| BWP BW                                    |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |  |    |
| BWP configuration                         | Initial DL BWP                                     | Config 1 | Config 1           | DLBWP.0.1  |    | NA   |    |
|   | Initial UL BWP                                     | Config 1 |                    | ULBWP.0.1  |    | NA   |    |
|   | Dedicated DL BWP                                   | Config 1 |                    | DLBWP.1.1  |    | NA   |    |
|   | Dedicated UL BWP                                   | Config 1 |                    | ULBWP.1.1  |    | NA   |    |
| TRS configuration                         |  |          | Config 1           | TRS.1.2 TDD  |    | NA   |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |          | Config 1           | OP.1   |    | OP.1   |    |
| PDSCH Reference measurement channel       |  |          | Config 1           | SR.1.1 CCA   |    |  |    |
| CORESET Reference Channel                 |  |          | Config 1           | CR.1.1 CCA   |    |  |    |
| SSB parameters                            | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | SSB.1 CCA  |    | SSB.1 CCA  |    |
|   | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | SSB.2 CCA  |    | SSB.2 CCA  |    |
| DBT window configuration                  |  |          | Config 1           | As defined in A.3.28.1                                     |    | As defined in A.3.28.1                                     |    |
| SMTC configuration defined in A.3.11      |  |          | Config 1           | SMTC.1   |    | SMTC.4   |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | P <sub>CCA_DL</sub> =0.9375                                |    | P <sub>CCA_DL</sub> =0.9375                                |    |
|   | Dynamic channel access <small>Note 6,7</small>     |          | Config 1           | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
|   | Dynamic channel access <small>Note 6,7</small>     |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    | P <sub>CCA_UL</sub> =1                                     |    |
| L <sub>CCA_DL</sub>                       |  |          | Config 1           | 5  |    | 5  |    |
| W <sub>CCA_DL</sub>                       |  | ms       | Config 1           | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz      | Config 1           | 30   |    |  |    |
| EPRE ratio of PSS to SSS                  |  |          | Config 1           | 0  |    | 0  |    |
| EPRE ratio of PBCH DMRS to SSS            |  |          |                    |  |    |  |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |          |                    |  |    |  |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |          |                    |  |    |  |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |          |                    |  |    |  |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |          |                    |  |    |  |    |
| EPRE ratio of PDSCH to PDSCH              |  |          |                    |  |    |  |    |
| EPRE ratio of OCNG DMRS to SSS (Note 1)   |  |          |                    |  |    |  |    |

|  |             |          |        |        |           |        |
|--|-------------|----------|--------|--------|-----------|--------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |             |          |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz  | Config 1 | -104   |        | -104      |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS    | Config 1 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS    | Config 1 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB          | Config 1 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB          | Config 1 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz | Config 1 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |             | Config 1 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |             |          |        |        |           |        |

#### A.11.5.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.11.5.2.6 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is used

### A.11.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 as PCell in FR1 with CCA on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters are given in Tables A.11.5.2.6.1-1, A.11.5.2.6.1-2 and A.11.5.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.11.5.2.6.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.11.5.2.6.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.11.5.2.6.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |



**Table A.11.5.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        |        |        | Comment   |
|---|------|--------------------|-----------------------------------|--------|--------|--------|---|
|   |      |                    | Test 1                            | Test 2 | Test 3 | Test 4 |   |
| NR RF Channel Number                            |      | Config 1           | 1, 2                              |        |        |        | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells                                    |      | Config 1           | NR cell 1 with CCA (PCell)        |        |        |        | NR cell 1 is on NR RF channel number 1 with CCA.                        |
| Neighbour cell                                  |      | Config 1           | NR cell 2 with CCA                |        |        |        | NR cell 2 is on NR RF channel number 2 with CCA.                        |
| DL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.1 |        |        |        |   |
| UL CCA model                                    |      | Config 1           | As specified in clause A.3.26.2.2 |        |        |        |   |
| Gap Pattern Id                                  |      | Config 1           | 0                                 |        | 4      |        | As specified in clause 9.1.2-1.   |
| Measurement gap offset                          |      | Config 1           | 9                                 |        | 9      |        |   |
| A3-Offset                                       | dB   | Config 1           | -6                                |        |        |        |   |
| Hysteresis                                      | dB   | Config 1           | 0                                 |        |        |        |   |
| CP length                                       |      | Config 1           | Normal                            |        |        |        |   |
| TimeToTrigger                                   | s    | Config 1           | 0                                 |        |        |        |   |
| Filter coefficient                              |      | Config 1           | 0                                 |        |        |        | L3 filtering is not used  |
| DRX   |      | Config 1           | DRX .1                            | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells |      | Config 1           | 3 $\mu$ s                         |        |        |        | Synchronous cells.  |
| T1  | s    | Config 1           | 5                                 |        |        |        |   |
| T2  | s    | Config 1           | 3                                 | 20     | 3      | 20     |   |

**Table A.11.5.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                 |  | Unit     | Test configuration | Cell 1   |    |    |    | Cell 2   |    |    |    |
|---|--|----------|--------------------|--|----|----|----|--|----|----|----|
|   |  |          |                    | T1   | T2 | T3 | T4 | T1   | T2 | T3 | T4 |
| NR RF Channel Number                      |  |          | Config 1           | 1  |    |    |    | 2  |    |    |    |
| Duplex mode                               |  |          | Config 1           | TDD  |    |    |    |  |    |    |    |
| TDD configuration                         |  |          | Config 1           | TDDConf.1.1 CCA  |    |    |    |  |    |    |    |
| BW <sub>channel</sub>                     |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| BWP BW                                    |  | MHz      | Config 1           | 40: N <sub>RB,c</sub> = 106                                |    |    |    |  |    |    |    |
| BWP configuration                         | Initial DL BWP                                     | Config 1 | Config 1           | DLBWP.0.1  |    |    |    | NA   |    |    |    |
|   | Initial UL BWP                                     | Config 1 |                    | ULBWP.0.1  |    |    |    | NA   |    |    |    |
|   | Dedicated DL BWP                                   | Config 1 |                    | DLBWP.1.1  |    |    |    | NA   |    |    |    |
|   | Dedicated UL BWP                                   | Config 1 |                    | ULBWP.1.1  |    |    |    | NA   |    |    |    |
| TRS configuration                         |  |          | Config 1           | TRS.1.2 TDD  |    |    |    | NA   |    |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |          | Config 1           | OP.1   |    |    |    | OP.1   |    |    |    |
| PDSCH Reference measurement channel       |  |          | Config 1           | SR.1.1 CCA   |    |    |    |  |    |    |    |
| CORESET Reference Channel                 |  |          | Config 1           | CR.1.1 CCA   |    |    |    |  |    |    |    |
| SSB parameters                            | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | SSB.1 CCA  |    |    |    | SSB.1 CCA  |    |    |    |
|   | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | SSB.2 CCA  |    |    |    | SSB.2 CCA  |    |    |    |
| DBT window configuration                  |  |          | Config 1           | As defined in A.3.28.1                                     |    |    |    | As defined in A.3.28.1                                     |    |    |    |
| SMTC configuration defined in A.3.11      |  |          | Config 1           | SMTC.1   |    |    |    | SMTC.4   |    |    |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | P <sub>CCA_DL</sub> =0.9375                                |    |    |    | P <sub>CCA_DL</sub> =0.9375                                |    |    |    |
|   | Dynamic channel access <small>Note 6,7</small>     |          | Config 1           | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <small>Note 5,7</small> |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
|   | Dynamic channel access <small>Note 6,7</small>     |          | Config 1           | P <sub>CCA_UL</sub> =1                                     |    |    |    | P <sub>CCA_UL</sub> =1                                     |    |    |    |
| L <sub>CCA_DL</sub>                       |  |          | Config 1           | 2  |    |    |    | 2  |    |    |    |
| W <sub>CCA_DL</sub>                       |  | ms       | Config 1           | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz      | Config 1           | 30   |    |    |    |  |    |    |    |
| EPRE ratio of PSS to SSS                  |  |          | Config 1           | 0  |    |    |    | 0  |    |    |    |
| EPRE ratio of PBCH DMRS to SSS            |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of PDSCH to PDSCH              |  |          |                    |  |    |    |    |  |    |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)    |  |          |                    |  |    |    |    |  |    |    |    |

|  |  |          |        |        |           |        |
|--|--|----------|--------|--------|-----------|--------|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |          |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>                | dBm/15 kHz   | Config 1 | -104   |        | -104      |        |
| $N_{oc}$ <sup>Note2</sup>                | dBm/S CS   | Config 1 | -101   |        | -101      |        |
| SS-RSRP <sup>Note 3</sup>                | dBm/S CS   | Config 1 | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$                       | dB   | Config 1 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$                       | dB   | Config 1 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>                   | dBm/9.36MHz  | Config 1 | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition                    |  | Config 1 | AWGN   |        | AWGN      |        |
| Note 1:                                  | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |          |        |        |           |        |
| Note 2:                                  | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |          |        |        |           |        |
| Note 3:                                  | SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |          |        |        |           |        |
| Note 4:                                  | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |          |        |        |           |        |
| Note 5:                                  | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |          |        |        |           |        |
| Note 6:                                  | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |          |        |        |           |        |
| Note 7:                                  | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.   |          |        |        |           |        |

**Table A.11.5.2.6.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.11.5.2.6.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.11.5.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of

## A.11.5.2.7 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

### A.11.5.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.11.5.2.7.1-1, A.11.5.2.7.1-2 and A.11.5.2.7.1-3.

In test 1, measurement gap pattern configuration # 0 as defined in Table A.11.5.2.7.1-2 is provided for UE that does not support per-FR gap. In test 2, measurement gap pattern configuration #4 as defined in Table A.11.5.2.7.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.11.5.2.7.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.5.2.7.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        | Comment  |
|---|------|--------------------|-----------------------------------|--------|--|
|   |      |                    | Test 1                            | Test 2 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2                              |        | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA.               |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (PCell)                 |        | NR cell 1 is on NR RF channel number 1 with CCA.                                 |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 2                         |        | NR cell 2 is on NR RF channel number 2.  |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1 |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2 |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                                 | 4      | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9                                 | 9      |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                                |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                                 |        |  |
| CP length                                       |      | Config 1,2,3       | Normal                            |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                                 |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0                                 |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | OFF                               |        | DRX is not used  |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3ms                               |        | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 1,2,3       | 3μs                               |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5                                 |        |  |
| T2  | s    | Config 1,2,3       | 1.7                               | 1.7    |  |

**Table A.11.5.2.7.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter                                 |  | Unit | Test configuration | Cell 1   |    | Cell 2                              |    |
|---|--|------|--------------------|--|----|-------------------------------------|----|
|   |  |      |                    | T1   | T2 | T1                                  | T2 |
| NR RF Channel Number                      |  |      | Config 1,2,3       | 1  |    | 2                                   |    |
| Duplex mode                               |  |      | Config 1           | TDD  |    | FDD                                 |    |
|   |  |      | Config 2,3         | TDD  |    | TDD                                 |    |
| TDD configuration                         |  |      | Config 1           | TDDConf.1.1 CCA  |    | Not Applicable                      |    |
|   |  |      | Config 2           | TDDConf.1.1 CCA  |    | TDDConf.1.1                         |    |
|   |  |      | Config 3           | TDDConf.1.1 CCA  |    | TDDConf.2.1                         |    |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    | 10: N <sub>RB,c</sub> = 52          |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106         |    |
| BWP BW                                    |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    | 10: N <sub>RB,c</sub> = 52          |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106         |    |
| BWP configuration                         | Initial DL BWP                                 |      | Config 1,2,3       | DLBWP.0.1  |    | NA                                  |    |
|   | Initial UL BWP                                 |      |                    | ULBWP.0.1  |    | NA                                  |    |
|   | Dedicated DL BWP                               |      |                    | DLBWP.1.1  |    | NA                                  |    |
|   | Dedicated UL BWP                               |      |                    | ULBWP.1.1  |    | NA                                  |    |
| TRS configuration                         |  |      | Config 1,2,3       | TRS.1.2 TDD  |    | NA                                  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |      | Config 1,2,3       | OP.1   |    | OP.1                                |    |
| PDSCH Reference measurement channel       |  |      | Config 1,2,3       | SR.1.1 CCA   |    |                                     |    |
| CORESET Reference Channel                 |  |      | Config 1,2,3       | CR.1.1 CCA   |    |                                     |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2         | SSB.1 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 3           | SSB.1 CCA  |    | SSB.2 FR1                           |    |
|   | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2         | SSB.2 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 3           | SSB.2 CCA  |    | SSB.2 FR1                           |    |
| DBT window configuration                  |  |      | Config 1,2,3       | As defined in A.3.28.1                                     |    | Not applicable                      |    |
| SMTC configuration defined in A.3.11      |  |      | Config 1,2,3       | SMTC.1   |    | SMTC.4                              |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz  | Config 1,2         | 30   |    | 15                                  |    |
|   |  |      | Config 3           | 30   |    | 30                                  |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3       | P <sub>CCA_DL</sub> =0.9375                                |    | NA                                  |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3       | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | NA                                  |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    | NA                                  |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    | NA                                  |    |
| L <sub>CCA_DL</sub>                       |  |      | Config 1,2,3       | 12   |    | 12                                  |    |
| W <sub>CCA_DL</sub>                       |  | ms   | Config 1,2,3       | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    | T <sub>PSS/SSS_sync_inter_cca</sub> |    |
| EPRE ratio of PSS to SSS                  |  |      | Config 1,2,3       | 0  |    | 0                                   |    |
| EPRE ratio of PBCH DMRS to SSS            |  |      |                    |  |    |                                     |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDSCH to PDSCH              |  |      |                    |  |    |                                     |    |



|  |              |              |        |        |           |        |
|--|--------------|--------------|--------|--------|-----------|--------|
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |              |              |        |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |              |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | Config 1,2,3 | -104   |        |           | -98    |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2   | -101   |        |           | -98    |
|  |              | Config 3     | -101   |        |           | -95    |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2   | -91    | -91    | -Infinity | -91    |
|  |              | Config 3     | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2   | -58.49 | -58.49 | -70.05    | -62.26 |
|  | dBm/38.16MHz | Config 3     | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |              |              |        |        |           |        |

### A.11.5.2.7.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.11.5.2.8 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used

#### A.11.5.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.11.5.2.8.1-1, A.11.5.2.8.1-2 and A.11.5.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.11.5.2.8.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.11.5.2.8.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.11.5.2.8.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.5.2.8.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        |        |        | Comment  |
|---|------|--------------------|-----------------------------------|--------|--------|--------|--|
|   |      |                    | Test 1                            | Test 2 | Test 3 | Test 4 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2                              |        |        |        | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA.               |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (PCell)                 |        |        |        | NR cell 1 is on NR RF channel number 1 with CCA.                                 |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 2                         |        |        |        | NR cell 2 is on NR RF channel number 2.  |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1 |        |        |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2 |        |        |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                                 |        | 4      |        | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9                                 |        | 9      |        |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                                |        |        |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                                 |        |        |        |  |
| CP length                                       |      | Config 1,2,3       | Normal                            |        |        |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                                 |        |        |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0                                 |        |        |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | DRX .1                            | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3   |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3ms                               |        |        |        | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 1,2,3       | 3μs                               |        |        |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5                                 |        |        |        |  |
| T2  | s    | Config 1,2,3       | 2.5                               | 17     | 2.5    | 17     |  |

**Table A.11.5.2.8.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                 |  | Unit | Test configuration | Cell 1   |    |    |    | Cell 2                              |    |    |    |
|---|--|------|--------------------|--|----|----|----|-------------------------------------|----|----|----|
|   |  |      |                    | T1   | T2 | T3 | T4 | T1                                  | T2 | T3 | T4 |
| NR RF Channel Number                      |  |      | Config 1,2,3       | 1  |    |    |    | 2                                   |    |    |    |
| Duplex mode                               |  |      | Config 1           | TDD  |    |    |    | FDD                                 |    |    |    |
|   |  |      | Config 2,3         | TDD  |    |    |    | TDD                                 |    |    |    |
| TDD configuration                         |  |      | Config 1           | TDDConf.1.1 CCA  |    |    |    | Not Applicable                      |    |    |    |
|   |  |      | Config 2           | TDDConf.1.1 CCA  |    |    |    | TDDConf.1.1                         |    |    |    |
|   |  |      | Config 3           | TDDConf.1.1 CCA  |    |    |    | TDDConf.2.1                         |    |    |    |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 10: N <sub>RB,c</sub> = 52          |    |    |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 40: N <sub>RB,c</sub> = 106         |    |    |    |
| BWP BW                                    |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 10: N <sub>RB,c</sub> = 52          |    |    |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 40: N <sub>RB,c</sub> = 106         |    |    |    |
| BWP configuration                         | Initial DL BWP                                     |      | Config 1,2,3       | DLBWP.0.1  |    |    |    | NA                                  |    |    |    |
|   | Initial UL BWP                                     |      |                    | ULBWP.0.1  |    |    |    | NA                                  |    |    |    |
|   | Dedicated DL BWP                                   |      |                    | DLBWP.1.1  |    |    |    | NA                                  |    |    |    |
|   | Dedicated UL BWP                                   |      |                    | ULBWP.1.1  |    |    |    | NA                                  |    |    |    |
| TRS configuration                         |  |      | Config 1,2,3       | TRS.1.2 TDD  |    |    |    | NA                                  |    |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |      | Config 1,2,3       | OP.1   |    |    |    | OP.1                                |    |    |    |
| PDSCH Reference measurement channel       |  |      | Config 1,2,3       | SR.1.1 CCA   |    |    |    |                                     |    |    |    |
| CORESET Reference Channel                 |  |      | Config 1,2,3       | CR.1.1 CCA   |    |    |    |                                     |    |    |    |
| SSB parameters                            | Semi-static channel access <small>Note 5,7</small> |      | Config 1,2         | SSB.1 CCA  |    |    |    | SSB.1 FR1                           |    |    |    |
|   |  |      | Config 3           | SSB.1 CCA  |    |    |    | SSB.2 FR1                           |    |    |    |
|   | Semi-static channel access <small>Note 5,7</small> |      | Config 1,2         | SSB.2 CCA  |    |    |    | SSB.1 FR1                           |    |    |    |
|   |  |      | Config 3           | SSB.2 CCA  |    |    |    | SSB.2 FR1                           |    |    |    |
| DBT window configuration                  |  |      | Config 1,2,3       | As defined in A.3.28.1                                     |    |    |    | Not applicable                      |    |    |    |
| SMTC configuration defined in A.3.11      |  |      | Config 1,2,3       | SMTC.1   |    |    |    | SMTC.4                              |    |    |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz  | Config 1,2         | 30   |    |    |    | 15                                  |    |    |    |
|   |  |      | Config 3           | 30   |    |    |    | 30                                  |    |    |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <small>Note 5,7</small> |      | Config 1,2,3       | P <sub>CCA_DL</sub> =0.9375                                |    |    |    | NA                                  |    |    |    |
|   | Dynamic channel access <small>Note 6,7</small>     |      | Config 1,2,3       | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    | NA                                  |    |    |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <small>Note 5,7</small> |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    |    |    | NA                                  |    |    |    |
|   | Dynamic channel access <small>Note 6,7</small>     |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    |    |    | NA                                  |    |    |    |
| L <sub>CCA_DL</sub>                       |  |      | Config 1,2,3       | 5  |    |    |    | 5                                   |    |    |    |
| W <sub>CCA_DL</sub>                       |  | ms   | Config 1,2,3       | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    | T <sub>PSS/SSS_sync_inter_cca</sub> |    |    |    |
| EPRE ratio of PSS to SSS                  |  |      | Config 1,2,3       | 0  |    |    |    | 0                                   |    |    |    |
| EPRE ratio of PBCH DMRS to SSS            |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDSCH to PDSCH              |  |      |                    |  |    |    |    |                                     |    |    |    |

|  |              |              |        |        |           |        |
|--|--------------|--------------|--------|--------|-----------|--------|
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |              |              |        |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |              |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | Config 1,2,3 | -104   |        | -98       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2   | -101   |        | -98       |        |
|  |              | Config 3     | -101   |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2   | -91    | -91    | -Infinity | -91    |
|  |              | Config 3     | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2   | -58.49 | -58.49 | -70.05    | -62.26 |
|  | dBm/38.16MHz | Config 3     | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |              |              |        |        |           |        |

**Table A.11.5.2.8.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.11.5.2.8.1-5: TimeAlignmentTimer-Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

**A.11.5.2.8.2 Test Requirements**

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_inter\_cca\_without\_index}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.11.5.2.9 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

### A.11.5.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.11.5.2.9.1-1, A.11.5.2.9.1-2 and A.11.5.2.9.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.11.5.2.9.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.11.5.2.9.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.11.5.2.9.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.5.2.9.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        | Comment  |
|---|------|--------------------|-----------------------------------|--------|--|
|   |      |                    | Test 1                            | Test 2 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2                              |        | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA.               |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (PCell)                 |        | NR cell 1 is on NR RF channel number 1 with CCA.                                 |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 2                         |        | NR cell 2 is on NR RF channel number 2.  |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1 |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2 |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                                 | 4      | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9                                 | 9      |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                                |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                                 |        |  |
| CP length                                       |      | Config 1,2,3       | Normal                            |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                                 |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0                                 |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | OFF                               |        | DRX is not used  |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3ms                               |        | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 1,2,3       | 3μs                               |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5                                 |        |  |
| T2  | s    | Config 1,2,3       | 2                                 | 2      |  |



**Table A.11.5.2.9.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                 |  | Unit | Test configuration | Cell 1   |    | Cell 2                              |    |
|---|--|------|--------------------|--|----|-------------------------------------|----|
|   |  |      |                    | T1   | T2 | T1                                  | T2 |
| NR RF Channel Number                      |  |      | Config 1,2,3       | 1  |    | 2                                   |    |
| Duplex mode                               |  |      | Config 1           | TDD  |    | FDD                                 |    |
|   |  |      | Config 2,3         | TDD  |    | TDD                                 |    |
| TDD configuration                         |  |      | Config 1           | TDDConf.1.1 CCA  |    | Not Applicable                      |    |
|   |  |      | Config 2           | TDDConf.1.1 CCA  |    | TDDConf.1.1                         |    |
|   |  |      | Config 3           | TDDConf.1.1 CCA  |    | TDDConf.2.1                         |    |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    | 10: N <sub>RB,c</sub> = 52          |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106         |    |
| BWP BW                                    |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    | 10: N <sub>RB,c</sub> = 52          |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    | 40: N <sub>RB,c</sub> = 106         |    |
| BWP configuration                         | Initial DL BWP                                 |      | Config 1,2,3       | DLBWP.0.1  |    | NA                                  |    |
|   | Initial UL BWP                                 |      |                    | ULBWP.0.1  |    | NA                                  |    |
|   | Dedicated DL BWP                               |      |                    | DLBWP.1.1  |    | NA                                  |    |
|   | Dedicated UL BWP                               |      |                    | ULBWP.1.1  |    | NA                                  |    |
| TRS configuration                         |  |      | Config 1,2,3       | TRS.1.2 TDD  |    | NA                                  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |      | Config 1,2,3       | OP.1   |    | OP.1                                |    |
| PDSCH Reference measurement channel       |  |      | Config 1,2,3       | SR.1.1 CCA   |    |                                     |    |
| CORESET Reference Channel                 |  |      | Config 1,2,3       | CR.1.1 CCA   |    |                                     |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2         | SSB.1 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 3           | SSB.1 CCA  |    | SSB.2 FR1                           |    |
|   | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2         | SSB.2 CCA  |    | SSB.1 FR1                           |    |
|   |  |      | Config 3           | SSB.2 CCA  |    | SSB.2 FR1                           |    |
| DBT window configuration                  |  |      | Config 1,2,3       | As defined in A.3.28.1                                     |    | Not applicable                      |    |
| SMTC configuration defined in A.3.11      |  |      | Config 1,2,3       | SMTC.1   |    | SMTC.4                              |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz  | Config 1,2         | 30   |    | 15                                  |    |
|   |  |      | Config 3           | 30   |    | 30                                  |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3       | P <sub>CCA_DL</sub> =0.9375                                |    | NA                                  |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3       | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    | NA                                  |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    | NA                                  |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    | NA                                  |    |
| L <sub>CCA_DL</sub>                       |  |      | Config 1,2,3       | 5  |    | 5                                   |    |
| W <sub>CCA_DL</sub>                       |  | ms   | Config 1,2,3       | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    | T <sub>PSS/SSS_sync_inter_cca</sub> |    |
| EPRE ratio of PSS to SSS                  |  |      | Config 1,2,3       | 0  |    | 0                                   |    |
| EPRE ratio of PBCH DMRS to SSS            |  |      |                    |  |    |                                     |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |      |                    |  |    |                                     |    |
| EPRE ratio of PDSCH to PDSCH              |  |      |                    |  |    |                                     |    |

|  |              |              |        |        |           |        |
|--|--------------|--------------|--------|--------|-----------|--------|
| EPRE ratio of OCNB DMRS to SSS(Note 1)   |              |              |        |        |           |        |
| EPRE ratio of OCNB to OCNB DMRS (Note 1)   |              |              |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | Config 1,2,3 | -104   |        | -98       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2   | -101   |        | -98       |        |
|  |              | Config 3     | -101   |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2   | -91    | -91    | -Infinity | -91    |
|  |              | Config 3     | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2   | -58.49 | -58.49 | -70.05    | -62.26 |
|  | dBm/38.16MHz | Config 3     | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |              |              |        |        |           |        |

### A.11.5.2.9.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.11.5.2.10 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used

### A.11.5.2.10.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are two cells: NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.11.5.2.10.1-1, A.11.5.2.10.1-2 and A.11.5.2.10.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.11.5.2.10.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.11.5.2.10.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.11.5.2.10.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.11.5.2.10.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value                             |        |        |        | Comment  |
|---|------|--------------------|-----------------------------------|--------|--------|--------|--|
|   |      |                    | Test 1                            | Test 2 | Test 3 | Test 4 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2                              |        |        |        | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA.               |
| Active cell                                     |      | Config 1,2,3       | NR cell 1 (PCell)                 |        |        |        | NR cell 1 is on NR RF channel number 1 with CCA.                                 |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 2                         |        |        |        | NR cell 2 is on NR RF channel number 2.  |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1 |        |        |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2 |        |        |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0                                 |        | 4      |        | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9                                 |        | 9      |        |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6                                |        |        |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0                                 |        |        |        |  |
| CP length                                       |      | Config 1,2,3       | Normal                            |        |        |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0                                 |        |        |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0                                 |        |        |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | DRX .1                            | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3   |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3ms                               |        |        |        | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|   |      | Config 1,2,3       | 3μs                               |        |        |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5                                 |        |        |        |  |
| T2  | s    | Config 1,2,3       | 3                                 | 20     | 3      | 20     |  |

**Table A.11.5.2.10.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                 |  | Unit | Test configuration | Cell 1   |    |    |    | Cell 2                              |    |    |    |
|---|--|------|--------------------|--|----|----|----|-------------------------------------|----|----|----|
|   |  |      |                    | T1   | T2 | T3 | T4 | T1                                  | T2 | T3 | T4 |
| NR RF Channel Number                      |  |      | Config 1,2,3       | 1  |    |    |    | 2                                   |    |    |    |
| Duplex mode                               |  |      | Config 1           | TDD  |    |    |    | FDD                                 |    |    |    |
|   |  |      | Config 2,3         | TDD  |    |    |    | TDD                                 |    |    |    |
| TDD configuration                         |  |      | Config 1           | TDDConf.1.1 CCA  |    |    |    | Not Applicable                      |    |    |    |
|   |  |      | Config 2           | TDDConf.1.1 CCA  |    |    |    | TDDConf.1.1                         |    |    |    |
|   |  |      | Config 3           | TDDConf.1.1 CCA  |    |    |    | TDDConf.2.1                         |    |    |    |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 10: N <sub>RB,c</sub> = 52          |    |    |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 40: N <sub>RB,c</sub> = 106         |    |    |    |
| BWP BW                                    |  | MHz  | Config 1,2         | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 10: N <sub>RB,c</sub> = 52          |    |    |    |
|   |  |      | Config 3           | 40: N <sub>RB,c</sub> = 106                                |    |    |    | 40: N <sub>RB,c</sub> = 106         |    |    |    |
| BWP configuration                         | Initial DL BWP                                 |      | Config 1,2,3       | DLBWP.0.1  |    |    |    | NA                                  |    |    |    |
|   | Initial UL BWP                                 |      |                    | ULBWP.0.1  |    |    |    | NA                                  |    |    |    |
|   | Dedicated DL BWP                               |      |                    | DLBWP.1.1  |    |    |    | NA                                  |    |    |    |
|   | Dedicated UL BWP                               |      |                    | ULBWP.1.1  |    |    |    | NA                                  |    |    |    |
| TRS configuration                         |  |      | Config 1,2,3       | TRS.1.2 TDD  |    |    |    | NA                                  |    |    |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |      | Config 1,2,3       | OP.1   |    |    |    | OP.1                                |    |    |    |
| PDSCH Reference measurement channel       |  |      | Config 1,2,3       | SR.1.1 CCA   |    |    |    |                                     |    |    |    |
| CORESET Reference Channel                 |  |      | Config 1,2,3       | CR.1.1 CCA   |    |    |    |                                     |    |    |    |
| SSB parameters                            | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2         | SSB.1 CCA  |    |    |    | SSB.1 FR1                           |    |    |    |
|   |  |      | Config 3           | SSB.1 CCA  |    |    |    | SSB.2 FR1                           |    |    |    |
|   | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2         | SSB.2 CCA  |    |    |    | SSB.1 FR1                           |    |    |    |
|   |  |      | Config 3           | SSB.2 CCA  |    |    |    | SSB.2 FR1                           |    |    |    |
| DBT window configuration                  |  |      | Config 1,2,3       | As defined in A.3.28.1                                     |    |    |    | Not applicable                      |    |    |    |
| SMTC configuration defined in A.3.11      |  |      | Config 1,2,3       | SMTC.1   |    |    |    | SMTC.4                              |    |    |    |
| PDSCH/PDCCH subcarrier spacing            |  | kHz  | Config 1,2         | 30   |    |    |    | 15                                  |    |    |    |
|   |  |      | Config 3           | 30   |    |    |    | 30                                  |    |    |    |
| DL CCA probability P <sub>CCA_DL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3       | P <sub>CCA_DL</sub> =0.9375                                |    |    |    | NA                                  |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3       | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |    |    |    | NA                                  |    |    |    |
| UL CCA probability P <sub>CCA_UL</sub>    | Semi-static channel access <sup>Note 5,7</sup> |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    |    |    | NA                                  |    |    |    |
|   | Dynamic channel access <sup>Note 6,7</sup>     |      | Config 1,2,3       | P <sub>CCA_UL</sub> =1                                     |    |    |    | NA                                  |    |    |    |
| L <sub>CCA_DL</sub>                       |  |      | Config 1,2,3       | 2  |    |    |    | 2                                   |    |    |    |
| W <sub>CCA_DL</sub>                       |  | ms   | Config 1,2,3       | T <sub>PSS/SSS_sync_inter_cca</sub>                        |    |    |    | T <sub>PSS/SSS_sync_inter_cca</sub> |    |    |    |
| EPRE ratio of PSS to SSS                  |  |      | Config 1,2,3       | 0  |    |    |    | 0                                   |    |    |    |
| EPRE ratio of PBCH DMRS to SSS            |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PBCH to PBCH DMRS           |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDCCH DMRS to SSS           |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS         |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDSCH DMRS to SSS           |  |      |                    |  |    |    |    |                                     |    |    |    |
| EPRE ratio of PDSCH to PDSCH              |  |      |                    |  |    |    |    |                                     |    |    |    |

|  |              |              |        |        |           |        |
|--|--------------|--------------|--------|--------|-----------|--------|
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |              |              |        |        |           |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |              |        |        |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | Config 1,2,3 | -104   |        | -98       |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/S CS     | Config 1,2   | -101   |        | -98       |        |
|  |              | Config 3     | -101   |        | -95       |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/S CS     | Config 1,2   | -91    | -91    | -Infinity | -91    |
|  |              | Config 3     | -91    | -91    | -Infinity | -88    |
| $\hat{E}_s/I_{ot}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $\hat{E}_s/N_{oc}$   | dB           | Config 1,2,3 | 4      | 4      | -Infinity | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36MHz  | Config 1,2   | -58.49 | -58.49 | -70.05    | -62.26 |
|  | dBm/38.16MHz | Config 3     | -58.49 | -58.49 | -63.94    | -56.15 |
| Propagation Condition  |              | Config 1,2,3 | AWGN   |        | AWGN      |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |              |              |        |        |           |        |

**Table A.11.5.2.10.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.11.5.2.10.1-5: TimeAlignmentTimer -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

**A.11.5.2.10.2 Test Requirements**

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_inter\_cca\_with\_index}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement



report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

### A.11.5.3 Inter-RAT E-UTRAN measurements

#### A.11.5.4 L1-RSRP measurements for beam reporting

##### A.11.5.4.1 SSB based L1-RSRP measurement when DRX is not used

###### A.11.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.1.1-1.

**Table A.11.5.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

###### A.11.5.4.1.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.1.2-1 and Table A.11.5.4.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

**Table A.11.5.4.1.2-1: General test parameters**

| Parameter   | Config | Unit | Value  |   |  |      |
|---|--------|------|--|---|--|------|
| SSB GSCN  | 1      |      | freq1  |   |  |      |
| DL CCA model                                      | 1      |      | As specified in A.3.20.2.1   |   |  |      |
| UL CCA model                                      | 1      |      | As specified in A.3.20.2.2   |   |  |      |
| Duplex mode                                       | 1      |      | TDD  |   |  |      |
| TDD Configuration                                 | 1      |      | TDDConf.1.1 CCA  |   |  |      |
| BW <sub>channel</sub>                             | 1      | MHz  | 40: N <sub>RB,c</sub> = 106  |   |  |      |
| PDSCH Reference measurement channel               | 1      |      | SR.1.1 CCA   |   |  |      |
| RMSI CORESET Reference Channel                    | 1      |      | CR.1.1 CCA   |   |  |      |
| Dedicated CORESET Reference Channel               | 1      |      | CCR.1.1 CCA  |   |  |      |
| SSB configuration                                 | 1      |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |   |  |      |
| OCNG Patterns                                     | 1      |      | OP.1   |   |  |      |
| Initial BWP Configuration                         | 1      |      | DLBWP.0.1<br>ULBWP.0.1   |   |  |      |
| Dedicated BWP configuration                       | 1      |      | DLBWP.1.1<br>ULBWP.1.1   |   |  |      |
| DBT Window Configuration                          | 1      |      | DBT.1  |   |  |      |
| TRS Configuration                                 | 1      |      | TRS.1.2 TDD  |   |  |      |
| DRX configuration                                 | 1      |      | Off  |   |  |      |
| reportConfigType                                  | 1      |      | periodic   |   |  |      |
| reportQuantity                                    | 1      |      | ssb-Index-RSRP   |   |  |      |
| Number of reported RS                             | 1      |      | 2  |   |  |      |
| L1-RSRP reporting period                          | 1      | slot | 80   |   |  |      |
| T1  | 1      | s    | 5  |   |  |      |
| T2  | 1      | s    | 1  |   |  |      |
| EPRE ratio of PSS to SSS                          | 1      | dB   | 0  |   |  |      |
| EPRE ratio of PBCH DMRS to SSS                    |        |      |  |   |  |      |
| EPRE ratio of PBCH to PBCH DMRS                   |        |      |  |   |  |      |
| EPRE ratio of PDCCH DMRS to SSS                   |        |      |  |   |  |      |
| EPRE ratio of PDCCH to PDCCH DMRS                 |        |      |  |   |  |      |
| EPRE ratio of PDSCH DMRS to SSS                   |        |      |  |   |  |      |
| EPRE ratio of PDSCH to PDSCH DMRS                 |        |      |  |   |  |      |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |   |  |      |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |        |      |  |   |  |      |
| Propagation condition                             |        |      |  | 1   |  | AWGN |
| Note 1:   |        |      |  | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |  |      |

Table A.11.5.4.1.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1      |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1      |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1      |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s/I_{ot}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1      | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1      | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s/N_{oc}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

### A.11.5.4.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.11.5.4.2 SSB based L1-RSRP measurement when DRX is used

#### A.11.5.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.2.1-1.

Table A.11.5.4.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

| Config   | Description  |
|--|--|
| 1  | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.11.5.4.2.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.2.2-1 and Table A.11.5.4.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.11.5.4.2.2-1: General test parameters

| Parameter   | Config | Unit | Value  |
|---|--------|------|--|
| SSB GSCN  | 1      |      | freq1  |
| DL CCA model  | 1      |      | As specified in A.3.20.2.1   |
| UL CCA model  | 1      |      | As specified in A.3.20.2.2   |
| Duplex mode   | 1      |      | TDD  |
| TDD Configuration   | 1      |      | TDDConf.1.1 CCA  |
| BW <sub>channel</sub>   | 1      | MHz  | 40: N <sub>RB,c</sub> = 106  |
| PDSCH Reference measurement channel   | 1      |      | SR.1.1 CCA   |
| RMSI CORESET Reference Channel  | 1      |      | CR.1.1 CCA   |
| Dedicated CORESET Reference Channel   | 1      |      | CCR.1.1 CCA  |
| SSB configuration   | 1      |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns   | 1      |      | OP.1   |
| Initial BWP Configuration   | 1      |      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration   | 1      |      | DLBWP.1.1<br>ULBWP.1.1   |
| DBT Window Configuration  | 1      |      | DBT.1  |
| TRS Configuration   | 1      |      | TRS.1.2 TDD  |
| DRX configuration   | 1      |      | DRX.3  |
| reportConfigType  | 1      |      | periodic   |
| reportQuantity  | 1      |      | ssb-Index-RSRP   |
| Number of reported RS   | 1      |      | 2  |
| L1-RSRP reporting period  | 1      | slot | 80   |
| T1  | 1      | s    | 5  |
| T2  | 1      | s    | 1  |
| EPRE ratio of PSS to SSS  | 1      | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS  |        |      |  |
| EPRE ratio of PBCH to PBCH DMRS   |        |      |  |
| EPRE ratio of PDCCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |  |
| EPRE ratio of PDSCH DMRS to SSS   |        |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |        |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |        |      |  |
| Propagation condition   |        |      |  |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |        |      |  |

Table A.11.5.4.2.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1      |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1      |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1      |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s/I_{ot}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1      | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1      | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s/N_{oc}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

### A.11.5.4.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.11.5.4.3 SSB based L1-RSRP measurement on SCC when DRX is not used

#### A.11.5.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.3.1-1.

Table A.11.5.4.3.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

| Config   | Description  |
|--|--|
| 1  | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

#### A.11.5.4.3.2 Test parameters

There are two cells in the test, the FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Both Cell 1 and Cell 2 operate on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.3.2-1 and Table A.11.5.4.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.11.5.4.3.2-1: General test parameters

| Parameter   | Config  | Unit | Value  |
|---|---|------|--|
| Active PCell                                      | 1   |      | Cell 1   |
| Active SCell                                      | 1   |      | Cell 2   |
| RF Channel Number                                 | 1   |      | 1: Cell 1<br>2: Cell 2   |
| DL CCA model                                      | 1   |      | As specified in A.3.20.2.1   |
| UL CCA model                                      | 1   |      | As specified in A.3.20.2.2   |
| Duplex mode                                       | 1   |      | TDD  |
| TDD Configuration                                 | 1   |      | TDDConf.1.1 CCA  |
| $BW_{channel}$                                    | 1   | MHz  | 40: $N_{RB,c} = 106$   |
| PDSCH Reference measurement channel               | 1   |      | SR.1.1 CCA   |
| RMSI CORESET Reference Channel                    | 1   |      | CR.1.1 CCA   |
| Dedicated CORESET Reference Channel               | 1   |      | CCR.1.1 CCA  |
| SSB configuration                                 | 1   |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns                                     | 1   |      | OP.1   |
| Initial BWP Configuration                         | 1   |      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration                       | 1   |      | DLBWP.1.1<br>ULBWP.1.1   |
| DBT Window Configuration                          | 1   |      | DBT.1  |
| TRS Configuration                                 | 1   |      | TRS.1.2 TDD  |
| DRX configuration                                 | 1   |      | Off  |
| reportConfigType                                  | 1   |      | periodic   |
| reportQuantity                                    | 1   |      | ssb-Index-RSRP   |
| Number of reported RS                             | 1   |      | 2  |
| L1-RSRP reporting period                          | 1   | slot | 80   |
| T1  | 1   | s    | 5  |
| T2  | 1   | s    | 1  |
| EPRE ratio of PSS to SSS                          | 1   | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |   |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |   |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |   |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |   |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |      |  |
| Propagation condition                             |   |      |  |
| Note 1:   | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |      |  |



Table A.11.5.4.3.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1      |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1      |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1      |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s/I_{ot}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1      | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1      | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s/N_{oc}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

### A.11.5.4.3.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.11.5.4.4 SSB based L1-RSRP measurement on SCC when DRX is used

#### A.11.5.4.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.4.1-1.

**Table A.11.5.4.4.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

#### A.11.5.4.4.2 Test parameters

There are two cells in the test, the FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Both Cell 1 and Cell 2 operate on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.4.2-1 and Table A.11.5.4.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.11.5.4.4.2-1: General test parameters

| Parameter   | Config  | Unit | Value  |
|---|---|------|--|
| Active PCell                                      | 1   |      | Cell 1   |
| Active SCell                                      | 1   |      | Cell 2   |
| RF Channel Number                                 | 1   |      | 1: Cell 1<br>2: Cell 2   |
| DL CCA model                                      | 1   |      | As specified in A.3.20.2.1   |
| UL CCA model                                      | 1   |      | As specified in A.3.20.2.2   |
| Duplex mode                                       | 1   |      | TDD  |
| TDD Configuration                                 | 1   |      | TDDConf.1.1 CCA  |
| $BW_{channel}$                                    | 1   | MHz  | 40: $N_{RB,c} = 106$   |
| PDSCH Reference measurement channel               | 1   |      | SR.1.1 CCA   |
| RMSI CORESET Reference Channel                    | 1   |      | CR.1.1 CCA   |
| Dedicated CORESET Reference Channel               | 1   |      | CCR.1.1 CCA  |
| SSB configuration                                 | 1   |      | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns                                     | 1   |      | OP.1   |
| Initial BWP Configuration                         | 1   |      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration                       | 1   |      | DLBWP.1.1<br>ULBWP.1.1   |
| DBT Window Configuration                          | 1   |      | DBT.1  |
| TRS Configuration                                 | 1   |      | TRS.1.2 TDD  |
| DRX configuration                                 | 1   |      | DRX.3  |
| reportConfigType                                  | 1   |      | periodic   |
| reportQuantity                                    | 1   |      | ssb-Index-RSRP   |
| Number of reported RS                             | 1   |      | 2  |
| L1-RSRP reporting period                          | 1   | slot | 80   |
| T1  | 1   | s    | 5  |
| T2  | 1   | s    | 1  |
| EPRE ratio of PSS to SSS                          | 1   | dB   | 0  |
| EPRE ratio of PBCH DMRS to SSS                    |   |      |  |
| EPRE ratio of PBCH to PBCH DMRS                   |   |      |  |
| EPRE ratio of PDCCH DMRS to SSS                   |   |      |  |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |      |  |
| EPRE ratio of PDSCH DMRS to SSS                   |   |      |  |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |      |  |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |      |  |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |      |  |
| Propagation condition                             |   |      |  |
| Note 1:   | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |      |  |

Table A.11.5.4.4.2-2: SSB specific test parameters

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,6</small>   | 1      |               | 0.9375        | 0.9375        | 0.9375        | 0.9375        |
| DL CCA Probability<br>$P_{CCA\_DL}$ <small>Note 4,7</small>   | 1      |               | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 | 0.75/0.7<br>5 |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1      |               | 1.0           | 1.0           | 1.0           | 1.0           |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <small>Note2</small>   | 1      | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s/I_{ot}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <small>Note3</small>   | 1      | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <small>Note3</small>  | 1      | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s/N_{oc}$  | 1      | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

#### A.11.5.4.4.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCC}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.11.6 Measurement performance

### A.11.6.1 SS-RSRP

#### A.11.6.1.1 Intra-frequency measurement accuracy on a carrier frequency with CCA

##### A.11.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will verify the requirements in clauses 10.1.36.1.1 and 10.1.36.1.2 for intra-frequency measurements under CCA.

##### A.11.6.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model. Supported test configurations are shown in table A.11.6.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in A.11.6.1.1.2-2. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell.

**Table A.11.6.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.6.1.1.2-2: SS-RSRP Intra frequency test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        | Test 3 |        |
|-----------|------|--------|--------|--------|--------|--------|--------|
|           |      | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |

|  |              |                              |  |                                   |                    |              |                  |              |
|--|--------------|------------------------------|--|-----------------------------------|--------------------|--------------|------------------|--------------|
| Cell ID  |              |                              | 489  | 0                                 | 489                | 0            | 489              | 0            |
| SSB ARFCN  |              |                              | freq1  |                                   | freq1              |              | freq1            |              |
| TDD configuration  | Config 1     |                              | TDDConf.1.1 CCA  |                                   |                    |              |                  |              |
| BW <sub>channel</sub>  | Config 1     | MHz                          | 40: N <sub>RB,c</sub> = 106                                |                                   |                    |              |                  |              |
| BWP BW   | Config 1     |                              | 40: N <sub>RB,c</sub> = 106                                |                                   |                    |              |                  |              |
| DL CCA model   |              |                              | As specified in clause A.3.26.2.1                          |                                   |                    |              |                  |              |
| UL CCA model   |              |                              | As specified in clause A.3.26.2.2                          |                                   |                    |              |                  |              |
| P <sub>CCA,DL</sub> for dynamic channel access <sup>Note 7,9</sup>     |              |                              | P <sub>CCA,DL,1</sub> =0.75<br>P <sub>CCA,DL,2</sub> =0.75 |                                   |                    |              |                  |              |
| P <sub>CCA,DL</sub> for semi-static channel access <sup>Note 8,9</sup> |              |                              | P <sub>CCA,DL</sub> =0.9375                                |                                   |                    |              |                  |              |
| P <sub>CCA,UL</sub>  |              |                              | 1  |                                   |                    |              |                  |              |
| Downlink initial BWP configuration                                     |              |                              | DLBWP.0.1  |                                   |                    |              |                  |              |
| Downlink dedicated BWP configuration                                   |              |                              | DLBWP.1.1  |                                   |                    |              |                  |              |
| Uplink initial BWP configuration                                       |              |                              | ULBWP.0.1  |                                   |                    |              |                  |              |
| Uplink dedicated BWP configuration                                     |              |                              | ULBWP.1.1  |                                   |                    |              |                  |              |
| TRS configuration  | Config 1     |                              | TRS.1.<br>2 TDD  | NA                                | TRS.1<br>.2<br>TDD | NA           | TRS.1.<br>2 TDD  | NA           |
| DRX Cycle  |              | ms                           | Not Applicable   |                                   |                    |              |                  |              |
| PDSCH Reference measurement channel                                    | Config 1     |                              | SR.1.1<br>CCA  | -                                 | SR.1.1<br>CCA      | -            | SR.1.1<br>CCA    | -            |
| RMSI CORESET Reference Channel   | Config 1     |                              | CR.1.1<br>CCA  | -                                 | CR.1.1<br>CCA      | -            | CR.1.1<br>CCA    | -            |
| Control channel RMC  | Config 1     |                              | CR.1.1<br>CCA  | -                                 | CR.1.1<br>CCA      | -            | CR.1.1<br>CCA    | -            |
| SSB configuration for semi-static channel access                       | Config 1     |                              | SSB.1<br>CCA   | SSB.1<br>CCA                      | SSB.1<br>CCA       | SSB.1<br>CCA | SSB.1<br>CCA     | SSB.1<br>CCA |
| SSB configuration for dynamic channel access                           | Config 1     |                              | SSB.2<br>CCA   | SSB.2<br>CCA                      | SSB.2<br>CCA       | SSB.2<br>CCA | SSB.2<br>CCA     | SSB.2<br>CCA |
| DBT window configuration   | Config 1,2,3 |                              | DBT.1  | DBT.1                             | DBT.1              | DBT.1        | DBT.1            | DBT.1        |
| Time offset with Cell 1  | Config 1     | μs                           | -  | 3                                 | -                  | 3            | -                | 3            |
| SMTC configuration   | Config 1     |                              | SMTC.1   |                                   |                    |              |                  |              |
| OCNG Patterns  |              |                              | OCNG pattern 1   |                                   |                    |              |                  |              |
| PDSCH/PDCCH subcarrier spacing   | Config 1     | kHz                          | 30 kHz   |                                   |                    |              |                  |              |
| EPRE ratio of PSS to SSS   |              | dB                           | 0  | 0                                 | 0                  | 0            | 0                | 0            |
| EPRE ratio of PBCH DMRS to SSS   |              |                              |  |                                   |                    |              |                  |              |
| EPRE ratio of PBCH to PBCH DMRS  |              |                              |  |                                   |                    |              |                  |              |
| EPRE ratio of PDCCH DMRS to SSS  |              |                              |  |                                   |                    |              |                  |              |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |              |                              |  |                                   |                    |              |                  |              |
| EPRE ratio of PDSCH DMRS to SSS  |              |                              |  |                                   |                    |              |                  |              |
| EPRE ratio of PDSCH to PDSCH   |              |                              |  |                                   |                    |              |                  |              |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                 |              |                              |  |                                   |                    |              |                  |              |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                               |              |                              |  |                                   |                    |              |                  |              |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1     | NR_CCA_FR1_I<br>NR_CCA_FR1_J | Not applicable <sup>Note 5</sup>                           |                                   | -94                |              | -110<br>-109.5   |              |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1     | NR_CCA_FR1_I<br>NR_CCA_FR1_J | Not applicable <sup>Note 5</sup>                           |                                   | -91                |              | -107.0<br>-106.5 |              |
| $\hat{E}_s/I_{ot}$ <sup>Note6</sup>                                    |              | dB                           | 2.46   | -5.97                             | 2.46               | -5.97        | -2.01            | -3.54        |
| $\hat{E}_s/N_{oc}$ <sup>Note6</sup>                                    |              | dB                           | 6  | 1                                 | 6                  | 1            | 1                | 0            |
| SS-RSRP <sup>Not e3,6</sup>  | Config 1     | NR_CCA_FR1_I                 | Not applicable <sup>Note 5</sup>                           | Not applicable <sup>Not e 5</sup> | -85                | -90          | -                | -            |
|  |              | NR_CCA_FR1_J                 |  |                                   |                    |              | 106.00           | 107.00       |
|  |              |                              |  |                                   |                    |              | -                | -            |
|  |              |                              |  |                                   |                    |              | 105.50           | 106.50       |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1     | NR_CCA_FR1_I<br>NR_CCA_FR1_J | Not applicable <sup>Note 5</sup>                           |                                   | -51.99             |              | -70.82<br>-70.32 |              |
| Propagation condition  |              | -                            | AWGN   |                                   |                    |              |                  |              |
| Antenna configuration  |              |                              | 1x2  |                                   |                    |              |                  |              |

|  |
|--|
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| NOTE 3: SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |
| NOTE 5: Subtest 1 is not used when testing with 30kHz SSB SCS.   |
| NOTE 6: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.  |
| NOTE 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| NOTE 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| NOTE 9: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.  |

A.11.6.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in clause 10.1.36.1.1 and relative requirement in clause 10.1.36.1.2.

A.11.6.1.2 Intra-frequency measurement accuracy on SCC on a carrier frequency with CCA

A.11.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will verify the requirements in clauses 10.1.36.1.1 and 10.1.36.1.2 for intra-frequency measurements under CCA.

A.11.6.1.2.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1) on the carrier frequency with CCA, and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). Supported test configurations are shown in table A.11.6.1.2.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in A.11.6.1.2.2-2.

**Table A.11.6.1.2.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A.11.6.1.2.2-2: SS-RSRP Intra frequency test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        | Test 3 |        |
|-----------|------|--------|--------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

|  |              |              |  |                                      |                                       |              |                 |               |
|--|--------------|--------------|--|--------------------------------------|---------------------------------------|--------------|-----------------|---------------|
| Cell ID  |              |              | 489  | 0                                    | 489                                   | 0            | 489             | 0             |
| SSB ARFCN  |              |              | freq1  |                                      | freq1                                 |              | freq1           |               |
| TDD configuration  | Config 1     |              | TDDConf.1.1 CCA  |                                      |                                       |              |                 |               |
| BW <sub>channel</sub>  | Config 1     | MHz          | 40: N <sub>RB,c</sub> = 106                                |                                      |                                       |              |                 |               |
| BWP BW   | Config 1     |              | 40: N <sub>RB,c</sub> = 106                                |                                      |                                       |              |                 |               |
| DL CCA model   |              |              | As specified in clause A.3.26.2.1                          |                                      |                                       |              |                 |               |
| UL CCA model   |              |              | As specified in clause A.3.26.2.2                          |                                      |                                       |              |                 |               |
| P <sub>CCA,DL</sub> for dynamic channel access <sup>Note 7,9</sup>     |              |              | P <sub>CCA,DL,1</sub> =0.75<br>P <sub>CCA,DL,2</sub> =0.75 |                                      |                                       |              |                 |               |
| P <sub>CCA,DL</sub> for semi-static channel access <sup>Note 8,9</sup> |              |              | P <sub>CCA,DL</sub> =0.9375                                |                                      |                                       |              |                 |               |
| P <sub>CCA,UL</sub>  |              |              | 1  |                                      |                                       |              |                 |               |
| Downlink initial BWP configuration                                     |              |              | DLBWP.0.1  |                                      |                                       |              |                 |               |
| Downlink dedicated BWP configuration                                   |              |              | DLBWP.1.1  |                                      |                                       |              |                 |               |
| Uplink initial BWP configuration                                       |              |              | ULBWP.0.1  |                                      |                                       |              |                 |               |
| Uplink dedicated BWP configuration                                     |              |              | ULBWP.1.1  |                                      |                                       |              |                 |               |
| TRS configuration  | Config 1     |              | TRS.1.<br>2 TDD  | NA                                   | TRS.1<br>.2<br>TDD                    | NA           | TRS.1.<br>2 TDD | NA            |
| DRX Cycle  |              | ms           | Not Applicable   |                                      |                                       |              |                 |               |
| PDSCH Reference measurement channel                                    | Config 1     |              | SR.1.1<br>CCA  | -                                    | SR.1.1<br>CCA                         | -            | SR.1.1<br>CCA   | -             |
| RMSI CORESET Reference Channel   | Config 1     |              | CR.1.1<br>CCA  | -                                    | CR.1.1<br>CCA                         | -            | CR.1.1<br>CCA   | -             |
| Control channel RMC  | Config 1     |              | CR.1.1<br>CCA  | -                                    | CR.1.1<br>CCA                         | -            | CR.1.1<br>CCA   | -             |
| SSB configuration for semi-static channel access                       | Config 1     |              | SSB.1<br>CCA   | SSB.1<br>CCA                         | SSB.1<br>CCA                          | SSB.1<br>CCA | SSB.1<br>CCA    | SSB.1<br>CCA  |
| SSB configuration for dynamic channel access                           | Config 1     |              | SSB.2<br>CCA   | SSB.2<br>CCA                         | SSB.2<br>CCA                          | SSB.2<br>CCA | SSB.2<br>CCA    | SSB.2<br>CCA  |
| DBT window configuration   | Config 1,2,3 |              | DBT.1  | DBT.1                                | DBT.1                                 | DBT.1        | DBT.1           | DBT.1         |
| Time offset with Cell 1  | Config 1     | μs           | -  | 3                                    | -                                     | 3            | -               | 3             |
| SMTC configuration   | Config 1     |              | SMTC.1   |                                      |                                       |              |                 |               |
| OCNG Patterns  |              |              | OCNG pattern 1   |                                      |                                       |              |                 |               |
| PDSCH/PDCCH subcarrier spacing   | Config 1     | kHz          | 30 kHz   |                                      |                                       |              |                 |               |
| EPRE ratio of PSS to SSS   |              | dB           | 0  | 0                                    | 0                                     | 0            | 0               | 0             |
| EPRE ratio of PBCH DMRS to SSS   |              |              |  |                                      |                                       |              |                 |               |
| EPRE ratio of PBCH to PBCH DMRS  |              |              |  |                                      |                                       |              |                 |               |
| EPRE ratio of PDCCH DMRS to SSS  |              |              |  |                                      |                                       |              |                 |               |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |              |              |  |                                      |                                       |              |                 |               |
| EPRE ratio of PDSCH DMRS to SSS  |              |              |  |                                      |                                       |              |                 |               |
| EPRE ratio of PDSCH to PDSCH   |              |              |  |                                      |                                       |              |                 |               |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                 |              |              |  |                                      |                                       |              |                 |               |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                               |              |              |  |                                      |                                       |              |                 |               |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1     |              | Not applicable <sup>Note 5</sup>                           |                                      | -94                                   |              | -110            |               |
|  |              |              |  |                                      |                                       |              | -109.5          |               |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1     | dBm/SCS      | Not applicable <sup>Note 5</sup>                           |                                      | -91                                   |              | -107.0          |               |
|  |              |              |  |                                      |                                       |              | -106.5          |               |
| $\hat{E}_s/I_{ot}$ <sup>Note6</sup>                                    |              | dB           | 2.46   | -5.97                                | 2.46                                  | -5.97        | -2.01           | -3.54         |
| $\hat{E}_s/N_{oc}$ <sup>Note6</sup>                                    |              | dB           | 6  | 1                                    | 6                                     | 1            | 1               | 0             |
| SS-RSRP <sup>Not e3</sup>  | Config 1     | NR_CCA_FR1_I | dBm/SCS  | Not applica<br>ble <sup>Note 5</sup> | Not applic<br>able <sup>Not e 5</sup> | -85          | -90             | -             |
|  |              | NR_CCA_FR1_J |  |                                      |                                       |              |                 | 106.00 107.00 |
|  |              |              |  |                                      |                                       |              |                 | - -           |
|  |              |              |  |                                      |                                       |              |                 | 105.50 106.50 |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1     | NR_CCA_FR1_I | dBm/<br>38.16MHz   | Not applicable <sup>Note 5</sup>     |                                       | -51.99       |                 | -70.82        |
|  |              | NR_CCA_FR1_J |  |                                      |                                       |              |                 | -70.32        |
| Propagation condition  |              |              | AWGN   |                                      |                                       |              |                 |               |
| Antenna configuration  |              |              | 1x2  |                                      |                                       |              |                 |               |



- NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- NOTE 3: SS-RSRP and  $I_0$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- NOTE 5: Subtest 1 is not used when testing with 30kHz SSB SCS.
- NOTE 6: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
- NOTE 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
- NOTE 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
- NOTE 9: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### A.11.6.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for cell 2 and cell 3 shall fulfil absolute requirement in clause 10.1.36.1.1 and relative requirement in clause 10.1.36.1.2.

## A.11.6.2 SS-RSRQ

### A.11.6.2.1 Intra-frequency measurement accuracy

#### A.11.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.29.1.1.

#### A.11.6.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.11.6.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is tested by using the parameters in Table A.11.6.2.1.2-2. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is the target cell with CCA. Three sub-tests (Test 1, Test 2, and Test 3) are provided different  $N_{oc}$  on Cells 1 and 2.

**Table A.11.6.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.11.6.2.1.2-2: SS-RSRQ Intra frequency test parameters**

| Parameter  |                       | Unit           | Test 1   |        | Test 2      |        | Test 3      |        |
|--|-----------------------|----------------|--|--------|-------------|--------|-------------|--------|
|  |                       |                | Cell 1   | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |
| SSB ARFCN  |                       |                | freq1  |        | freq1       |        | freq1       |        |
| DL CCA model   | Config 1              |                | As specified in clause A.3.26.2.1  |        |             |        |             |        |
| UL CCA model   | Config 1              |                | As specified in clause A.3.26.2.2  |        |             |        |             |        |
| UL CCA probability   | P <sub>CCA_UL</sub>   |                | 1.0  | -      | 1.0         | -      | 1.0         | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | P <sub>CCA_DL</sub>   |                | 0.9375   | -      | 0.9375      | -      | 0.9375      | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | P <sub>CCA_DL_1</sub> |                | 0.75   | -      | 0.75        | -      | 0.75        | -      |
|  | P <sub>CCA_DL_2</sub> |                | 0.75   | -      | 0.75        | -      | 0.75        | -      |
| Duplex mode  | Config 1              |                | TDD  |        |             |        |             |        |
| TDD configuration  | Config 1              |                | TDDConf.1.1 CCA  |        |             |        |             |        |
| BW <sub>channel</sub>  | Config 1              | MHz            | 40: N <sub>RB,c</sub> = 106  |        |             |        |             |        |
| Gap Pattern ID   |                       |                | 0  |        |             |        |             |        |
| BWP configuration  | Initial DL BWP        |                | DLBWP.0.1  |        |             |        |             |        |
|  | Dedicated DL BWP      |                | DLBWP.1.1  |        |             |        |             |        |
|  | Initial UL BWP        |                | ULBWP.0.1  |        |             |        |             |        |
|  | Dedicated UL BWP      |                | ULBWP.1.1  |        |             |        |             |        |
| DRX Cycle  |                       | ms             | Not Applicable   |        |             |        |             |        |
| PDSCH Reference measurement channel  | Config 1              |                | SR1.1 CCA  |        | SR1.1 CCA   |        | SR1.1 CCA   |        |
| RMSI CORESET Reference Channel   | Config 1              |                | CR.1.1 CCA   |        | CR.1.1 CCA  |        | CR.1.1 CCA  |        |
| Control Channel RMC  | Config 1              |                | CCR.1.1 CCA  |        | CCR.1.1 CCA |        | CCR.1.1 CCA |        |
| TRS Configuration  | Config 1              |                | TRS.1.2 TDD  |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |
| OCNG Patterns  |                       |                | OP. 1  |        |             |        |             |        |
| SS-RSSI-Measurement  |                       |                | Not Applicable   |        |             |        |             |        |
| Time offset with Cell 1  | Config 1              | µs             | -  | 3      | -           | 3      | -           | 3      |
| DBT Window configuration   | Config 1              |                | DBT.1  |        |             |        |             |        |
| SSB configuration  | Config 1              |                | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |             |        |             |        |
| SMTc configuration   | Config 1              |                | SMTc.1   |        |             |        |             |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1              | kHz            | 30 kHz   |        |             |        |             |        |
| EPRE ratio of PSS to SSS   |                       | dB             | 0  | 0      | 0           | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                       |                |  |        |             |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS  |                       |                |  |        |             |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS  |                       |                |  |        |             |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                       |                |  |        |             |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS  |                       |                |  |        |             |        |             |        |
| EPRE ratio of PDSCH to PDSCH   |                       |                |  |        |             |        |             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                       |                |  |        |             |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                       |                |  |        |             |        |             |        |
| N <sub>oc</sub> <small>Note2</small>                                       |                       | dBm/15kHz<br>z | -91  |        | -           |        | -110        |        |
|  |                       |                |  |        |             |        | -109.5      |        |
| N <sub>oc</sub> <small>Note2</small>                                       | Config 1              | dBm/SCS        | -88  |        | -           |        | -107        |        |
|  |                       |                |  |        |             |        | -106.5      |        |
| $\hat{E}_s/I_{\text{ref}}$   |                       | dB             | -1.76  |        | -4.7        |        | -5.46       | -5.46  |
| $\hat{E}_s/N_{oc}$   |                       | dB             | 3  | 3      | -2.9        | -2.9   | -4          | -4     |
| SS-RSRP <small>Note3</small>   | Config 1              | NR_CCA_FR1_I   | -85  | -85    | -           | -      | -111        | -111   |
|  |                       | NR_CCA_FR1_J   |  |        |             |        | -110.5      | -110.5 |
| SS-RSRQ <small>Note3</small>   |                       | dB             | -14.77   | -14.77 | -16.76      | -16.76 | -17.34      | -17.34 |

|   |          |              |                  |      |      |      |      |       |       |
|---|----------|--------------|------------------|------|------|------|------|-------|-------|
| Io <sup>Note3</sup>   | Config 1 | NR_CCA_FR1_J | dBm/<br>38.16MHz | -50  | -    |      |      | -73.4 |       |
|   |          | NR_CCA_FR1_I |                  |      |      |      |      |       |       |
|   |          | NR_CCA_FR1_J |                  |      |      |      |      |       | -72.9 |
| Propagation condition   |          |              | -                | AWGN | AWGN | AWGN | AWGN | AWGN  | AWGN  |
| Antenna configuration   |          |              |                  | 1x2  | 1x2  | 1x2  | 1x2  | 1x2   | 1x2   |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration</p> <p>Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 9: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |          |              |                  |      |      |      |      |       |       |

A.11.6.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.29.1.1.

A.11.6.2.2 Inter-frequency measurement accuracy

A.11.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.30.1.1 and 10.1.30.1.2.

A.11.6.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.11.6.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.11.6.2.2.2-2. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is target cell with CCA. Three sub-tests (Test 1, Test 2, and Test 3) are provided different  $N_{oc}$  on Cells 1 and 2.

**Table A.11.6.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                    |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.11.6.2.2.2-2: SS-RSRQ Inter frequency test parameters**

| Parameter  |                       | Unit         | Test 1   |        | Test 2      |        | Test 3      |         |
|--|-----------------------|--------------|--|--------|-------------|--------|-------------|---------|
|  |                       |              | Cell 1   | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2  |
| SSB ARFCN  |                       |              | freq1  | freq2  | freq1       | freq2  | freq1       | freq2   |
| DL CCA model   | Config 1              |              | As specified in clause A.3.26.2.1  |        |             |        |             |         |
| UL CCA model   | Config 1              |              | As specified in clause A.3.26.2.2  |        |             |        |             |         |
| UL CCA probability   | P <sub>CCA_UL</sub>   |              | 1.0  | -      | 1.0         | -      | 1.0         | -       |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | P <sub>CCA_DL</sub>   |              | 0.9375   | -      | 0.9375      | -      | 0.9375      | -       |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | P <sub>CCA_DL_1</sub> |              | 0.75   | -      | 0.75        | -      | 0.75        | -       |
|  | P <sub>CCA_DL_2</sub> |              | 0.75   | -      | 0.75        | -      | 0.75        | -       |
| Duplex mode  | Config 1              |              | TDD  |        |             |        |             |         |
| TDD configuration  | Config 1              |              | TDDConf.1.1 CCA  |        |             |        |             |         |
| BW <sub>channel</sub>  | Config 1              | MHz          | 40: N <sub>RB,c</sub> = 106  |        |             |        |             |         |
| Gap pattern ID   | Config 1              |              | 0  |        |             |        |             |         |
| BWP BW   | Config 1              |              | 40: N <sub>RB,c</sub> = 106  |        |             |        |             |         |
| DRX Cycle  |                       | ms           | Not Applicable   |        |             |        |             |         |
| PDSCH Reference measurement channel  | Config 1              |              | SR.1.1 CCA   |        | SR.1.1 CCA  |        | SR.1.1 CCA  |         |
| RMSI CORESET Reference Channel   | Config 1              |              | CR.1.1 CCA   |        | CR.1.1 CCA  |        | CR.1.1 CCA  |         |
| Dedicated CORESET Reference Channel  | Config 1              |              | CCR.1.1 CCA  |        | CCR.1.1 CCA |        | CCR.1.1 CCA |         |
| TRS Configuration  | Config 1              |              | TRS.1.2 TDD  |        | TRS.1.2 TDD |        | TRS.1.2 TDD |         |
| OCNG Patterns  |                       |              | OCNG pattern 1   |        |             |        |             |         |
| Time offset with Cell 1  | Config 1              | µs           | -  | 3      | -           | 3      | -           | 3       |
| DBT Window configuration   | Config 1              |              | DBT.1  |        |             |        |             |         |
| SSB configuration  | Config 1              |              | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |             |        |             |         |
| SMTC configuration   | Config 1              |              | SMTC.1   |        |             |        |             |         |
| PDSCH/PDCCH subcarrier spacing   | Config 1              | kHz          | 30 kHz   |        |             |        |             |         |
| EPRE ratio of PSS to SSS   |                       |              | 0  | 0      | 0           | 0      | 0           | 0       |
| EPRE ratio of PBCH DMRS to SSS   |                       |              |  |        |             |        |             |         |
| EPRE ratio of PBCH to PBCH DMRS  |                       |              |  |        |             |        |             |         |
| EPRE ratio of PDCCH DMRS to SSS  |                       |              |  |        |             |        |             |         |
| EPRE ratio of PDCCH to PDCCH DMRS  |                       |              |  |        |             |        |             |         |
| EPRE ratio of PDSCH DMRS to SSS  |                       |              |  |        |             |        |             |         |
| EPRE ratio of PDSCH to PDSCH   |                       |              |  |        |             |        |             |         |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                     |                       |              |  |        |             |        |             |         |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                       |              |  |        |             |        |             |         |
| N <sub>oc</sub> <small>Note2</small>                                       |                       | NR_CCA_FR1_I | -86.27   |        | -113        |        | -112        |         |
|  |                       | NR_CCA_FR1_J |  |        |             |        | -111.5      |         |
| N <sub>oc</sub> <small>Note2</small>                                       | Config 1              | NR_CCA_FR1_I | -83.27   |        | -110        |        | -109        |         |
|  |                       | NR_CCA_FR1_J |  |        |             |        | -108.5      |         |
| Ê <sub>s</sub> /I <sub>ot</sub>  |                       | dB           | -1.75  |        | -1.75       |        | 3           | -1.75   |
| Ê <sub>s</sub> /N <sub>oc</sub>  |                       | dB           | -1.75  |        | -1.75       |        | 3           | -1.75   |
| SS-RSRP <sup>Not e3</sup>  | Config 1              | NR_CCA_FR1_I | -85.02   | -85.02 | -           | -      | -106        | -       |
|  |                       | NR_CCA_FR1_J |  |        | 111.75      | 111.75 | -105.5      | -110.25 |
| SS-RSRQ <sup>Note3</sup>   |                       | NR_CCA_FR1_I | -14.77   | -14.77 | -40.59      | -40.59 | 12.56       | 14.76   |
|  |                       | NR_CCA_FR1_J |  |        |             |        |             |         |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1              | NR_CCA_FR1_I | -50  |        | -76.73      |        | -73.19      | -75.73  |
|  |                       | NR_CCA_FR1_J |  |        |             |        | -72.69      | -75.23  |
|  |                       | NR_CCA_FR1_J |  |        |             |        |             |         |
| Propagation condition  |                       |              | -  | AWGN   | AWGN        | AWGN   | AWGN        | AWGN    |

| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |
|-----------------------|--|-----|-----|-----|-----|-----|-----|
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |     |     |     |     |     |     |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |     |     |     |     |     |     |
| Note 3:               | SS-RSRQ, SS-RSRP, and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |     |     |     |     |     |     |
| Note 4:               | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |     |     |     |     |     |     |
| Note 5:               | NR operating band groups are as defined in clause 3.5.2.   |     |     |     |     |     |     |
| Note 6:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.   |     |     |     |     |     |     |
| Note 7:               | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |     |     |     |     |     |     |
| Note 8:               | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |     |     |     |     |     |     |
| Note 9:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |     |     |     |     |     |     |

### A.11.6.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.30.1.1 and 10.1.30.1.2.

### A.11.6.2.3 Intra-frequency measurement accuracy on SCC

#### A.11.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.29.1.1.

#### A.11.6.2.3.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.11.6.2.3.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is tested by using the parameters in Table A.11.6.2.3.2-2. In all test cases, Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA. Three sub-tests (Test 1, Test 2, and Test 3) are provided different  $N_{oc}$  on Cells 1, 2, and 3.

**Table A.11.6.2.3.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.11.6.2.3.2-2: SS-RSRQ Intra frequency test parameters**



| Parameter  |                       | Unit           | Test 1   |        | Test 2   |        | Test 3   |        |
|--|-----------------------|----------------|--|--------|--|--------|--|--------|
|  |                       |                | Cell 1 / Cell 2  | Cell 3 | Cell 1 / Cell 2                                  | Cell 3 | Cell 1 / Cell 2                                  | Cell 3 |
| SSB ARFCN  |                       |                | freq1<br>for Cell<br>1<br>freq2<br>for Cell<br>2                                 | freq2  | freq1<br>for Cell<br>1<br>freq2<br>for Cell<br>2 | freq2  | freq1<br>for<br>Cell 1<br>freq2<br>for<br>Cell 2 | freq2  |
| DL CCA model   | Config 1              |                | As specified in clause A.3.26.2.1  |        |  |        |  |        |
| UL CCA model   | Config 1              |                | As specified in clause A.3.26.2.2  |        |  |        |  |        |
| UL CCA probability   | P <sub>CCA_UL</sub>   |                | 1.0  | -      | 1.0  | -      | 1.0  | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | P <sub>CCA_DL</sub>   |                | 0.9375   | -      | 0.9375   | -      | 0.9375   | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | P <sub>CCA_DL_1</sub> |                | 0.75   | -      | 0.75   | -      | 0.75   | -      |
|  | P <sub>CCA_DL_2</sub> |                | 0.75   | -      | 0.75   | -      | 0.75   | -      |
| Duplex mode  | Config 1              |                | TDD  |        |  |        |  |        |
| TDD configuration  | Config 1              |                | TDDConf.1.1 CCA  |        |  |        |  |        |
| BW <sub>channel</sub>  | Config 1              | MHz            | 40: N <sub>RB,c</sub> = 106  |        |  |        |  |        |
| Gap Pattern ID   |                       |                | 0  |        |  |        |  |        |
| BWP configuration  | Initial DL BWP        |                | DLBWP.0.1  |        |  |        |  |        |
|  | Dedicated DL BWP      |                | DLBWP.1.1  |        |  |        |  |        |
|  | Initial UL BWP        |                | ULBWP.0.1  |        |  |        |  |        |
|  | Dedicated UL BWP      |                | ULBWP.1.1  |        |  |        |  |        |
| DRX Cycle  |                       | ms             | Not Applicable   |        |  |        |  |        |
| PDSCH Reference measurement channel  | Config 1              |                | SR1.1 CCA  |        | SR1.1 CCA  |        | SR1.1 CCA  |        |
| RMSI CORESET Reference Channel   | Config 1              |                | CR.1.1 CCA   |        | CR.1.1 CCA                                       |        | CR.1.1 CCA                                       |        |
| Control Channel RMC  | Config 1              |                | CCR.1.1 CCA  |        | CCR.1.1 CCA                                      |        | CCR.1.1 CCA                                      |        |
| TRS Configuration  | Config 1              |                | TRS.1.2 TDD  |        | TRS.1.2 TDD                                      |        | TRS.1.2 TDD                                      |        |
| OCNG Patterns  |                       |                | OP. 1  |        |  |        |  |        |
| SS-RSSI-Measurement  |                       |                | Not Applicable   |        |  |        |  |        |
| Time offset with Cell 1  | Config 1              | µs             | 3 (for Cell 2)   | 3      | 3 (for Cell 2)                                   | 3      | 3 (for Cell 2)                                   | 3      |
| DBT Window configuration   | Config 1              |                | DBT.1  |        |  |        |  |        |
| SSB configuration  | Config 1              |                | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |  |        |  |        |
| SMTc configuration   | Config 1              |                | SMTc.1   |        |  |        |  |        |
| CSI-RS for tracking  | Config 1              |                | TRS.1.2 TDD  |        |  |        |  |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1              | kHz            | 30 kHz   |        |  |        |  |        |
| EPRE ratio of PSS to SSS   |                       | dB             | 0  | 0      | 0  | 0      | 0  | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                       |                |  |        |  |        |  |        |
| EPRE ratio of PBCH to PBCH DMRS  |                       |                |  |        |  |        |  |        |
| EPRE ratio of PDCCH DMRS to SSS  |                       |                |  |        |  |        |  |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                       |                |  |        |  |        |  |        |
| EPRE ratio of PDSCH DMRS to SSS  |                       |                |  |        |  |        |  |        |
| EPRE ratio of PDSCH to PDSCH   |                       |                |  |        |  |        |  |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                       |                |  |        |  |        |  |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                       |                |  |        |  |        |  |        |
| $N_{oc}$ <small>Note2</small>  | NR_CCA_FR1_I          | dBm/15kHz<br>z | -91  |        | -  |        | -110   |        |
|  | NR_CCA_FR1_J          |                |  |        |  |        | -109.5   |        |
| $N_{oc}$ <small>Note2</small>  | Config 1              | dBm/SCS        | -88  |        | -  |        | -107   |        |
|  | NR_CCA_FR1_J          |                |  |        |  |        | -106.5   |        |

|   |          |              |                  |        |        |        |        |        |        |
|---|----------|--------------|------------------|--------|--------|--------|--------|--------|--------|
| $\hat{E}_s/I_{\alpha}$  |          |              | dB               | -1.76  |        | -4.7   |        | -5.46  | -5.46  |
| $\hat{E}_s/N_{oc}$  |          |              | dB               | 3      | 3      | -2.9   | -2.9   | -4     | -4     |
| SS-RSRP <sup>Note 3</sup>   | Config 1 | NR_CCA_FR1_I |                  | -85    | -85    | -      | -      | -111   | -111   |
|   |          | NR_CCA_FR1_J |                  |        |        |        |        | -110.5 | -110.5 |
| SS-RSRQ <sup>Note 3</sup>   |          | NR_CCA_FR1_I | dB               | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
|   |          | NR_CCA_FR1_J |                  |        |        |        |        |        |        |
| I <sub>o</sub> <sup>Note 3</sup>  | Config 1 | NR_CCA_FR1_I | dBm/<br>38.16MHz | -50    |        | -      |        | -73.4  |        |
|   |          | NR_CCA_FR1_J |                  |        |        |        |        | -72.9  |        |
| Propagation condition   |          |              | -                | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   |
| Antenna configuration   |          |              |                  | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.</p> <p>Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 9: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |          |              |                  |        |        |        |        |        |        |

### A.11.6.2.3.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.29.1.1.

### A.11.6.2.4 Inter-frequency measurement accuracy

#### A.11.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.30.1.1 and 10.1.30.1.2.

#### A.11.6.2.4.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.11.6.2.4.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.11.6.2.4.2-2 and A.11.6.2.4.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell with CCA. Three sub-tests (Test 1, Test 2, and Test 3) are provided different  $N_{oc}$  on Cells 1 and 2.

**Table A.11.6.2.4.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations**

| Config | Description   |
|--------|---|
| 1      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3      | Without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations  |

**Table A.11.6.2.4.2-2: SS-RSRQ Inter frequency test parameters**

| Parameter  |                  | Unit         | Test 1   | Test 2 | Test 3  |              |
|--|------------------|--------------|--|--------|---------|--------------|
|  |                  |              | Cell 2   | Cell 2 | Cell 2  |              |
| SSB ARFCN  |                  |              | freq2  | freq2  | freq2   |              |
| DL CCA model   | Config 1, 2, 3   |              | As specified in clause A.3.26.2.1  |        |         |              |
| UL CCA model   | Config 1, 2, 3   |              | As specified in clause A.3.26.2.2  |        |         |              |
| UL CCA probability   | $P_{CCA\_UL}$    |              | 1.0  |        |         |              |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | $P_{CCA\_DL}$    |              | 0.9375   |        |         |              |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | $P_{CCA\_DL\_1}$ |              | 0.75   |        |         |              |
|  | $P_{CCA\_DL\_2}$ |              | 0.75   |        |         |              |
| Duplex mode  | Config 1, 2, 3   |              | TDD  |        |         |              |
| TDD configuration  | Config 1, 2, 3   |              | TDDConf.1.1 CCA  |        |         |              |
| BW <sub>channel</sub>  | Config 1, 2, 3   | MHz          | 40: $N_{RB,c} = 106$   |        |         |              |
| Gap pattern ID   | Config 1, 2, 3   |              | 0  |        |         |              |
| BWP BW   | Config 1, 2, 3   |              | 40: $N_{RB,c} = 106$   |        |         |              |
| DRX Cycle  |                  | ms           | Not Applicable   |        |         |              |
| OCNG Patterns  |                  |              | OCNG pattern 1   |        |         |              |
| Time offset with Cell 1  | Config 1, 2, 3   | µs           | 3  |        |         |              |
| DBT Window configuration   | Config 1, 2, 3   |              | DBT.1  |        |         |              |
| SSB configuration  | Config 1, 2, 3   |              | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |         |              |
| SMTC configuration   | Config 1, 2, 3   |              | SMTC.1   |        |         |              |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2, 3   | kHz          | 30 kHz   |        |         |              |
| EPRE ratio of PSS to SSS   |                  | dB           | 0  | 0      | 0       |              |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |        |         |              |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |        |         |              |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |        |         |              |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |              |  |        |         |              |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |        |         |              |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |        |         |              |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                     |                  |              |  |        |         |              |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |              |  |        |         |              |
| $N_{oc}$<br><small>Note2</small>   |                  | dBm/15kHz    | -86.27   | -113   | -112    |              |
|  |                  |              |  |        | -111.5  |              |
| $N_{oc}$<br><small>Note2</small>   | Config 1, 2, 3   | dBm/SCS      | -83.27   | -110   | -109    |              |
|  |                  |              |  |        |         | -108.5       |
| $\hat{E}_s / I_{\alpha}$   |                  | dB           | -1.75  | -1.75  | -1.75   |              |
| $\hat{E}_s / N_{oc}$   |                  |              |  |        |         |              |
| SS-RSRP <sup>Not e3</sup>  | Config 1, 2, 3   | NR_CCA_FR1_I |  | -85.02 | -111.75 | -110.75      |
|  |                  |              |  |        |         |              |
| SS-RSRQ <sup>Note3</sup>   |                  | dB           | -14.77   | -40.59 | 14.76   |              |
|  |                  |              |  |        |         |              |
| $I_o$ <sup>Note3</sup>   | Config 1, 2, 3   | NR_CCA_FR1_I | dBm/SCS  | -50    | -76.73  | -75.73       |
|  |                  |              |  |        |         | NR_CCA_FR1_J |
| Propagation condition  |                  | -            | AWGN   | AWGN   | AWGN    |              |
| Antenna configuration  |                  |              | 1x2  | 1x2    | 1x2     |              |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRQ, SS-RSRP, and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | NR operating band groups are as defined in clause 3.5.2.   |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.   |
| Note 7: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 8: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 9: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |

**Table A.11.6.2.4.2-3: SS-RSRQ Intra frequency test parameters for NR PCell**

| Parameter                                |                  | Unit         | Test 1<br>Cell 1                        | Test 2<br>Cell 1 | Test 3<br>Cell 1 |      |
|--|------------------|--------------|---|------------------|------------------|------|
| SSB ARFCN                                |                  |              | freq1                                   |                  |                  |      |
| Duplex mode                              | Config 1         |              | FDD                                     |                  |                  |      |
|  | Config 2,3       |              | TDD                                     |                  |                  |      |
| TDD configuration                        | Config 1         |              | Not Applicable                          |                  |                  |      |
|  | Config 2         |              | TDDConf.1.1                             |                  |                  |      |
|  | Config 3         |              | TDDConf.2.1                             |                  |                  |      |
| BW <sub>channel</sub>                    | Config 1         | MHz          | 10: N <sub>RB,c</sub> = 52              |                  |                  |      |
|  | Config 2         |              | 10: N <sub>RB,c</sub> = 52              |                  |                  |      |
|  | Config 3         |              | 40: N <sub>RB,c</sub> = 106             |                  |                  |      |
| Gap Pattern ID                           |                  |              | 0                                       |                  |                  |      |
| BWP configuration                        | Initial DL BWP   |              | DLBWP.0.1                               |                  |                  |      |
|  | Dedicated DL BWP |              | DLBWP.1.1                               |                  |                  |      |
|  | Initial UL BWP   |              | ULBWP.0.1                               |                  |                  |      |
|  | Dedicated UL BWP |              | ULBWP.1.1                               |                  |                  |      |
| DRX Cycle                                |                  | ms           | Not Applicable                          |                  |                  |      |
| PDSCH Reference measurement channel      | Config 1         |              | SR.1.1 FDD                              |                  |                  |      |
|  | Config 2         |              | SR.1.1 TDD                              |                  |                  |      |
|  | Config 3         |              | SR2.1 TDD                               |                  |                  |      |
| RMSI CORESET Reference Channel           | Config 1         |              | CR.1.1 FDD                              |                  |                  |      |
|  | Config 2         |              | CR.1.1 TDD                              |                  |                  |      |
|  | Config 3         |              | CR.2.1 TDD                              |                  |                  |      |
| Control Channel RMC                      | Config 1         |              | CCR.1.1 FDD                             |                  |                  |      |
|  | Config 2         |              | CCR.1.1 TDD                             |                  |                  |      |
|  | Config 3         |              | CCR.2.1 TDD                             |                  |                  |      |
| TRS Configuration                        | Config 1         |              | TRS.1.1 FDD                             |                  |                  |      |
|  | Config 2         |              | TRS.1.1 TDD                             |                  |                  |      |
|  | Config 3         |              | TRS.1.2 TDD                             |                  |                  |      |
| OCNG Patterns                            |                  |              | OP. 1                                   |                  |                  |      |
| SS-RSSI-Measurement                      |                  |              | Not Applicable                          |                  |                  |      |
| SMTC configuration                       | Config 1         |              | SMTC.2                                  |                  |                  |      |
|  | Config 2,3       |              | SMTC.1                                  |                  |                  |      |
| SSB configuration                        | Config 1,2       |              | SSB.1 FR1                               |                  |                  |      |
|  | Config 3         |              | SSB.2 FR1                               |                  |                  |      |
| CSI-RS for tracking                      | Config 1         |              | TRS.1.1 FDD                             |                  |                  |      |
|  | Config 2         |              | TRS.1.1 TDD                             |                  |                  |      |
|  | Config 3         |              | TRS.1.2 TDD                             |                  |                  |      |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2       | kHz          | 15 kHz                                  |                  |                  |      |
|  | Config 3         |              | 30 kHz                                  |                  |                  |      |
| EPRE ratio of PSS to SSS                 |                  | dB           | 0                                       |                  |                  |      |
| EPRE ratio of PBCH DMRS to SSS           |                  |              |   |                  |                  |      |
| EPRE ratio of PBCH to PBCH DMRS          |                  |              |   |                  |                  |      |
| EPRE ratio of PDCCH DMRS to SSS          |                  |              |   |                  |                  |      |
| EPRE ratio of PDCCH to PDCCH DMRS        |                  |              |   |                  |                  |      |
| EPRE ratio of PDSCH DMRS to SSS          |                  |              |   |                  |                  |      |
| EPRE ratio of PDSCH to PDSCH             |                  |              |   |                  |                  |      |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                  |              |   |                  |                  |      |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                  |              |   |                  |                  |      |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2       |              | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz<br>z   | -85              | -101 |
|  |                  | NR_FDD_FR1_B | -113.5                                  |                  |                  |      |
|  |                  | NR_TDD_FR1_C | -113                                    |                  |                  |      |
|  |                  |              |   |                  |                  |      |

|                              |            |   |         |       |        |        |
|------------------------------|------------|---|---------|-------|--------|--------|
|                              |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |       |        | -112.5 |
|                              |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |       |        | -112   |
|                              |            | NR_FDD_FR1_F                            |         |       |        | -111.5 |
|                              |            | NR_FDD_FR1_G                            |         |       |        | -111   |
|                              |            | NR_FDD_FR1_H                            |         |       |        | -110.5 |
|                              | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |         | -91   | -      | -114   |
|                              |            | NR_FDD_FR1_B                            |         |       |        | -113.5 |
|                              |            | NR_TDD_FR1_C                            |         |       |        | -113   |
|                              |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |       |        | -112.5 |
|                              |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |       |        | -112   |
|                              |            | NR_FDD_FR1_F                            |         |       |        | -111.5 |
|                              |            | NR_FDD_FR1_G                            |         |       |        | -111   |
|                              |            | NR_FDD_FR1_H                            |         |       |        | -110.5 |
| $N_{oc}$ <sup>Note2</sup>    | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -85   | -101   | -114   |
|                              |            | NR_FDD_FR1_B                            |         |       |        | -113.5 |
|                              |            | NR_TDD_FR1_C                            |         |       |        | -113   |
|                              |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |       |        | -112.5 |
|                              |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |       |        | -112   |
|                              |            | NR_FDD_FR1_F                            |         |       |        | -111.5 |
|                              |            | NR_FDD_FR1_G                            |         |       |        | -111   |
|                              |            | NR_FDD_FR1_H                            |         |       |        | -110.5 |
|                              | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |         | -88   | -      | -111   |
|                              |            | NR_FDD_FR1_B                            |         |       |        | -110.5 |
|                              |            | NR_TDD_FR1_C                            |         |       |        | -110   |
|                              |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |       |        | -109.5 |
|                              |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |       |        | -109   |
|                              |            | NR_FDD_FR1_F                            |         |       |        | -108.5 |
|                              |            | NR_FDD_FR1_G                            |         |       |        | -108   |
|                              |            | NR_FDD_FR1_H                            |         |       |        | -107.5 |
|                              |            |   | dB      | -1.76 | -4.7   | -5.46  |
|                              |            |   | dB      | 3     | -2.9   | -4     |
| $\hat{E}_s/I_{ot}$           |            |   |         |       |        |        |
| $\hat{E}_s/N_{oc}$           |            |   |         |       |        |        |
| SS-<br>RSRP <sup>Note3</sup> | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -82   | -103.9 | -118   |
|                              |            | NR_FDD_FR1_B                            |         |       |        | -117.5 |
|                              |            | NR_TDD_FR1_C                            |         |       |        | -117   |
|                              |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |       |        | -116.5 |
|                              |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |       |        | -116   |
|                              |            | NR_FDD_FR1_F                            |         |       |        | -115.5 |
|                              |            | NR_FDD_FR1_G                            |         |       |        | -115   |
|                              |            | NR_FDD_FR1_H                            |         |       |        | -114.5 |
|                              | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |         | -85   | -      | -115   |
|                              |            | NR_FDD_FR1_B                            |         |       |        | -114.5 |

|   |            |   |                  |        |        |        |
|---|------------|---|------------------|--------|--------|--------|
|   |            | NR_TDD_FR1_C                            |                  |        |        | -114   |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        | -113.5 |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        | -113   |
|   |            | NR_FDD_FR1_F                            |                  |        |        | -112.5 |
|   |            | NR_FDD_FR1_G                            |                  |        |        | -112   |
|   |            | NR_FDD_FR1_H                            |                  |        |        | -111.5 |
| SS-RSRQ <sup>Note3</sup>  |            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dB               | -14.77 | -16.76 | -17.34 |
|   |            | NR_FDD_FR1_B                            |                  |        |        |        |
|   |            | NR_TDD_FR1_C                            |                  |        |        |        |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |
|   |            | NR_FDD_FR1_F                            |                  |        |        |        |
|   |            | NR_FDD_FR1_G                            |                  |        |        |        |
|   |            | NR_FDD_FR1_H                            |                  |        |        |        |
| Io <sup>Note3</sup>   | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz  | -50    | -70    | -83.5  |
|   |            | NR_FDD_FR1_B                            |                  |        |        | -83    |
|   |            | NR_TDD_FR1_C                            |                  |        |        | -82.5  |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        | -82    |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        | -81.5  |
|   |            | NR_FDD_FR1_F                            |                  |        |        | -81    |
|   |            | NR_FDD_FR1_G                            |                  |        |        | -80.5  |
|   |            | NR_FDD_FR1_H                            |                  |        |        | -80    |
|   | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MHz | -50    | -      | -77.4  |
|   |            | NR_FDD_FR1_B                            |                  |        |        | -76.9  |
|   |            | NR_TDD_FR1_C                            |                  |        |        | -76.4  |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        | -75.9  |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        | -75.4  |
|   |            | NR_FDD_FR1_F                            |                  |        |        | -74.9  |
|   |            | NR_FDD_FR1_G                            |                  |        |        | -74.4  |
|   |            | NR_FDD_FR1_H                            |                  |        |        | -73.9  |
| Propagation condition   |            |   | -                | AWGN   | AWGN   | AWGN   |
| Antenna configuration   |            |   |                  | 1x2    | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |            |   |                  |        |        |        |



#### A.11.6.2.4.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.30.1.1 and 10.1.30.1.2.

### A.11.6.3 SS-SINR

#### A.11.6.3.1 Intra-frequency measurement accuracy

##### A.11.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.31.1.1.

##### A.11.6.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.11.6.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.11.6.3.1.2-2. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is the target cell with CCA. Two sub-tests (Test 1 and Test 2) are provided different  $N_{oc}$  on Cells 1 and 2.

**Table A.11.6.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.11.6.3.1.2-2: SS-SINR Intra frequency test parameters**

| Parameter  |                       | Unit      | Test 1   |        | Test 2      |        |
|--|-----------------------|-----------|--|--------|-------------|--------|
|  |                       |           | Cell 1   | Cell 2 | Cell 1      | Cell 2 |
| SSB ARFCN  |                       |           | freq1  |        | freq1       |        |
| DL CCA model   | Config 1              |           | As specified in clause A.3.26.2.1  |        |             |        |
| UL CCA model   | Config 1              |           | As specified in clause A.3.26.2.2  |        |             |        |
| UL CCA probability   | P <sub>CCA_UL</sub>   |           | 1.0  | -      | 1.0         | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | P <sub>CCA_DL</sub>   |           | 0.9375   | -      | 0.9375      | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | P <sub>CCA_DL_1</sub> |           | 0.75   | -      | 0.75        | -      |
|  | P <sub>CCA_DL_2</sub> |           | 0.75   | -      | 0.75        | -      |
| Duplex mode  | Config 1              |           | TDD  |        |             |        |
| TDD configuration  | Config 1              |           | TDDConf.1.1 CCA  |        |             |        |
| Downlink initial BWP configuration   |                       |           | DLBWP.0.1  |        |             |        |
| Downlink dedicated BWP configuration                                       |                       |           | DLBWP.1.1  |        |             |        |
| Uplink initial BWP configuration   |                       |           | ULBWP.0.1  |        |             |        |
| Uplink dedicated BWP configuration   |                       |           | ULBWP.1.1  |        |             |        |
| DRX Cycle configuration  |                       | ms        | Not Applicable   |        |             |        |
| TRS configuration  | Config 1              |           | TRS.1.2 TDD  |        | TRS.1.2 TDD |        |
| PDSCH Reference measurement channel  | Config 1              |           | SR.1.1 CCA   |        | SR.1.1 CCA  |        |
| RMSI CORESET Reference Channel   | Config 1              |           | CR.1.1 CCA   |        | CR.1.1 CCA  |        |
| Dedicated CORESET Reference Channel  | Config 1              |           | CCR.1.1 CCA  |        | CCR.1.1 CCA |        |
| OCNG Patterns  |                       |           | OP.1   |        |             |        |
| SS-RSSI-Measurement  |                       |           | Not Applicable   |        |             |        |
| DBT Window configuration   | Config 1              |           | DBT.1  |        |             |        |
| Time offset with Cell 1  | Config 1              | µs        | -  | 3      | -           | 3      |
| SSB configuration  | Config 1              |           | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |             |        |
| SMTC configuration   | Config 1              |           | SMTC.1   |        |             |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1              | kHz       | 30   |        |             |        |
| EPRE ratio of PSS to SSS   |                       | dB        | 0  | 0      | 0           | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                       |           |  |        |             |        |
| EPRE ratio of PBCH to PBCH DMRS  |                       |           |  |        |             |        |
| EPRE ratio of PDCCH DMRS to SSS  |                       |           |  |        |             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                       |           |  |        |             |        |
| EPRE ratio of PDSCH DMRS to SSS  |                       |           |  |        |             |        |
| EPRE ratio of PDSCH to PDSCH   |                       |           |  |        |             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                       |           |  |        |             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                       |           |  |        |             |        |
| $N_{oc}$ <small>Note2</small>  | NR_CCA_FR1_I          | dBm/15kHz | -93  |        | -112        |        |
|  | NR_CCA_FR1_J          |           |  |        | -111.5      |        |
| $N_{oc}$ <small>Note2</small>  | Config 1              | dBm/SCS   | -90  |        | -109        |        |
|  | NR_CCA_FR1_J          |           |  |        | -108.5      |        |
| $\hat{E}_s / I_{ot}$   |                       | dB        | 0  | -3.19  | -5.46       | -5.46  |
| $\hat{E}_s / N_{oc}$   |                       | dB        | 4.54   | 2.66   | -4          | -4     |
| SS-RSRP <sup>Not e3</sup>  | Config 1              | dBm/SCS   | -85.46   | -87.34 | -113        | -113   |
|  | NR_CCA_FR1_J          |           |  |        | -112.5      | -112.5 |
| SS-SINR <small>Note3</small>   | NR_CCA_FR1_I          | dB        | 0  | -3.19  | -5.46       | -5.46  |
|  | NR_CCA_FR1_J          |           |  |        |             |        |

|                       |  |              |                  |        |        |
|-----------------------|--|--------------|------------------|--------|--------|
| Io <sup>Note3</sup>   | Config 1   | NR_CCA_FR1_I | dBm/<br>38.16MHz | -51.41 | -75.41 |
|                       |  | NR_CCA_FR1_J |                  |        | -74.91 |
| Propagation condition |  |              | -                | AWGN   |        |
| Antenna configuration |  |              | -                | 1x2    |        |
| Note 1:               | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |              |                  |        |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                  |        |        |
| Note 3:               | SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |              |                  |        |        |
| Note 4:               | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |              |                  |        |        |
| Note 5:               | NR operating band groups are as defined in clause 3.5.2.   |              |                  |        |        |
| Note 6:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.   |              |                  |        |        |
| Note 7:               | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |              |                  |        |        |
| Note 8:               | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |              |                  |        |        |
| Note 9:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |              |                  |        |        |

A.11.6.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.31.1.1.

A.11.6.3.2 Inter-frequency measurement accuracy

A.11.6.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.32.1.1 and 10.1.32.1.2.

A.11.6.3.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.11.6.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.11.6.3.2.2-2. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is target cell with CCA. Three sub-tests (Test 1, Test 2, and Test 3) are provided different  $N_{oc}$  on Cells 1 and 2.

**Table A.11.6.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.11.6.3.2.2-2: SS-SINR Inter frequency test parameters**

| Parameter  |                       | Unit         | Test 1   |        | Test 2      |        | Test 3      |        |        |  |
|--|-----------------------|--------------|--|--------|-------------|--------|-------------|--------|--------|--|
|  |                       |              | Cell 1   | Cell 2 | Cell 1      | Cell 2 | Cell 1      | Cell 2 |        |  |
| SSB ARFCN  |                       |              | freq1  | freq2  | freq1       | freq2  | freq1       | freq2  |        |  |
| DL CCA model   | Config 1              |              | As specified in clause A.3.26.2.1  |        |             |        |             |        |        |  |
| UL CCA model   | Config 1              |              | As specified in clause A.3.26.2.2  |        |             |        |             |        |        |  |
| UL CCA probability   | P <sub>CCA_UL</sub>   |              | 1.0  | -      | 1.0         | -      | 1.0         | -      |        |  |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | P <sub>CCA_DL</sub>   |              | 0.9375   | -      | 0.9375      | -      | 0.9375      | -      |        |  |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | P <sub>CCA_DL_1</sub> |              | 0.75   | -      | 0.75        | -      | 0.75        | -      |        |  |
|  | P <sub>CCA_DL_2</sub> |              | 0.75   | -      | 0.75        | -      | 0.75        | -      |        |  |
| Duplex mode  | Config 1              |              | TDD  |        |             |        |             |        |        |  |
| TDD configuration  | Config 1              |              | TDDConf.1.1 CCA  |        |             |        |             |        |        |  |
| Downlink initial BWP configuration   |                       |              | DLBWP.0.1  |        |             |        |             |        |        |  |
| Downlink dedicated BWP configuration                                       |                       |              | DLBWP.1.1  |        |             |        |             |        |        |  |
| Uplink initial BWP configuration   |                       |              | ULBWP.0.1  |        |             |        |             |        |        |  |
| Uplink dedicated BWP configuration   |                       |              | ULBWP.1.1  |        |             |        |             |        |        |  |
| DRX Cycle configuration  |                       | ms           | Not Applicable   |        |             |        |             |        |        |  |
| Gap pattern ID   |                       |              | 0  | -      | 0           | -      | 0           | -      |        |  |
| TRS configuration  | Config 1              |              | TRS.1.2 TDD  |        | TRS.1.2 TDD |        | TRS.1.2 TDD |        |        |  |
| PDSCH Reference measurement channel  | Config 1              |              | SR.1.1 CCA   |        | SR.1.1 CCA  |        | SR.1.1 CCA  |        |        |  |
| RMSI CORESET Reference Channel   | Config 1              |              | CR.1.1 CCA   |        | CR.1.1 CCA  |        | CR.1.1 CCA  |        |        |  |
| Dedicated CORESET Reference Channel  | Config 1              |              | CCR.1.1 CCA  |        | CCR.1.1 CCA |        | CCR.1.1 CCA |        |        |  |
| OCNG Patterns  |                       |              | OP.1   |        |             |        |             |        |        |  |
| SS-RSSI-Measurement  |                       |              | Not Applicable   |        |             |        |             |        |        |  |
| Time offset with Cell 1  | Config 1              | μs           | -  | 3      | -           | 3      | -           | 3      |        |  |
| DBT Window configuration   | Config 1              |              | DBT.1  |        |             |        |             |        |        |  |
| SSB configuration  | Config 1              |              | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |             |        |             |        |        |  |
| SMTc configuration   | Config 1              |              | SMTc.1   |        |             |        |             |        |        |  |
| PDSCH/PDCCH subcarrier spacing   | Config 1              | kHz          | 30   |        |             |        |             |        |        |  |
| EPRE ratio of PSS to SSS   |                       | dB           | 0  | 0      | 0           | 0      | 0           | 0      |        |  |
| EPRE ratio of PBCH DMRS to SSS   |                       |              |  |        |             |        |             |        |        |  |
| EPRE ratio of PBCH to PBCH DMRS  |                       |              |  |        |             |        |             |        |        |  |
| EPRE ratio of PDCCH DMRS to SSS  |                       |              |  |        |             |        |             |        |        |  |
| EPRE ratio of PDCCH to PDCCH DMRS  |                       |              |  |        |             |        |             |        |        |  |
| EPRE ratio of PDSCH DMRS to SSS  |                       |              |  |        |             |        |             |        |        |  |
| EPRE ratio of PDSCH to PDSCH   |                       |              |  |        |             |        |             |        |        |  |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                       |              |  |        |             |        |             |        |        |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                       |              |  |        |             |        |             |        |        |  |
| $N_{oc}$ <small>Note2</small>  | Config 1              | NR_CCA_FR1_I | dBm/15kHz  |        | -88         |        | -108.5      |        | -115.5 |  |
|  |                       | NR_CCA_FR1_J |  |        |             |        |             |        | -115   |  |
| $N_{oc}$ <small>Note2</small>  | Config 1              | NR_CCA_FR1_I | dBm/SCS  |        | -85         |        | -105.5      |        | -112.5 |  |
|  |                       | NR_CCA_FR1_J |  |        |             |        |             |        | -112   |  |
| $\hat{E}_s / I_{ot}$   |                       |              | dB   | -1.75  | -1.75       | 20     | 20          | -4.0   | -4.0   |  |
| $\hat{E}_s / N_{oc}$   |                       |              | dB   | -1.75  |             | 20     |             | -4.0   |        |  |
| SS-RSRP <small>Note3</small>   | Config 1              | NR_CCA_FR1_I | dBm/SCS  |        | -86.75      |        | -85.5       |        | -116.5 |  |
|  |                       | NR_CCA_FR1_J |  |        |             |        |             |        | -116   |  |
| SS-SINR <small>Note3</small>   |                       |              | dB   | -1.75  |             | 20     |             | -4.0   |        |  |

|                                 |  |              |                  |        |        |       |
|---------------------------------|--|--------------|------------------|--------|--------|-------|
| I <sub>o</sub> <sup>Note3</sup> | Config 1   | NR_CCA_FR1_I | dBm/<br>38.16MHz | -51.73 | -54.41 | -80   |
|                                 |  | NR_CCA_FR1_J |                  |        |        | -79.5 |
| Propagation condition           |  |              | -                | AWGN   |        |       |
| Antenna configuration           |  |              | -                | 1x2    |        |       |
| Note 1:                         | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |              |                  |        |        |       |
| Note 2:                         | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                  |        |        |       |
| Note 3:                         | SS-SINR, SS-RSRP, and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |              |                  |        |        |       |
| Note 4:                         | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |              |                  |        |        |       |
| Note 5:                         | NR operating band groups are as defined in clause 3.5.2.   |              |                  |        |        |       |
| Note 6:                         | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.   |              |                  |        |        |       |
| Note 7:                         | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |              |                  |        |        |       |
| Note 8:                         | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |              |                  |        |        |       |
| Note 9:                         | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |              |                  |        |        |       |

### A.11.6.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.32.1.1 and 10.1.32.1.2.

### A.11.6.3.3 Intra-frequency measurement accuracy on SCC

#### A.11.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.31.1.1.

#### A.11.6.3.3.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.11.6.3.3.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.11.6.3.3.2-2. In all test cases, Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA. Two sub-tests (Test 1 and Test 2) are provided different  $N_{oc}$  on Cells 1, 2, and 3.

**Table A.11.6.3.3.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Config | Description  |
|--------|--|
| 1      | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode                   |
| Note:  | The UE is only required to be tested in one of the supported test configurations |

**Table A.11.6.3.3.2-2: SS-SINR Intra frequency test parameters**



| Parameter  |                  | Unit      | Test 1   |        | Test 2                               |        |
|--|------------------|-----------|--|--------|--------------------------------------|--------|
|  |                  |           | Cell 1 / Cell 2  | Cell 3 | Cell 1 / Cell 2                      | Cell 3 |
| SSB ARFCN  |                  |           | freq1 for Cell 1<br>freq2 for Cell 2   | freq2  | freq1 for Cell 1<br>freq2 for Cell 2 | freq2  |
| DL CCA model   | Config 1         |           | As specified in clause A.3.26.2.1  |        |                                      |        |
| UL CCA model   | Config 1         |           | As specified in clause A.3.26.2.2  |        |                                      |        |
| UL CCA probability   | $P_{CCA\_UL}$    |           | 1.0  | -      | 1.0                                  | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | $P_{CCA\_DL}$    |           | 0.9375   | -      | 0.9375                               | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | $P_{CCA\_DL\_1}$ |           | 0.75   | -      | 0.75                                 | -      |
|  | $P_{CCA\_DL\_2}$ |           | 0.75   | -      | 0.75                                 | -      |
| Duplex mode  | Config 1         |           | TDD  |        |                                      |        |
| TDD configuration  | Config 1         |           | TDDConf.1.1 CCA  |        |                                      |        |
| Downlink initial BWP configuration   |                  |           | DLBWP.0.1  |        |                                      |        |
| Downlink dedicated BWP configuration                                       |                  |           | DLBWP.1.1  |        |                                      |        |
| Uplink initial BWP configuration   |                  |           | ULBWP.0.1  |        |                                      |        |
| Uplink dedicated BWP configuration   |                  |           | ULBWP.1.1  |        |                                      |        |
| DRX Cycle configuration  |                  | ms        | Not Applicable   |        |                                      |        |
| TRS configuration  | Config 1         |           | TRS.1.2 TDD  |        | TRS.1.2 TDD                          |        |
| PDSCH Reference measurement channel  | Config 1         |           | SR.1.1 CCA   |        | SR.1.1 CCA                           |        |
| RMSI CORESET Reference Channel   | Config 1         |           | CR.1.1 CCA   |        | CR.1.1 CCA                           |        |
| Dedicated CORESET Reference Channel  | Config 1         |           | CCR.1.1 CCA  |        | CCR.1.1 CCA                          |        |
| OCNG Patterns  |                  |           | OP.1   |        |                                      |        |
| SS-RSSI-Measurement  |                  |           | Not Applicable   |        |                                      |        |
| DBT Window configuration   | Config 1         |           | DBT.1  |        |                                      |        |
| Time offset with Cell 1  | Config 1         | $\mu$ s   | 3 (for Cell 2)   | 3      | 3 (for Cell 2)                       | 3      |
| SSB configuration  | Config 1         |           | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |                                      |        |
| SMTc configuration   | Config 1         |           | SMTc.1   |        |                                      |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1         | kHz       | 30   |        |                                      |        |
| EPRE ratio of PSS to SSS   |                  | dB        | 0  | 0      | 0                                    | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                  |           |  |        |                                      |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |           |  |        |                                      |        |
| EPRE ratio of PDSCH to PDSCH   |                  |           |  |        |                                      |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                  |           |  |        |                                      |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |           |  |        |                                      |        |
| $N_{oc}$ <small>Note2</small>  |                  | dBm/15kHz | -93  |        | -112                                 |        |
|  |                  |           |  |        |                                      |        |
| $N_{oc}$ <small>Note2</small>  | Config 1         | dBm/SCS   | -90  |        | -109                                 |        |
|  |                  |           |  |        |                                      |        |
| $\hat{E}_s / I_{ot}$   |                  | dB        | 0  | -3.19  | -5.46                                | -5.46  |
| $\hat{E}_s / N_{oc}$   |                  | dB        | 4.54   | 2.66   | -4                                   | -4     |

|  |          |              |                  |        |        |        |       |
|--|----------|--------------|------------------|--------|--------|--------|-------|
| SS-RSRP <sup>Note3</sup>   | Config 1 | NR_CCA_FR1_I | dBm/SCS          | -85.46 | -87.34 | -113   | -113  |
|  |          | NR_CCA_FR1_J |                  |        |        |        |       |
| SS-SINR <sup>Note3</sup>   |          | NR_CCA_FR1_I | dB               | 0      | -3.19  | -5.46  | -5.46 |
|  |          | NR_CCA_FR1_J |                  |        |        |        |       |
| Io <sup>Note3</sup>  | Config 1 | NR_CCA_FR1_I | dBm/<br>38.16MHz | -51.41 |        | -75.41 |       |
|  |          | NR_CCA_FR1_J |                  |        |        |        |       |
| Propagation condition  |          |              | -                | AWGN   |        |        |       |
| Antenna configuration  |          |              | -                | 1x2    |        |        |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.</p> <p>Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 9: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |          |              |                  |        |        |        |       |

A.11.6.3.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.31.1.1.

A.11.6.3.4 Inter-frequency measurement accuracy

A.11.6.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.32.1.1 and 10.1.32.1.2.

A.11.6.3.4.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.11.6.3.4.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.11.6.3.4.2-2 and Table A.11.6.3.4.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell with CCA. Three sub-tests (Test 1, Test 2, and Test 3) are provided different  $N_{oc}$  on Cells 1 and 2.

**Table A.11.6.3.4.2-1: SS-SINR Inter frequency SS-SINR supported test configurations**

| Config | Description   |
|--------|---|
| 1      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3      | Without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations  |

**Table A.11.6.3.4.2-2: SS-SINR Inter frequency test parameters**

| Parameter  |                       | Unit             | Test 1   | Test 2 | Test 3 |
|--|-----------------------|------------------|--|--------|--------|
|  |                       |                  | Cell 2   | Cell 2 | Cell 2 |
| SSB ARFCN  |                       |                  | freq2  | freq2  | freq2  |
| DL CCA model   | Config 1              |                  | As specified in clause A.3.26.2.1  |        |        |
| UL CCA model   | Config 1              |                  | As specified in clause A.3.26.2.2  |        |        |
| UL CCA probability   | P <sub>CCA_UL</sub>   |                  | 1.0  |        |        |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | P <sub>CCA_DL</sub>   |                  | 0.9375   |        |        |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | P <sub>CCA_DL_1</sub> |                  | 0.75   |        |        |
|  | P <sub>CCA_DL_2</sub> |                  | 0.75   |        |        |
| Duplex mode  | Config 1              |                  | TDD  |        |        |
| TDD configuration  | Config 1              |                  | TDDConf.1.1 CCA  |        |        |
| Downlink initial BWP configuration   |                       |                  | DLBWP.0.1  |        |        |
| Downlink dedicated BWP configuration                                       |                       |                  | DLBWP.1.1  |        |        |
| Uplink initial BWP configuration   |                       |                  | ULBWP.0.1  |        |        |
| Uplink dedicated BWP configuration   |                       |                  | ULBWP.1.1  |        |        |
| DRX Cycle configuration  |                       | ms               | Not Applicable   |        |        |
| Gap pattern ID   |                       |                  | -  |        |        |
| OCNG Patterns  |                       |                  | OP.1   |        |        |
| SS-RSSI-Measurement  |                       |                  | Not Applicable   |        |        |
| Time offset with Cell 1  | Config 1              | μs               | 3  |        |        |
| DBT Window configuration   | Config 1              |                  | DBT.1  |        |        |
| SSB configuration  | Config 1              |                  | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |        |
| SMTc configuration   | Config 1              |                  | SMTc.1   |        |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1              | kHz              | 30   |        |        |
| EPRE ratio of PSS to SSS   |                       | dB               | 0  | 0      | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                       |                  |  |        |        |
| EPRE ratio of PBCH to PBCH DMRS  |                       |                  |  |        |        |
| EPRE ratio of PDCCH DMRS to SSS  |                       |                  |  |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                       |                  |  |        |        |
| EPRE ratio of PDSCH DMRS to SSS  |                       |                  |  |        |        |
| EPRE ratio of PDSCH to PDSCH   |                       |                  |  |        |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)                                    |                       |                  |  |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                       |                  |  |        |        |
| $N_{oc}$<br><small>Note2</small>   |                       | dBm/15kHz        | -88  | -108.5 | -115.5 |
|  |                       |                  |  |        |        |
| $N_{oc}$<br><small>Note2</small>   | Config 1              | dBm/SCS          | -85  | -105.5 | -112.5 |
|  |                       |                  |  |        |        |
| $\hat{E}_s / I_{ot}$   |                       | dB               | -1.75  | 20     | -4.0   |
| $\hat{E}_s / N_{oc}$   |                       | dB               | -1.75  | 20     | -4.0   |
| SS-RSRP<br><small>Note3</small>  | Config 1              | dBm/SCS          | -86.75   | -85.5  | -116.5 |
|  |                       |                  |  |        |        |
| SS-SINR <small>Note3</small>   |                       | dB               | -1.75  | 20     | -4.0   |
| $I_o$ <small>Note3</small>   | Config 1              | dBm/<br>38.16MHz | -51.73   | -54.41 | -80    |
|  |                       |                  |  |        |        |
| Propagation condition  |                       | -                | AWGN   |        |        |
| Antenna configuration  |                       | -                | 1x2  |        |        |

- |         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-SINR, SS-RSRP, and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.   |
| Note 5: | NR operating band groups are as defined in clause 3.5.2.   |
| Note 6: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.   |
| Note 7: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 8: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 9: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |

**Table A.11.6.3.4.2-3: SS-SINR Inter frequency test parameters for NR PCell**

| Parameter                                |            | Unit                                   | Test 1         | Test 2 | Test 3 |
|--|------------|--|----------------|--------|--------|
|  |            |  | Cell 1         | Cell 1 | Cell 1 |
| SSB ARFCN                                |            |  | freq1          | freq1  | freq1  |
| Duplex mode                              | Config 1   |  | FDD            |        |        |
|  | Config 2,3 |  | TDD            |        |        |
| TDD configuration                        | Config 1   |  | Not Applicable |        |        |
|  | Config 2   |  | TDDConf.1.1    |        |        |
|  | Config 3   |  | TDDConf.2.1    |        |        |
| Downlink initial BWP configuration       |            |  | DLBWP.0.1      |        |        |
| Downlink dedicated BWP configuration     |            |  | DLBWP.1.1      |        |        |
| Uplink initial BWP configuration         |            |  | ULBWP.0.1      |        |        |
| Uplink dedicated BWP configuration       |            |  | ULBWP.1.1      |        |        |
| DRX Cycle configuration                  |            | ms                                     | Not Applicable |        |        |
| Gap pattern ID                           |            |  | 0              |        |        |
| TRS configuration                        | Config 1   |  | TRS.1.1 FDD    |        |        |
|  | Config 2   |  | TRS.1.1 TDD    |        |        |
|  | Config 3   |  | TRS.1.2 TDD    |        |        |
| PDSCH Reference measurement channel      | Config 1   |  | SR.1.1 FDD     |        |        |
|  | Config 2   |  | SR.1.1 TDD     |        |        |
|  | Config 3   |  | SR2.1 TDD      |        |        |
| RMSI CORESET Reference Channel           | Config 1   |  | CR.1.1 FDD     |        |        |
|  | Config 2   |  | CR.1.1 TDD     |        |        |
|  | Config 3   |  | CR2.1 TDD      |        |        |
| Dedicated CORESET Reference Channel      | Config 1   |  | CCR.1.1 FDD    |        |        |
|  | Config 2   |  | CCR.1.1 TDD    |        |        |
|  | Config 3   |  | CCR2.1 TDD     |        |        |
| OCNG Patterns                            |            |  | OP.1           |        |        |
| SS-RSSI-Measurement                      |            |  | Not Applicable |        |        |
| SMTC configuration                       | Config 1   |  | SMTC pattern 2 |        |        |
|  | Config 2,3 |  | SMTC pattern 1 |        |        |
| SSB configuration                        | Config 1,2 |  | SSB.1 FR1      |        |        |
|  | Config 3   |  | SSB.2 FR1      |        |        |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2 | kHz                                    | 15             |        |        |
|  | Config 3   |  | 30             |        |        |
| EPRE ratio of PSS to SSS                 |            | dB                                     | 0              | 0      | 0      |
| EPRE ratio of PBCH DMRS to SSS           |            |  |                |        |        |
| EPRE ratio of PBCH to PBCH DMRS          |            |  |                |        |        |
| EPRE ratio of PDCCH DMRS to SSS          |            |  |                |        |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |  |                |        |        |
| EPRE ratio of PDSCH DMRS to SSS          |            |  |                |        |        |
| EPRE ratio of PDSCH to PDSCH             |            |  |                |        |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |  |                |        |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |  |                |        |        |
| $N_{oc}$<br>Note2                        | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | -88            | -108.5 | -119.5 |
|  |            | NR_FDD_FR1_B                           |                |        | -119   |
|  |            | NR_TDD_FR1_C                           |                |        | -118.5 |
|  |            | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                |        | -118   |
|  |            | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                |        | -117.5 |
|  |            | NR_FDD_FR1_F                           |                |        | -117   |
|  |            | NR_FDD_FR1_G                           |                |        | -116.5 |
|  |            | NR_FDD_FR1_H                           |                |        | -116   |

|                        |                    |  |                     |        |        |                             |      |  |
|------------------------|--------------------|--|---------------------|--------|--------|-----------------------------|------|--|
| $N_{oc}$<br>Note2      | Config 1,2         |  | dBm/S<br>CS         | -88    | -108.5 | Same as<br>Noc for<br>15kHz |      |  |
|                        | Config 3           | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |                     | -85    | -105.5 | -116.5                      |      |  |
|                        |                    | NR_FDD_FR1_B                           |                     |        |        | -116                        |      |  |
|                        |                    | NR_TDD_FR1_C                           |                     |        |        | -115.5                      |      |  |
|                        |                    | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                     |        |        | -115                        |      |  |
|                        |                    | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                     |        |        | -114.5                      |      |  |
|                        |                    | NR_FDD_FR1_F                           |                     |        |        | -114                        |      |  |
|                        |                    | NR_FDD_FR1_G                           |                     |        |        | -114.5                      |      |  |
|                        |                    | NR_FDD_FR1_H                           |                     |        |        | -113                        |      |  |
|                        | $\hat{E}_s/I_{ot}$ |  |                     | dB     | -1.75  | 20                          | -4.0 |  |
| $\hat{E}_s/N_{oc}$     |                    |  | dB                  | -1.75  | 20     | -4.0                        |      |  |
| SS-<br>RSRP<br>Note3   | Config 1,2         | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/S<br>CS         | -89.75 | -88.5  | -123.5                      |      |  |
|                        |                    | NR_FDD_FR1_B                           |                     |        |        | -123                        |      |  |
|                        |                    | NR_TDD_FR1_C                           |                     |        |        | -122.5                      |      |  |
|                        |                    | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                     |        |        | -122                        |      |  |
|                        |                    | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                     |        |        | -121.5                      |      |  |
|                        |                    | NR_FDD_FR1_F                           |                     |        |        | -121                        |      |  |
|                        |                    | NR_FDD_FR1_G                           |                     |        |        | -120.5                      |      |  |
|                        |                    | NR_FDD_FR1_H                           |                     |        |        | -120                        |      |  |
|                        | Config 3           | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |                     | -86.75 | -85.5  | -120.5                      |      |  |
|                        |                    | NR_FDD_FR1_B                           |                     |        |        | -120                        |      |  |
|                        |                    | NR_TDD_FR1_C                           |                     |        |        | -119.5                      |      |  |
|                        |                    | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                     |        |        | -119                        |      |  |
|                        |                    | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                     |        |        | -118.5                      |      |  |
|                        |                    | NR_FDD_FR1_F                           |                     |        |        | -118                        |      |  |
|                        |                    | NR_FDD_FR1_G                           |                     |        |        | -117.5                      |      |  |
|                        |                    | NR_FDD_FR1_H                           |                     |        |        | -117                        |      |  |
|                        |                    | SS-SINR <sup>Note3</sup>               |                     | dB     | -1.75  | 20                          | -4.0 |  |
|                        |                    |  |                     |        |        |                             |      |  |
| $I_o$ <sup>Note3</sup> | Config 1,2         | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MH<br>z | -57.83 | -60.5  | -90.09                      |      |  |
|                        |                    | NR_FDD_FR1_B                           |                     |        |        | -89.59                      |      |  |
|                        |                    | NR_TDD_FR1_C                           |                     |        |        | -89.09                      |      |  |
|                        |                    | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                     |        |        | -88.59                      |      |  |
|                        |                    | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                     |        |        | -88.09                      |      |  |
|                        |                    | NR_FDD_FR1_F                           |                     |        |        | -87.59                      |      |  |
|                        |                    | NR_FDD_FR1_G                           |                     |        |        | -87.09                      |      |  |
|                        |                    |  |                     |        |        |                             |      |  |



|   |  |                      |        |        |        |
|---|--|----------------------|--------|--------|--------|
| Config 3  | NR_FDD_FR1_H                           | dBm/<br>38.16M<br>Hz | -51.73 | -54.41 | -86.59 |
|   | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 |                      |        |        | -84    |
|   | NR_FDD_FR1_B                           |                      |        |        | -83.5  |
|   | NR_TDD_FR1_C                           |                      |        |        | -83    |
|   | NR_FDD_FR1_D<br>NR_TDD_FR1_D           |                      |        |        | -82.5  |
|   | NR_FDD_FR1_E<br>NR_TDD_FR1_E           |                      |        |        | -82    |
|   | NR_FDD_FR1_F                           |                      |        |        | -81.5  |
|   | NR_FDD_FR1_G                           |                      |        |        | -81    |
|   | NR_FDD_FR1_H                           |                      |        |        | -80.5  |
| Propagation condition   |  | -                    | AWGN   |        |        |
| Antenna configuration   |  | -                    | 1x2    |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |  |                      |        |        |        |

#### A.11.6.3.4.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.32.1.1 and 10.1.32.1.2.

### A.11.6.4 L1-RSRP measurement for beam reporting with CCA serving cell

#### A.11.6.4.1 SSB based L1-RSRP measurement

##### A.11.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.33.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.11.6.4.1.1-1.

**Table A.11.6.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode   |
| Note:  | The UE is only required to be tested in one of the supported test configurations in each supported band |

##### A.11.6.4.1.2 Test parameters

In this set of test cases there one cell in the test, PCell under CCA (Cell 1). Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model.

Two sub-tests (Test 1 and Test 2) are provided with different  $N_{oc}$  on Cell 1. The test parameters for the Cell 1 are given in Table A.11.6.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.11.6.4.1.2-1.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

**Table A.11.6.4.1.2-1: FR1 SSB based L1-RSRP test parameters**

| Parameter  | Config       | Unit | Test 1                      | Test 2                      |              |
|--|--------------|------|-----------------------------|-----------------------------|--------------|
| SSB GSCN   | 1            |      | freq1                       | freq1                       |              |
| DL CCA model   | 1            |      | As specified in A.3.20.2.1  | As specified in A.3.20.2.1  |              |
| UL CCA model   | 1            |      | As specified in A.3.20.2.2  | As specified in A.3.20.2.2  |              |
| Duplex mode  | 1            |      | TDD                         | TDD                         |              |
| TDD configuration  | 1            |      | TDDConf.1.1 CCA             | TDDConf.1.1 CCA             |              |
| BW <sub>channel</sub>  | 1            | MHz  | 40: N <sub>RB,c</sub> = 106 | 40: N <sub>RB,c</sub> = 106 |              |
| PDSCH Reference measurement channel  | 1            |      | SR.1.1 CCA                  | SR.1.1 CCA                  |              |
| RMSI CORESET Reference Channel   | 1            |      | CR.1.1 CCA                  | CR.1.1 CCA                  |              |
| Dedicated CORESET Reference Channel  | 1            |      | CCR.1.1 CCA                 | CCR.1.1 CCA                 |              |
| SSB configuration Semi-static channel access   | 1            |      | SSB.3 CCA                   | SSB.3 CCA                   |              |
| SSB configuration for Dynamic channel access   | 1            |      | SSB.4 CCA                   | SSB.4 CCA                   |              |
| OCNG Patterns  | 1            |      | OP.1                        | OP.1                        |              |
| Initial BWP Configuration  | 1            |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1      |              |
| TRS configuration  | 1            |      | TRS.1.2 TDD                 | TRS.1.2 TDD                 |              |
| Dedicated BWP configuration  | 1            |      | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1      |              |
| DBT Window Configuration   | 1            |      | DBT.1                       | DBT.1                       |              |
| reportConfigType   | 1            |      | periodic                    | periodic                    |              |
| reportQuantity   | 1            |      | ssb-Index-RSRP              | ssb-Index-RSRP              |              |
| Number of reported RS  | 1            |      | 2                           | 2                           |              |
| L1-RSRP reporting period   | 1            |      | slot80                      | slot80                      |              |
| EPRE ratio of PSS to SSS   | 1            | dB   | 0                           | 0                           |              |
| EPRE ratio of PBCH DMRS to SSS   |              |      |                             |                             |              |
| EPRE ratio of PBCH to PBCH DMRS  |              |      |                             |                             |              |
| EPRE ratio of PDCCH DMRS to SSS  |              |      |                             |                             |              |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |      |                             |                             |              |
| EPRE ratio of PDSCH DMRS to SSS  |              |      |                             |                             |              |
| EPRE ratio of PDSCH to PDSCH DMRS  |              |      |                             |                             |              |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>   |              |      |                             |                             |              |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>  |              |      |                             |                             |              |
| N <sub>oc</sub> <sup>Note2</sup>   |              |      |                             |                             | NR_TDD_FR1_I |
| N <sub>oc</sub> <sup>Note2</sup>   | NR_TDD_FR1_I | 1    | dBm/SCS                     | -91.65                      | [-110]       |
| $\hat{E}_s/I_{ot}$   | NR_TDD_FR1_I | 1    | dB                          | 10                          | -3           |
| SS-RSRP <sup>Note3</sup>   | NR_TDD_FR1_I | 1    | dBm/SCS                     | -81.65                      | [-113]       |
| I <sub>o</sub> <sup>Note3</sup>  | NR_TDD_FR1_I | 1    | dBm/38.16MHz                | -50.19                      | [-77.19]     |
| $\hat{E}_s/N_{oc}$   | NR_TDD_FR1_I | 1    | dB                          | 10                          | -3           |
| Propagation condition  | 1            |      | AWGN                        | AWGN                        |              |
| Antenna configuration  | 1            |      | 1x2                         | 1x2                         |              |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |              |      |                             |                             |              |

#### A.11.6.4.1.3 Test Requirements

In both Test 1 and Test 2, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 1 shall fulfil the requirements in clauses 10.1.33.1.

### A.11.6.5 RSSI

#### A.11.6.5.1 Intra-frequency RSSI measurement accuracy on PCC with CCA

##### A.11.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.1.

##### A.11.6.5.1.2 Test parameters

In all test cases, Cell 1 is the PCell with CCA. RSSI is measured on channel number 1. Supported test configurations are shown in table A.11.6.5.1.2-1. The accuracy of RSSI intra-frequency measurements is tested by using the parameters in A.11.6.5.1.2-2 and A.11.6.5.1.2-3.

**Table A.11.6.5.1.2-1: Intra frequency RSSI supported test configurations**

| <b>Configuration</b> | <b>Description</b>  |
|----------------------|---|
| 1                    | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

Table A.11.6.5.1.2-2: RSSI Intra frequency test parameters

| Parameter   |   | Configurations | Unit      | Test 1<br>Cell 1                 |
|---|---|----------------|-----------|----------------------------------|
| RF Channel Number   |   |                |           | 1                                |
| $BW_{channel}$  |   |                | MHz       | 40                               |
| SSB configuration   | Semi-static channel access <small>Note 1, 3</small> | 1              |           | SSB.1 CCA                        |
|   | Dynamic channel access <small>Note 2, 3</small>     | 1              |           | SSB.2 CCA                        |
| $P_{CCA\_DL}$   |   |                |           | TBD                              |
| $P_{CCA\_UL}$   |   |                |           | TBD                              |
| DL CCA model  |   |                |           | As specified in A.3.20.2.1       |
| UL CCA model  |   |                |           | As specified in A.3.20.2.2       |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |
| Channel access bandwidth  |   |                | MHz       | 20                               |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      |
| OCNG Patterns   |   |                |           | OP.1                             |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/SCS   | -106                             |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/SCS   | -87                              |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dB        | 2.5                              |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                | dB        | -Infinity                        |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)  |   |                | dBm/SCS   | -103.5                           |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)  |   |                |           | -Infinity                        |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)                            |   |                | dBm/BW    | -101.6                           |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)                                |   |                | dBm/BW    | -87                              |
| Propagation condition   |   |                | -         | AWGN                             |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |   |                |           |                                  |
| Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |   |                |           |                                  |
| Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |   |                |           |                                  |

**Table A.11.6.5.1.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.11.6.5.1.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.1. The nominal RSSI used to evaluate the requirement shall be based on  $I_0$  in slots corresponding to RSSI measurement time configuration (RMTC).

## A.11.6.5.2 Intra-frequency RSSI measurement accuracy on SCC with CCA

### A.11.6.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.1.

### A.11.6.5.2.2 Test parameters

In all test cases, Cell 1 which is PCell operating on a carrier frequency under CCA, and Cell 2 which is SCell operating on a carrier frequency under CCA. RSSI is measured on channel number 2. Supported test configurations are shown in table A.11.6.5.2.2-1. The accuracy of RSSI intra-frequency measurements is tested by using the parameters in A.11.6.5.2.2-2 and A.11.6.5.2.2-3.

**Table A.11.6.5.2.2-1: Intra frequency RSSI supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.6.5.2.2-2: RSSI Intra frequency test parameters**



| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 1                           | Cell 2                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| BW <sub>channel</sub>   |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1              |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1              |           | SSB.2 CCA                        | SSB.2 CCA                  |
| P <sub>CCA_DL</sub>   |   |                |           | 1                                | TBD                        |
| P <sub>CCA_UL</sub>   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       | SR.1.1 CCA                 |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       | CR.1.1 CCA                 |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      | CCR.1.1 CCA                |
| OCNG Patterns   |   |                |           | OP.1                             | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|  |   |        |        |        |
|--|---|--------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) |   | dBm/BW | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)     |   | dBm/BW | -101.6 | -87    |
| Propagation condition  |   | -      | AWGN   |        |
| Note 1:  | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |        |        |        |
| Note 2:  | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |        |        |        |
| Note 3:  | For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |        |        |        |

**Table A.11.6.5.2.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.11.6.5.2.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.1. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## A.11.6.5.3 Inter-frequency RSSI measurement accuracy on a carrier with CCA

### A.11.6.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.2.

### A.11.6.5.3.2 Test parameters

In all test cases, Cell 1 which is PCell operating on a carrier frequency under CCA, and Cell 2 which is neighbor cell operating on a carrier frequency under CCA. RSSI is measured on channel number 2. Supported test configurations are shown in table A.11.6.5.3.2-1. The accuracy of RSSI intra-frequency measurements is tested by using the parameters in A.11.6.5.3.2-2 and A.11.6.5.3.2-3.

**Table A.11.6.5.3.2-1: Inter frequency RSSI supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.6.5.3.2-2: RSSI Inter frequency test parameters**

| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 1                           | Cell 2                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| BW <sub>channel</sub>   |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1              |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1              |           | SSB.2 CCA                        | SSB.2 CCA                  |
| P <sub>CCA_DL</sub>   |   |                |           | 1                                | TBD                        |
| P <sub>CCA_UL</sub>   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       | SR.1.1 CCA                 |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       | CR.1.1 CCA                 |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      | CCR.1.1 CCA                |
| OCNG Patterns   |   |                |           | OP.1                             | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|  |  |        |        |        |
|--|--|--------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/BW | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/BW | -101.6 | -87    |
| Propagation condition  |  | -      | AWGN   |        |
| <p>Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |  |        |        |        |

**Table A.11.6.5.3.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.11.6.5.3.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.2. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## A.11.6.6 Channel occupancy

### A.11.6.6.1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA

#### A.11.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.35.1.

#### A.11.6.6.1.2 Test parameters

In all test cases, Cell 1 is the PCell with CCA. channel occupancy is measured on channel number 1. Supported test configurations are shown in table A.11.6.6.1.2-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in A.11.6.6.1.2-2 and A.11.6.6.1.2-3.

**Table A.11.6.6.1.2-1: Intra frequency CO supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

Table A.11.6.6.1.2-2: CO Intra frequency test parameters

| Parameter  |   | Configurations | Unit      | Test 1<br>Cell 1                 |
|--|---|----------------|-----------|----------------------------------|
| RF Channel Number  |   |                |           | 1                                |
| $BW_{channel}$   |   |                | MHz       | 40                               |
| SSB configuration  | Semi-static channel access <small>Note 1, 3</small> | 1              |           | SSB.1 CCA                        |
|  | Dynamic channel access <small>Note 2, 3</small>     | 1              |           | SSB.2 CCA                        |
| $P_{CCA\_DL}$  |   |                |           | TBD                              |
| $P_{CCA\_UL}$  |   |                |           | TBD                              |
| DL CCA model   |   |                |           | As specified in A.3.20.2.1       |
| UL CCA model   |   |                |           | As specified in A.3.20.2.2       |
| Measurement bandwidth  |   |                | $n_{PRE}$ | Same as channel access bandwidth |
| Channel access bandwidth   |   |                | MHz       | 20                               |
| DRX Cycle configuration  |   |                | ms        | Not Applicable                   |
| PDSCH Reference measurement channel  |   |                |           | SR.1.1 CCA                       |
| RMSI CORESET Reference Channel   |   |                |           | CR.1.1 CCA                       |
| Dedicated CORESET Reference Channel  |   |                |           | CCR.1.1 CCA                      |
| OCNG Patterns  |   |                |           | OP.1                             |
| EPRE ratio of PSS to SSS   |   |                | dB        | 0                                |
| EPRE ratio of PBCH DMRS to SSS   |   |                |           |                                  |
| EPRE ratio of PBCH to PBCH DMRS  |   |                |           |                                  |
| EPRE ratio of PDCCH DMRS to SSS  |   |                |           |                                  |
| EPRE ratio of PDCCH to PDCCH DMRS  |   |                |           |                                  |
| EPRE ratio of PDSCH DMRS to SSS  |   |                |           |                                  |
| EPRE ratio of PDSCH to PDSCH   |   |                |           |                                  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |   |                |           |                                  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |   |                |           |                                  |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)  |   |                | dBm/SCS   | -106                             |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)  |   |                | dBm/SCS   | -87                              |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC)  |   |                | dB        | 2.5                              |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)  |   |                | dB        | -Infinity                        |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/SCS   | -103.5                           |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                |           | -Infinity                        |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/BW    | -101.6                           |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)   |   |                | dBm/BW    | -87                              |
| Propagation condition  |   |                | -         | AWGN                             |
| channelOccupancyThreshold  |   |                | dBm       | -83                              |
| <p>Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |   |                |           |                                  |

**Table A.11.6.6.1.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.11.6.6.1.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## A.11.6.6.2 Intra-frequency channel occupancy measurement accuracy on SCC with CCA

### A.11.6.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.35.1.

### A.11.6.6.2.2 Test parameters

In all test cases, Cell 1 which is PCell operating on a carrier frequency under CCA, and Cell 2 which is SCell operating on a carrier frequency under CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in table A.11.6.6.2.2-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in A.11.6.6.2.2-2 and A.11.6.6.2.2-3.

**Table A.11.6.6.2.2-1: Intra frequency CO supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.6.6.2.2-2: CO Intra frequency test parameters**



| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 1                           | Cell 2                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| BW <sub>channel</sub>   |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1              |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1              |           | SSB.2 CCA                        | SSB.2 CCA                  |
| P <sub>CCA_DL</sub>   |   |                |           | 1                                | TBD                        |
| P <sub>CCA_UL</sub>   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       | SR.1.1 CCA                 |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       | CR.1.1 CCA                 |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      | CCR.1.1 CCA                |
| OCNG Patterns   |   |                |           | OP.1                             | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|  |   |        |        |        |
|--|---|--------|--------|--------|
| lo within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) |   | dBm/BW | -101.6 | -101.6 |
| lo within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)     |   | dBm/BW | -101.6 | -87    |
| Propagation condition  |   | -      | AWGN   |        |
| channelOccupancyThreshold  |   | dBm    | -83    |        |
| Note 1:  | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |        |        |        |
| Note 2:  | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |        |        |        |
| Note 3:  | For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |        |        |        |

**Table A.11.6.6.2.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.11.6.6.2.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## A.11.6.6.3 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA

### A.11.6.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.34.2.

### A.11.6.6.3.2 Test parameters

In all test cases, Cell 1 which is PCell operating on a carrier frequency under CCA, and Cell 2 which is neighbor cell operating on a carrier frequency under CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in table A.11.6.6.3.2-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in A.11.6.6.3.2-2 and A.11.6.6.3.2-3.

**Table A.11.6.6.3.2-1: Inter frequency CO supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

**Table A.11.6.6.3.2-2: CO Inter frequency test parameters**

| Parameter   |   | Configurations | Unit      | Test 1                           |                            |
|---|---|----------------|-----------|----------------------------------|----------------------------|
|   |   |                |           | Cell 1                           | Cell 2                     |
| RF Channel Number   |   |                |           | 1                                | 2                          |
| BW <sub>channel</sub>   |   |                | MHz       | 40                               | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1              |           | SSB.1 CCA                        | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1              |           | SSB.2 CCA                        | SSB.2 CCA                  |
| P <sub>CCA_DL</sub>   |   |                |           | 1                                | TBD                        |
| P <sub>CCA_UL</sub>   |   |                |           | 1                                | TBD                        |
| DL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A                              | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRE}$ | Same as channel access bandwidth |                            |
| Channel access bandwidth  |   |                | MHz       | 20                               |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable                   |                            |
| PDSCH Reference measurement channel   |   |                |           | SR.1.1 CCA                       | SR.1.1 CCA                 |
| RMSI CORESET Reference Channel  |   |                |           | CR.1.1 CCA                       | CR.1.1 CCA                 |
| Dedicated CORESET Reference Channel   |   |                |           | CCR.1.1 CCA                      | CCR.1.1 CCA                |
| OCNG Patterns   |   |                |           | OP.1                             | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0                                | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |                                  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |                                  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |                                  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |                                  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |                                  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |                                  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106                             | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5                              | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5                              | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5                           | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5                           | -Infinity                  |

|  |   |        |        |        |
|--|---|--------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) |   | dBm/BW | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)     |   | dBm/BW | -101.6 | -87    |
| Propagation condition  |   | -      | AWGN   |        |
| channelOccupancyThreshold  |   | dBm    | -83    |        |
| Note 1:  | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.                         |        |        |        |
| Note 2:  | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.                                 |        |        |        |
| Note 3:  | For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |        |        |        |

**Table A.11.6.6.3.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.11.6.6.3.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

### A.11.6.7 E-UTRAN RSRP

### A.11.6.8 E-UTRAN RSRQ

### A.11.6.9 E-UTRAN SINR

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## A.12 E-UTRA Standalone Tests with at Least One NR Cell under CCA

### A.12.1 RRC\_IDLE state mobility

#### A.12.1.1 Inter-RAT cell re-selection to NR on a carrier frequency with CCA

##### A.12.1.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA

###### A.12.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell subject to CCA reselection requirements specified in clause 4.2.2.5.7 in TS 36.133 [15].

The test scenario comprises of 1 E-UTRA cell and 1 NR cell subject to CCA as given in tables A.12.1.1.1.1-1, A.8.2.1.1.1-2, A.8.2.1.1.1-3 and A.8.2.1.1.1-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

**Table A.12.1.1.1-1: Supported test configurations**

| Configuration  | Description of a cell without CCA | Description of a cell with CCA                       |
|--|-----------------------------------|--|
| 1  | LTE FDD                           | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD                           | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |                                   |  |

**Table A.12.1.1.1-2: General test parameters for E-UTRA cell re-selection FR1 NR cell subject to CCA test case**

| Parameter                    |                | Unit | Test configuration | Value                             | Comment  |
|------------------------------|----------------|------|--------------------|-----------------------------------|--|
| Initial condition            | Active cell    |      | 1, 2               | Cell2                             | The UE camps on cell 2 in the initial phase  |
|                              | Neighbour cell |      | 1, 2               | Cell1                             |  |
| T1 end condition             | Active cell    |      |                    | Cell1                             | During T1 period the UE reselects to cell 1  |
|                              | Neighbour cell |      |                    | Cell2                             |  |
| T3 end condition             | Active cell    |      | 1, 2               | Cell2                             | The UE shall perform reselection to cell 2 during T3   |
|                              | Neighbour cell |      | 1, 2               | Cell1                             |  |
| RF Channel Number            |                |      | 1, 2               | 1, 2                              | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test  |
| Time offset between cells    |                |      | 1, 2               | 3 $\mu$ s                         | Synchronous cells  |
| Access Barring Information   |                | -    | 1, 2               | Not Sent                          | No additional delays in random access procedure.   |
| DBT Window Configuration     |                |      | 1, 2               | TBD                               | As specified in clause A.3.28.1.   |
| DL CCA model                 |                |      | 1, 2               | As specified in clause A.3.20.2.1 | DL CCA model   |
| UL CCA model                 |                |      | 1, 2               | As specified in clause A.3.20.2.2 | UL CCA model   |
| DRX cycle length             |                | s    | 1, 2               | 1.28                              | The value shall be used for all cells in the test.   |
| NR PRACH configuration index |                |      | 1, 2               | 102                               | The detailed configuration is specified in TS 38.211 clause 6.3.3.2  |
| T1                           |                | s    | 1, 2               | TBD                               | T1 needs to be defined so that cell re-selection reaction time is taken into account.  |
| T2                           |                | s    | 1, 2               | TBD                               | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3                           |                | s    | 1, 2               | TBD                               | T3 needs to be defined so that cell re-selection reaction time is taken into account.  |

Table A.12.1.1.1-3: Cell specific test parameters for NR cell 2 subject to CCA

| Parameter  | Unit          | Test configuration | Cell 2    |           |        |
|--|---------------|--------------------|-----------|-----------|--------|
|  |               |                    | T1        | T2        | T3     |
| TDD configuration  |               | 1, 2               | TBD       |           |        |
| DL CCA probability<br>$P_{CCA\_DL}$  |               | 1, 2               | TBD       |           |        |
| UL CCA probability<br>$P_{CCA\_UL}$  |               | 1, 2               | TBD       |           |        |
| $M_{d,max}$  |               | 1, 2               | 16        |           |        |
| $M_{m,max}$  |               | 1, 2               | 4         |           |        |
| $M_{e,max}$  |               | 1, 2               | 8         |           |        |
| PDSCH Reference measurement channel  |               | 1, 2               | TBD       |           |        |
| RMSI CORESET Reference Channel   |               | 1, 2               | TBD       |           |        |
| RMC CORESET Reference Channel  |               | 1, 2               | TBD       |           |        |
| OCNG Patterns  |               | 1, 2               | OP.1      |           |        |
| SSB configuration  |               | 1, 2               | TBD       |           |        |
| Initial DL BWP configuration   |               | 1, 2               | DLBWP.0.1 |           |        |
| Initial UL BWP configuration   |               | 1, 2               | ULBWP.0.1 |           |        |
| RLM-RS   |               | 1, 2               | SSB       |           |        |
| $Q_{rxlevmin}$   | dBm/SCS       | 1, 2               | -137      |           |        |
| $P_{compensation}$   | dB            | 1, 2               | 0         |           |        |
| $Q_{hyst_s}$   | dB            | 1, 2               | 0         |           |        |
| $Q_{offset_{s,n}}$   | dB            | 1, 2               | 0         |           |        |
| Cell_selection_and_reselection_quality_measurement   |               | 1, 2               | SS-RSRP   |           |        |
| $\hat{E}_s / I_{ot}$   | dB            | 1, 2               | -4        | -infinity | 12     |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS       | 1, 2               | -95       |           |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15 kHz    | 1, 2               | -98       |           |        |
| $\hat{E}_s / N_{oc}$   | dB            | 1, 2               | -4        | -infinity | 12     |
| SS-RSRP <sup>Note3</sup>   | dBm/SCS       | 1, 2               | -99       | -infinity | -83    |
| $l_o$  | dBm/38.16 MHz | 1, 2               | -62.50    | -63.95    | -51.69 |
| Treselection   | s             | 1, 2               | 0         | 0         | 0      |
| $S_{nonintrasearchP}$  | dB            | 1, 2               | 50        |           |        |
| $Thresh_{x,highP}$   | dB            | 1, 2               | 48        |           |        |
| $Thresh_{serving,lowP}$  | dB            | 1, 2               | 44        |           |        |
| $Thresh_{x,lowP}$  | dB            | 1, 2               | 50        |           |        |
| Propagation Condition  |               | 1, 2               | AWGN      |           |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |               |                    |           |           |        |

Table A.12.1.1.1-4: Cell specific test parameters for E-UTRA cell 1

| Parameter   | Unit       | Cell 1  |     |     |
|---|------------|---|-----|-----|
|   |            | T1  | T2  | T3  |
| E-UTRA RF Channel number  |            | 1   |     |     |
| $BW_{channel}$  | MHz        | 10  |     |     |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2  |            | OP.2 TDD for test configuration 1, 2, 3;<br>OP.2 FDD for test configuration 4, 5, 6 |     |     |
| PBCH_RA   | dB         | 0   |     |     |
| PBCH_RB   | dB         |   |     |     |
| PSS_RA  | dB         |   |     |     |
| SSS_RA  | dB         |   |     |     |
| PCFICH_RB   | dB         |   |     |     |
| PHICH_RA  | dB         |   |     |     |
| PHICH_RB  | dB         |   |     |     |
| PDCCH_RA  | dB         |   |     |     |
| PDCCH_RB  | dB         |   |     |     |
| PDSCH_RA  | dB         |   |     |     |
| PDSCH_RB  | dB         |   |     |     |
| OCNG_RA <sup>Note 1</sup>   | dB         |   |     |     |
| OCNG_RB <sup>Note 1</sup>   | dB         |   |     |     |
| Qrxlevmin   | dBm        | -140  |     |     |
| $N_{oc}$ <sup>Note 2</sup>  | dBm/15 kHz | -98   |     |     |
| RSRP <sup>Note 3</sup>  | dBm/15 KHz | -84   | -84 | -84 |
| $\hat{E}_s/I_{ot}$  | dB         | 14  | 14  | 14  |
| $\hat{E}_s/N_{oc}$  | dB         | 14  | 14  | 14  |
| Treselection <sup>EUTRAN</sup>  | S          | 0   |     |     |
| SnonintrasearchP  | dB         | 50  |     |     |
| Thresh <sub>x, highP</sub>  | dB         | 48  |     |     |
| Thresh <sub>-serving, lowP</sub>  | dB         | 44  |     |     |
| Thresh <sub>x, lowP</sub>   | dB         | 50  |     |     |
| Propagation Condition   |            | AWGN  |     |     |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> |            |   |     |     |

#### A.12.1.1.1.2 Test Requirements

The cell reselection delay to a higher priority NR cell subject to CCA is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than  $60 + 1.28 \times (5 + M_e) + T_{SI\_CCA}$  s.  $M_e$  is the number of DRX cycles with at least one SMTC where there are no SSBs available during the  $T_{evaluate, NR\_Intra\_CCA}$ . If  $M_e > M_{e, max}$  the UE is required to restart the evaluation of cell 2.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR\_inter\_CCA} + T_{SI\_CCA}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR} + T_{SI\_NR}$ .

Where:

$T_{higher\_priority\_search}$  See clause 4.2.2 in TS 36.133 [15]

$T_{evaluate, NR\_inter\_CCA}$  See Table 4.2.2.5.7-1 in clause 4.2.2.5.7



$T_{SI\_CCA}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

$T_{evaluate, NR}$  See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

$T_{SI\_NR}$  Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## A.12.2 RRC\_CONNECTED state mobility

### A.12.2.1 Handover

#### A.12.2.1.1 E-UTRAN - NR with CCA handover

##### A.12.2.1.1.1 Test Purpose and Environment

This test shall verify the E-UTRAN to NR FR1 handover requirements specified in clause 5.3.4A in TS 36.133 [15].

The test comprises of one E-UTRA carrier and one NR carrier with CCA. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN cell and Cell 2 is an inter-RAT NR neighbour cell with CCA.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [15] is configured before T2 begins to enable inter-RAT frequency monitoring. A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.12.2.1.1-1. General test parameters are provided in Table A.12.2.1.1-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.12.2.1.1-3 and A.12.2.1.1-4 respectively.

**Table A.12.2.1.1-1: Supported test configurations for E-UTRAN inter-RAT NR handover**

| Configuration | Description   |
|---------------|---|
| 1             | LTE FDD, NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode            |
| 2             | LTE TDD, NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode            |
| NOTE:         | The UE is only required to be tested in one of the supported test configurations. |

**Table A.12.2.1.1-2: General test parameters for E-UTRAN inter-RAT NR handover**

| Parameter                    |                   | Unit | Value                              | Comment   |
|------------------------------|-------------------|------|------------------------------------|---|
| NR RF Channel Number         |                   |      | 1                                  | 1 NR carrier frequency with CCA is used in the test           |
| LTE RF Channel Number        |                   |      | 2                                  | 1 E-UTRAN carrier frequency is used in the test               |
| Initial conditions           | Active cell       |      | Cell 1                             | E-UTRAN cell  |
|                              | Neighbouring cell |      | Cell 2                             | NR cell with CCA  |
| Final condition              | Active cell       |      | Cell 2                             |   |
| DL CCA model                 |                   |      | As specified in clause A.3.26.2.1  |   |
| UL CCA model                 |                   |      | As specified in clause A.3.26.2.2  |   |
| NR measurement quantity      |                   |      | SS-RSRP                            |   |
| E-UTRAN measurement quantity |                   |      | RSRP                               |   |
| b2-Threshold1                |                   | dBm  | -84                                | Absolute E-UTRAN RSRP threshold for event B2                  |
| b2-Threshold2NR              |                   | dBm  | As specified in Table A.12.2.1.1-4 | Absolute NR SS-RSRP threshold for event B2                    |
| Hysteresis                   |                   | dB   | 0                                  |   |
| TimeToTrigger                |                   | s    | 0                                  |   |
| Filter coefficient           |                   |      | 0                                  | L3 filtering is not used                                      |
| DRX                          |                   |      | OFF                                | Non-DRX test  |
| Access Barring Information   |                   | -    | Not sent                           | No additional delays in random access procedure               |
| Time offset between cells    |                   |      | 3 ms                               | Asynchronous cells  |
| Gap pattern configuration Id |                   |      | 0                                  | As specified in Table 8.1.2.1-1 started before T2 starts [15] |
| T1                           |                   | s    | [5]                                |   |
| T2                           |                   | s    | [≤5]                               |   |
| T3                           |                   | s    | [1]                                |   |

**Table A.12.2.1.1-3: Cell specific test parameters for E-UTRAN inter-RAT NR handover with CCA (Cell 1)**

| Parameter   | Unit | Configuration | Cell 1   |    |    |
|---|------|---------------|--|----|----|
|   |      |               | T1   | T2 | T3 |
| RF channel number   |      | 1, 2          | 2  |    |    |
| Duplex mode   |      | 1             | FDD  |    |    |
|   |      | 2             | TDD  |    |    |
| TDD special subframe configuration <sup>Note1</sup>                                 |      | 1, 2          | 6  |    |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |      | 1, 2          | 1  |    |    |
| BW <sub>channel</sub>   | MHz  | 1, 2          | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |    |
| PRACH Configuration <sup>Note2</sup>  |      | 1             | 4  |    |    |
|   |      | 2             | 53   |    |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup>              |      | 1             | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |    |
|   |      | 2             | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |    |    |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note3</sup> |      | 1             | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD   |    |    |
|   |      | 2             | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD   |    |    |
| OCNG Patterns <sup>Note3</sup>  |      | 1             | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD   |    |    |

|  |           |      |   |        |        |
|--|-----------|------|---|--------|--------|
|  |           | 2    | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |        |        |
| PBCH_RA  | dB        | 1, 2 | 0   |        |        |
| PBCH_RB  |           |      |   |        |        |
| PSS_RA   |           |      |   |        |        |
| SSS_RA   |           |      |   |        |        |
| PCFICH_RB  |           |      |   |        |        |
| PHICH_RA   |           |      |   |        |        |
| PHICH_RB   |           |      |   |        |        |
| PDCCH_RA   |           |      |   |        |        |
| PDCCH_RB   |           |      |   |        |        |
| PDSCH_RA   |           |      |   |        |        |
| PDSCH_RB   |           |      |   |        |        |
| OCNG_RA <sup>Note4</sup>   |           |      |   |        |        |
| OCNG_RB <sup>Note4</sup>   |           |      |   |        |        |
| $N_{oc}$ <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -98   |        |        |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2 | 7   | 7      | 7      |
| $\hat{E}_s/I_{ot}$ <sup>Note6</sup>  | dB        | 1, 2 | 7   | 7      | 7      |
| RSRP <sup>Note6</sup>  | dBm/15kHz | 1, 2 | -91   | -91    | -91    |
| SCH_RP <sup>Note6</sup>  | dBm/15kHz | 1, 2 | -91   | -91    | -91    |
| $I_o$ <sup>Note6</sup>   | dBm/9MHz  | 1, 2 | -62.43  | -62.43 | -62.43 |
| Propagation Condition  |           | 1, 2 | AWGN  |        |        |
| Antenna Configuration and Correlation Matrix <sup>Note7</sup>  |           | 1, 2 | 1x2 Low   |        |        |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].</p> <p>Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 6: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |      |   |        |        |

**Table A.12.2.1.1-4: Cell specific test parameters E-UTRAN inter-RAT NR with CCA handover (Cell 2)**

| Parameter                               |   | Unit       | Configuration | Cell 2   |    |    |
|---|---|------------|---------------|--|----|----|
|   |   |            |               | T1   | T2 | T3 |
| RF channel number                       |   |            | 1, 2          | 1  |    |    |
| DL CCA probability<br>$P_{CCA\_DL}$     | Semi-static channel access <small>Note 4, 6</small> |            | 1, 2          | $P_{CCA\_DL}=0.9375$                           |    |    |
|   | Dynamic channel access <small>Note 5, 6</small>     |            | 1, 2          | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    |    |
| UL CCA probability<br>$P_{CCA\_UL}$     | Semi-static channel access <small>Note 4, 6</small> |            | 1, 2          | $P_{CCA\_UL}=0.87$                             |    |    |
|   | Dynamic channel access <small>Note 5, 6</small>     |            | 1, 2          | $P_{CCA\_UL}=0.75$                             |    |    |
| $L_{CCA\_DL}$                           |   | -          | 1, 2          | 5  |    |    |
| $W_{CCA\_DL}$                           |   | ms         | 1, 2          | T304   |    |    |
| $L_{CCA\_UL}$                           |   | -          | 1, 2          | 5  |    |    |
| $W_{CCA\_UL}$                           |   | ms         | 1, 2          | T304   |    |    |
| T304                                    |   | ms         | 1, 2          | 500  |    |    |
| Duplex mode                             |   |            | 1, 2          | TDD  |    |    |
| TDD Configuration                       |   |            | 1, 2          | TDDConf.1.1 CCA                                |    |    |
| $BW_{channel}$                          |   | MHz        | 1, 2          | 40: $N_{RB,c} = 106$ (TDD)                     |    |    |
| PDSCH reference measurement channel     |   |            | 1, 2          | SR.1.1 CCA                                     |    |    |
| CORESET reference channel               |   |            | 1, 2          | CR.1.1 CCA                                     |    |    |
| PRACH configuration                     |   |            | 1, 2          | FR1 PRACH configuration 1 under CCA            |    |    |
| OCNG pattern <small>Note1</small>       |   |            | 1, 2          | OP.1   |    |    |
| BWP                                     | Initial DL BWP                                      |            | 1, 2          | DLBWP.0.1                                      |    |    |
|   | Dedicated DL BWP                                    |            |               | DLBWP.1.1                                      |    |    |
|   | Initial UL BWP                                      |            |               | ULBWP.0.1                                      |    |    |
|   | Dedicated UL BWP                                    |            |               | ULBWP.1.1                                      |    |    |
| SMTc configuration                      |   |            | 1, 2          | SMTc.1   |    |    |
| SSB configuration                       | Semi-static channel access <small>Note 4, 6</small> |            | 1, 2          | SSB.1 CCA                                      |    |    |
|   | Dynamic channel access <small>Note 5, 6</small>     |            | 1, 2          | SSB.2 CCA                                      |    |    |
| DBT window configuration                |   |            |               | As defined in A.3.28.1                         |    |    |
| b2-Threshold2NR                         |   | dBm        | 1             | -105   |    |    |
|   |   |            | 2             | -103   |    |    |
| EPRE ratio of PSS to SSS                |   | dB         | 1, 2          | 0  |    |    |
| EPRE ratio of PBCH_DMRS to SSS          |   |            |               |  |    |    |
| EPRE ratio of PBCH to PBCH_DMRS         |   |            |               |  |    |    |
| EPRE ratio of PDCCH_DMRS to SSS         |   |            |               |  |    |    |
| EPRE ratio of PDCCH to PDCCH_DMRS       |   |            |               |  |    |    |
| EPRE ratio of PDSCH_DMRS to SSS         |   |            |               |  |    |    |
| EPRE ratio of PDSCH to PDSCH_DMRS       |   |            |               |  |    |    |
| EPRE ratio of OCNG DMRS to SSS          |   |            |               |  |    |    |
| EPRE ratio of OCNG to OCNG DMRS         |   |            |               |  |    |    |
| $N_{oc}$ <small>Note2</small>           |   | dBm/15 KHz | 1, 2          | -98  |    |    |
| $N_{oc}$ <small>Note2</small>           |   | dBm/SCS    | 1, 2          | -95  |    |    |
| $\bar{E}_s/N_{oc}$                      |   | dB         | 1, 2          | -inifinit                                      | 0  | 0  |
| $\bar{E}_s/I_{ot}$ <small>Note3</small> |   | dB         | 1, 2          | -inifinit                                      | 0  | 0  |

|   |               |      |           |        |        |
|---|---------------|------|-----------|--------|--------|
| SS-RSRP <sup>Note3</sup>  | dBm/SCS       | 1, 2 | -inifinit | -95    | -95    |
| I <sub>o</sub> <sup>Note3</sup>   | dBm/38.16 MHz | 1, 2 | -63.96    | -60.94 | -60.94 |
| Propagation condition   |               | 1, 2 | AWGN      |        |        |
| Antenna Configuration and Correlation Matrix  |               | 1, 2 | 1x2 Low   |        |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: <math>\hat{E}_s/I_{ot}</math>, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |               |      |           |        |        |

### A.12.2.1.1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than TBD ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 50 ms and is specified in TS36.331.

T<sub>interrupt</sub> = 62 + (L<sub>1</sub>' + L<sub>3</sub>) \* T<sub>SMTC</sub>; T<sub>interrupt</sub> is defined in TS36.133 clause 5.3.4A.3 where

L<sub>1</sub>' is the number of SMTC occasions not available at the UE during the inter-RAT detection period.

L<sub>3</sub> is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. L<sub>3</sub> = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [57].

T<sub>SMTC</sub> = 20 ms is the SMTC periodicity ms in the test.

This gives a total of 112 + (L<sub>1</sub>' + L<sub>3</sub>)\*20 ms.

## A.12.3 Signalling characteristics

### A.12.3.1 Interruptions

## A.12.4 Measurement procedure

### A.12.4.1 E-UTRAN–NR inter-RAT SFTD measurements

#### A.12.4.1.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX

##### A.12.4.1.1.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell under CCA is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and no DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier under CCA with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 2 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.12.4.1.1.1-1 below. General test parameters and cell-specific parameters for the NR cell are provided in Tables A.12.4.1.1.1-2 and A.12.4.1.1.1-3 below, respectively. Cell-specific parameters for the E-UTRA cell are provided in clause A.3.7.2.1.

**Table A.12.4.1.1.1-1: Applicable test configurations for inter-RAT SFTD measurement delay test with NR under CCA**

| Config   | Description  |
|--|--|
| 1  | LTE FDD; NR: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD; NR: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.12.4.1.1.1-2: General test parameters for inter-RAT SFTD measurement delay test with NR under CCA**

| Parameter   | Unit | Test configuration | Value  |        | Comment  |
|---|------|--------------------|--------|--------|--|
|   |      |                    | Test 1 | Test 2 |  |
| E-UTRA RF Channel Number                              |      | Config 1,2         | 1      |        | One E-UTRAN carrier frequencies is used.                                     |
| NR RF Channel Number                                  |      | Config 1,2         | 1      |        | One NR carrier frequencies is used.  |
| Active cell   |      | Config 1,2         | Cell 1 |        | Cell 1 is on E-UTRA RF channel number 1.                                     |
| Neighbour cell  |      | Config 1,2         | Cell 2 |        | Cell 2 is on NR RF channel number 1.   |
| CP length   |      | Config 1,2         | Normal |        | Applicable to both cells.  |
| DRX   |      | Config 1,2         | OFF    |        | DRX is not used  |
| Frame time offset between serving and neighbour cells | ms   | Config 1           | 3      | 7      | Asynchronous cells. The timing of Cell 2 relative to the timing of Cell 1.   |
|   | µs   | Config 2           | 3      |        | Synchronous cells.   |
| SFN offset between serving and neighbour cells        |      | Config 1,2         | 0      | 1      | SFN of Cell 2 relative to SFN of Cell 1.                                     |
| SS-RSRP reporting                                     |      | Config 1,2         | No     |        | Only SFTD is reported.   |
| T1  | s    | Config 1,2         | 2      |        | T1 shall exceed $T_{\text{measure\_SFTD\_LBT\_max}} = 56 \times \text{SMTC}$ |

**Table A.12.4.1.1-3: Cell specific test parameters for Cell 2 in inter-RAT SFTD measurement delay test with NR under CCA**

| Parameter   |                       | Unit          | Cell 2                            |
|---|-----------------------|---------------|-----------------------------------|
| NR RF Channel Number  |                       |               | 1                                 |
| Duplex mode   |                       |               | TDD                               |
| BW <sub>channel</sub>   |                       | MHz           | 40: N <sub>RB,c</sub> = 106       |
| TDD configuration   |                       |               | TDDConf.1.1 CCA                   |
| DL CCA model  |                       |               | As specified in clause A.3.20.2.1 |
| DL CCA probability for semi-static channel access <sup>Note5,7</sup>  | P <sub>CCA_DL</sub>   |               | 0.9375                            |
| DL CCA probability for dynamic channel access <sup>Note6,7</sup>  | P <sub>CCA_DL_1</sub> |               | 0.75                              |
|   | P <sub>CCA_DL_2</sub> |               | 0.75                              |
| OCNG Pattern defined in A.3.2.1.1 <sup>Note 1</sup>   |                       |               | OP.1                              |
| SMTC configuration defined in A.3.2.11.1 and A.3.2.11.2   |                       |               | SMTC.2                            |
| SSB configuration for semi-static channel access <sup>Note5,7</sup>   |                       |               | SSB.1 CCA                         |
| SSB configuration for dynamic channel access <sup>Note6,7</sup>   |                       |               | SSB.2 CCA                         |
| DBT window configuration  |                       |               | DBT.1                             |
| PDSCH/PDCCH subcarrier spacing  |                       | kHz           | 30                                |
| EPRE ratio of PSS to SSS  |                       | dB            | 0                                 |
| EPRE ratio of PBCH DMRS to SSS  |                       | dB            |                                   |
| EPRE ratio of PBCH to PBCH DMRS   |                       | dB            |                                   |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |                       | dB            |                                   |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |                       | dB            |                                   |
| N <sub>oc</sub> <sup>Note2</sup>  |                       | dBm/15 kHz    | -98                               |
| N <sub>oc</sub> <sup>Note2</sup>  |                       | dBm/SCS       | -95                               |
| SS-RSRP <sup>Note 3, 4</sup>  |                       | dBm/SCS       | -91                               |
| $\bar{E}_s/I_{ot}$  |                       | dB            | 4                                 |
| $\bar{E}_s/N_{oc}$  |                       | dB            | 4                                 |
| I <sub>o</sub> <sup>Note 3</sup>  |                       | dBm/38.16 MHz | -58.50                            |
| Propagation Condition   |                       |               | AWGN                              |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel access only..</p> |                       |               |                                   |



### A.12.4.1.1.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at  $T_{\text{RRC\_procedure\_delay}} + T_{\text{measure\_SFTD\_LBT\_max}}$  after the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TI\_DCCCH}}$  longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

## A.12.4.2 E-UTRAN–NR inter-RAT measurements on NR carrier frequency under CCA

### A.12.4.2.1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

#### A.12.4.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21A of TS 36.133 [15] for E-UTRAN FDD-NR measurements under CCA and clause 8.1.2.4.22A of TS 36.133 [15] for E-UTRAN TDD-NR measurements under CCA.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables A.12.4.2.1.1-1, A.12.4.2.1.1-2, A.12.4.2.1.1-3 and A.12.4.2.1.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.12.4.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.12.4.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The UE is tested when MeasTriggerQuantity is configured as RSRP, RSRQ and SINR for each test. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.12.4.2.1.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| 2             | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| NOTE:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.12.4.2.1.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter   | Unit | Test configuration | Value   |   | Comment  |
|---|------|--------------------|---|---|--|
|   |      |                    | Test 1  | Test 2  |  |
| E-UTRA RF Channel Number  |      | 1, 2               | 1   |   | One E-UTRA carrier frequency is used.  |
| NR RF Channel Number  |      | 1, 2               | 1   |   | One FR1 NR carrier frequency under CCA is used.  |
| DL CCA model  |      |                    | As specified in clause A.3.26.2.1                     |   |  |
| UL CCA model  |      |                    | As specified in clause A.3.26.2.2                     |   |  |
| Active cell   |      | 1, 2               | E-UTRA cell 1 (PCell)                                 |   | E-UTRA cell 1 is on E-UTRA RF channel number 1.  |
| Neighbour cell  |      | 1, 2               | NR cell 2   |   | NR cell 2 is on NR RF channel number 1.  |
| Gap Pattern Id  |      | 1, 2               | 0   | 4   | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].  |
| Measurement gap offset  |      | 1, 2               | 39  | 19  | As specified in TS 36.331 [16].  |
| b2-Threshold1   | dBm  | 1, 2               | Note 1  |   | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                            |
| b2-Threshold2NR   | dBm  | 1, 2               | Note 2  |   | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 2 for event B2 [16]  |
| Hysteresis  | dB   | 1, 2               | 0   |   |  |
| CP length   |      | 1, 2               | Normal  |   |  |
| TimeToTrigger   | s    | 1, 2               | 0   |   |  |
| Filter coefficient  |      | 1, 2               | 0   |   | L3 filtering is not used   |
| DRX   |      | 1, 2               | OFF   |   | DRX is not used  |
| Time offset between serving and neighbour cells                         |      | 1, 2               | 3µs   |   | Synchronous cells.   |
| T1  | s    | 1, 2               | 5   |   |  |
| T2  | s    | 1, 2               | $\geq T_{\text{identify\_irat\_cca\_without\_index}}$ | $\geq T_{\text{identify\_irat\_cca\_without\_index}}$ | $T_{\text{identify\_irat\_cca\_without\_index}}$ is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| Note 1: The value of b2-Threshold1 is defined in Table A.12.4.2.1.1-3   |      |                    |   |   |  |
| Note 2: The value of b2-Threshold2NR is defined in Table A.12.4.2.1.1-4 |      |                    |   |   |  |

**Table A.12.4.2.1.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter   | Unit | Configuration | Cell 1   |    |
|---|------|---------------|--|----|
|   |      |               | T1   | T2 |
| RF channel number   |      | 1, 2          | 1  |    |
| Duplex mode   |      | 1             | FDD  |    |
|   |      | 2             | TDD  |    |
| TDD special subframe configuration <sup>Note1</sup>                 |      | 2             | 6  |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                  |      | 2             | 1  |    |
| BW <sub>channel</sub>   | MHz  | 1, 2          | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |
| PDSCH parameters: DL Reference Measurement Channel <sup>Note2</sup> |      | 1             | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |
|   |      | 2             | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |    |

|  |           |      |  |                              |           |      |      |    |
|--|-----------|------|--|------------------------------|-----------|------|------|----|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1    | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                              |           |      |      |    |
|  |           | 2    | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                              |           |      |      |    |
| OCNG Patterns <sup>Note2</sup>   |           | 1    | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                              |           |      |      |    |
|  |           | 2    | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                              |           |      |      |    |
| b2-Threshold1  | dBm       | 1, 2 | -77 for RSRP   |                              |           |      |      |    |
|  | dB        | 1, 2 | 77 for RSRQ  |                              |           |      |      |    |
|  | dB        | 1, 2 | 90 for SINR  |                              |           |      |      |    |
| PBCH_RA  | dB        | 1, 2 | 0  |                              |           |      |      |    |
| PBCH_RB  |           |      |  |                              |           |      |      |    |
| PSS_RA   |           |      |  |                              |           |      |      |    |
| SSS_RA   |           |      |  |                              |           |      |      |    |
| PCFICH_RB  |           |      |  |                              |           |      |      |    |
| PHICH_RA   |           |      |  |                              |           |      |      |    |
| PHICH_RB   |           |      |  |                              |           |      |      |    |
| PDCCH_RA   |           |      |  |                              |           |      |      |    |
| PDCCH_RB   |           |      |  |                              |           |      |      |    |
| PDSCH_RA   |           |      |  |                              |           |      |      |    |
| PDSCH_RB   |           |      |  |                              |           |      |      |    |
| OCNG_RA <sup>Note3</sup>   |           |      |  |                              |           |      |      |    |
| OCNG_RB <sup>Note3</sup>   |           |      |  |                              |           |      |      |    |
| $N_{oc}$ <sup>Note4</sup>  |           |      |  |                              | dBm/15kHz | 1, 2 | -104 |    |
| $\hat{E}_s/N_{oc}$   |           |      |  |                              | dB        | 1, 2 | 17   | 17 |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2 | 17   | 17                           |           |      |      |    |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |           |      |      |    |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |           |      |      |    |
| $I_o$ <sup>Note5</sup>   | dBm/9MHz  | 1, 2 | $-59.13+10\log(N_{RB,c}/50)$                               | $-59.13+10\log(N_{RB,c}/50)$ |           |      |      |    |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2 | ETU70  |                              |           |      |      |    |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2 | 1x2 Low  |                              |           |      |      |    |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |      |  |                              |           |      |      |    |

**Table A.12.4.2.1.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit         | Test configuration | Cell 2                      |        |
|--|--------------|--------------------|-----------------------------|--------|
|  |              |                    | T1                          | T2     |
| NR RF Channel Number   |              | 1, 2               | 2                           |        |
| TDD configuration  |              | 1, 2               | TDDConf.1.1 CCA             |        |
| BW <sub>channel</sub>  | MHz          | 1, 2               | 40: N <sub>RB,c</sub> = 106 |        |
| P <sub>CCA_DL</sub>  |              | 1, 2               | [TBD]                       |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |              | 1, 2               | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2  |              | 1, 2               | SMTC.1                      |        |
| DBT window configuration   |              | 1, 2               | DBT.1                       |        |
| SSB configuration for semi-static channel access   |              | 1, 2               | SSB.1 CCA                   |        |
| SSB configuration for dynamic channel access   |              | 1, 2               | SSB.2 CCA                   |        |
| PDSCH/PDCCH subcarrier spacing   | kHz          | 1, 2               | 30                          |        |
| b2-Threshold2NR  | dBm          | 1, 2               | -98 for SS-RSRP             |        |
|  | dB           | 1, 2               | 55 for SS-RSRQ              |        |
|  |              | 1, 2               | 50 for SS-RSRQ              |        |
| EPRE ratio of PSS to SSS   |              | 1, 2               | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH   |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |                    |                             |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | 1, 2               | -98                         |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS      | 1, 2               | -95                         |        |
| SS-RSRP <sup>Note 3,5</sup>  | dBm/SCS      | 1, 2               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/38.16MHz | 1, 2               | -63.95                      | -56.16 |
| Propagation Condition  |              | 1, 2               | ETU70                       |        |
| Antenna Configuration and Correlation Matrix   |              | 1, 2,              | 1x2 Low                     |        |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |                    |                             |        |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                    |                             |        |
| NOTE 3: SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |                    |                             |        |
| NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |              |                    |                             |        |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.  |              |                    |                             |        |

#### A.12.4.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_irat\_cca\_without\_index}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.  $T_{\text{identify\_irat\_cca\_without\_index}}$  is defined in defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.12.4.2.2 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used

##### A.12.4.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables A.12.4.2.2.1-1, A.12.4.2.2.1-2, A.12.4.2.2.1-3 and A.12.4.2.2.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.12.4.2.2.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.12.4.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The UE is tested when MeasTriggerQuantity is configured as RSRP, RSRQ and SINR for each test. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.12.4.2.2.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| 2             | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| NOTE:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.12.4.2.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter   | Unit | Test configuration | Value   |        |        |        | Comment  |
|---|------|--------------------|---|--------|--------|--------|--|
|   |      |                    | Test 1  | Test 2 | Test 3 | Test 4 |  |
| E-UTRA RF Channel Number  |      | 1, 2               | 1   |        |        |        | One E-UTRA carrier frequency is used.  |
| NR RF Channel Number  |      | 1, 2               | 1   |        |        |        | One FR1 NR carrier frequency under CCA is used.  |
| Active cell   |      | 1, 2               | E-UTRA cell 1 (PCell)                                 |        |        |        | E-UTRA cell 1 is on E-UTRA RF channel number 1.  |
| DL CCA model  |      |                    | As specified in clause A.3.26.2.1                     |        |        |        |  |
| UL CCA model  |      |                    | As specified in clause A.3.26.2.2                     |        |        |        |  |
| Neighbour cell  |      | 1, 2               | NR cell 2   |        |        |        | NR cell 2 is on NR RF channel number 1.  |
| Gap Pattern Id  |      | 1, 2               | 0   | 4      |        |        | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].  |
| Measurement gap offset  |      | 1, 2               | 39  | 19     |        |        | As specified in TS 36.331 [16].  |
| b2-Threshold1   | dBm  | 1, 2               | Note 1  |        |        |        | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                            |
| b2-Threshold2NR   | dBm  | 1, 2               | Note 2  |        |        |        | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 2 for event B2 [16]  |
| Hysteresis  | dB   | 1, 2               | 0   |        |        |        |  |
| CP length   |      | 1, 2               | Normal  |        |        |        |  |
| TimeToTrigger   | s    | 1, 2               | 0   |        |        |        |  |
| Filter coefficient  |      | 1, 2               | 0   |        |        |        | L3 filtering is not used   |
| DRX   |      | 1, 2               | DR X.9  | DR X.1 | DR X.9 | DR X.1 | As specified in clause A.3.3   |
| Time offset between serving and neighbour cells                         |      | 1, 2               | 3µs   |        |        |        | Synchronous cells.   |
| T1  | s    | 1, 2               | 5   |        |        |        |  |
| T2  | s    | 1, 2               | $\geq T_{\text{identify\_irat\_cca\_without\_index}}$ |        |        |        | $T_{\text{identify\_irat\_cca\_without\_index}}$ is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| Note 1: The value of b2-Threshold1 is defined in Table A.12.4.2.1.1-3   |      |                    |   |        |        |        |  |
| Note 2: The value of b2-Threshold2NR is defined in Table A.12.4.2.1.1-4 |      |                    |   |        |        |        |  |

**Table A.12.4.2.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection**

| Parameter   | Unit | Configuration | Cell 1  |    |
|---|------|---------------|---|----|
|   |      |               | T1  | T2 |
| RF channel number                                   |      | 1, 2          | 1   |    |
| Duplex mode   |      | 1             | FDD   |    |
|   |      | 2             | TDD   |    |
| TDD special subframe configuration <sup>Note1</sup> |      | 2             | 6   |    |
| TDD uplink-downlink configuration <sup>Note1</sup>  |      | 2             | 1   |    |
| BW <sub>channel</sub>                               | MHz  | 1, 2          | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50 |    |

|  |           |      |  |                              |
|--|-----------|------|--|------------------------------|
|  |           |      | 20 MHz: $N_{RB,c} = 100$                                   |                              |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>   |           | 1    | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD       |                              |
|  |           | 2    | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD       |                              |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1    | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                              |
|  |           | 2    | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                              |
| OCNG Patterns <sup>Note2</sup>   |           | 1    | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                              |
|  |           | 2    | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                              |
| b2-Threshold1  | dBm       | 1, 2 | -77 for RSRP   |                              |
|  | dB        | 1, 2 | 77 for RSRQ  |                              |
|  | dB        | 1, 2 | 90 for SINR  |                              |
| PBCH_RA  | dB        | 1, 2 | 0  |                              |
| PBCH_RB  |           |      |  |                              |
| PSS_RA   |           |      |  |                              |
| SSS_RA   |           |      |  |                              |
| PCFICH_RB  |           |      |  |                              |
| PHICH_RA   |           |      |  |                              |
| PHICH_RB   |           |      |  |                              |
| PDCCH_RA   |           |      |  |                              |
| PDCCH_RB   |           |      |  |                              |
| PDSCH_RA   |           |      |  |                              |
| PDSCH_RB   |           |      |  |                              |
| OCNG_RA <sup>Note3</sup>   |           |      |  |                              |
| OCNG_RB <sup>Note3</sup>   |           |      |  |                              |
| $N_{oc}$ <sup>Note4</sup>  |           |      |  |                              |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2 | 17   | 17                           |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2 | 17   | 17                           |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |
| $I_o$ <sup>Note5</sup>   | dBm/9MHz  | 1, 2 | $-59.13+10\log(N_{RB,c}/50)$                               | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2 | ETU70  |                              |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2 | 1x2 Low  |                              |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |      |  |                              |

**Table A.12.4.2.2.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter  | Unit         | Test configuration | Cell 2                      |        |
|--|--------------|--------------------|-----------------------------|--------|
|  |              |                    | T1                          | T2     |
| NR RF Channel Number   |              | 1, 2               | 1                           |        |
| TDD configuration  |              | 1, 2               | TDDConf.1.1 CCA             |        |
| BW <sub>channel</sub>  | MHz          | 1, 2               | 40: N <sub>RB,C</sub> = 106 |        |
| P <sub>CCA_DL</sub>  |              |                    | [TBD]                       |        |
| CCA model  |              | 1, 2               | TBD                         |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |              | 1, 2               | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2  |              | 1, 2               | SMTC.1                      |        |
| DBT window configuration   |              | 1, 2               | DBT.1                       |        |
| SSB configuration for semi-static channel access   |              | 1, 2               | SSB.1 CCA                   |        |
| SSB configuration for dynamic channel access   |              | 1, 2               | SSB.2 CCA                   |        |
| PDSCH/PDCCH subcarrier spacing   | kHz          | 1, 2               | 30                          |        |
| b2-Threshold2NR  | dBm          | 1, 2               | -98 for SS-RSRP             |        |
|  | dB           | 1, 2               | 55 for SS-RSRQ              |        |
|  |              | 1, 2               | 50 for SS-SINR              |        |
| EPRE ratio of PSS to SSS   |              | 1, 2               | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH   |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |                    |                             |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | 1, 2               | -98                         |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS      | 1, 2               | -95                         |        |
| SS-RSRP <sup>Note 3,5</sup>  | dBm/SCS      | 1, 2               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/38.16MHz | 1, 2               | -63.95                      | -56.16 |
| Propagation Condition  |              | 1, 2               | ETU70                       |        |
| Antenna Configuration and Correlation Matrix   |              | 1, 2,              | 1x2 Low                     |        |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |                    |                             |        |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                    |                             |        |
| NOTE 3: SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |                    |                             |        |
| NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |              |                    |                             |        |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.  |              |                    |                             |        |

#### A.12.4.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_irat\_cca\_without\_index}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.



In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_without\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.12.4.2.3 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

#### A.12.4.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables A.12.4.2.3.1-1, A.12.4.2.3.1-2, A.12.4.2.3.1-3 and A.12.4.2.3.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.12.4.2.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.12.4.2.3.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The UE is tested when MeasTriggerQuantity is configured as RSRP, RSRQ and SINR for each test. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.12.4.2.3.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR1**

| Configuration | Description  |
|---------------|--|
| 1             | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| 2             | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD                                   |
| NOTE:         | The UE is only required to pass in one of the supported test configurations in FR1 |

**Table A.12.4.2.3.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter   | Unit | Test configuration | Value   |   | Comment   |
|---|------|--------------------|---|---|---|
|   |      |                    | Test 1  | Test 2  |   |
| E-UTRA RF Channel Number  |      | 1, 2               | 1   |   | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number  |      | 1, 2               | 1   |   | One FR1 NR carrier frequency under CCA is used.   |
| DL CCA model  |      |                    | As specified in clause A.3.26.2.1                     |   |   |
| UL CCA model  |      |                    | As specified in clause A.3.26.2.2                     |   |   |
| Active cell   |      | 1, 2               | E-UTRA cell 1 (PCell)                                 |   | E-UTRA cell 1 is on E-UTRA RF channel number 1.   |
| Neighbour cell  |      | 1, 2               | NR cell 2   |   | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id  |      | 1, 2               | 0   | 4   | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].   |
| Measurement gap offset  |      | 1, 2               | 39  | 19  | As specified in TS 36.331 [16].   |
| b2-Threshold1   | dBm  | 1, 2               | Note 1  |   | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                         |
| b2-Threshold2NR   | dBm  | 1, 2               | Note 2  |   | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 2 for event B2 [16]                                     |
| Hysteresis  | dB   | 1, 2               | 0   |   |   |
| CP length   |      | 1, 2               | Normal  |   |   |
| TimeToTrigger   | s    | 1, 2               | 0   |   |   |
| Filter coefficient  |      | 1, 2               | 0   |   | L3 filtering is not used  |
| DRX   |      | 1, 2               | OFF   |   | DRX is not used   |
| Time offset between serving and neighbour cells                         |      | 1, 2               | 3µs   |   | Synchronous cells.  |
| T1  | s    | 1, 2               | 5   |   |   |
| T2  | s    | 1, 2               | $\geq T_{\text{identify\_irat\_cca\_a\_with\_index}}$ | $\geq T_{\text{identify\_irat\_cca\_a\_with\_index}}$ | $T_{\text{identify\_irat\_cca\_with\_index}}$ is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| Note 1: The value of b2-Threshold1 is defined in Table A.12.4.2.3.1-3   |      |                    |   |   |   |
| Note 2: The value of b2-Threshold2NR is defined in Table A.12.4.2.3.1-4 |      |                    |   |   |   |

**Table A.12.4.2.3.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 with SSB time index detection**

| Parameter   | Unit | Configuration | Cell 1   |    |
|---|------|---------------|--|----|
|   |      |               | T1   | T2 |
| RF channel number   |      | 1, 2          | 1  |    |
| Duplex mode   |      | 1             | FDD  |    |
|   |      | 2             | TDD  |    |
| TDD special subframe configuration <sup>Note1</sup>                 |      | 2             | 6  |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                  |      | 2             | 1  |    |
| BW <sub>channel</sub>   | MHz  | 1, 2          | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |
| PDSCH parameters: DL Reference Measurement Channel <sup>Note2</sup> |      | 1             | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |
|   |      | 2             | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD   |    |

|  |           |      |  |                              |
|--|-----------|------|--|------------------------------|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1    | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                              |
|  |           | 2    | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                              |
| OCNG Patterns <sup>Note2</sup>   |           | 1    | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                              |
|  |           | 2    | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                              |
| b2-Threshold1  | dBm       | 1, 2 | -77 for RSRP   |                              |
|  | dB        | 1, 2 | 77 for RSRQ  |                              |
|  | dB        | 1, 2 | 90 for SINR  |                              |
| PBCH_RA  | dB        | 1, 2 | 0  |                              |
| PBCH_RB  |           |      |  |                              |
| PSS_RA   |           |      |  |                              |
| SSS_RA   |           |      |  |                              |
| PCFICH_RB  |           |      |  |                              |
| PHICH_RA   |           |      |  |                              |
| PHICH_RB   |           |      |  |                              |
| PDCCH_RA   |           |      |  |                              |
| PDCCH_RB   |           |      |  |                              |
| PDSCH_RA   |           |      |  |                              |
| PDSCH_RB   |           |      |  |                              |
| OCNG_RA <sup>Note3</sup>   |           |      |  |                              |
| OCNG_RB <sup>Note3</sup>   |           |      |  |                              |
| $N_{oc}$ <sup>Note4</sup>  |           |      |  |                              |
| $\hat{E}_s/N_{oc}$   | dB        | 1, 2 | 17   | 17                           |
| $\hat{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2 | 17   | 17                           |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |
| $I_o$ <sup>Note5</sup>   | dBm/9MHz  | 1, 2 | $-59.13+10\log(N_{RB,c}/50)$                               | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2 | ETU70  |                              |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2 | 1x2 Low  |                              |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>\hat{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |      |  |                              |

**Table A.12.4.2.3.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter  | Unit         | Test configuration | Cell 2                      |        |
|--|--------------|--------------------|-----------------------------|--------|
|  |              |                    | T1                          | T2     |
| NR RF Channel Number   |              | 1, 2               | 1                           |        |
| TDD configuration  |              | 1, 2               | TDDConf.1.1 CCA             |        |
| BW <sub>channel</sub>  | MHz          | 1, 2               | 40: N <sub>RB,C</sub> = 106 |        |
| P <sub>CCA_DL</sub>  |              |                    | [TBD]                       |        |
| CCA model  |              | 1, 2               | TBD                         |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |              | 1, 2               | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2  |              | 1, 2               | SMTC.1                      |        |
| DBT window configuration   |              | 1, 2               | DBT.1                       |        |
| SSB configuration for semi-static channel access   |              | 1, 2               | SSB.1 CCA                   |        |
| SSB configuration for dynamic channel access   |              | 1, 2               | SSB.2 CCA                   |        |
| PDSCH/PDCCH subcarrier spacing   | kHz          | 1, 2               | 30                          |        |
| b2-Threshold2NR  | dBm          | 1, 2               | -98 for SS-RSRP             |        |
|  | dB           | 1, 2               | 55 for SS-RSRQ              |        |
|  |              | 1, 2               | 50 for SS-SINR              |        |
| EPRE ratio of PSS to SSS   |              | 1, 2               | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH   |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |                    |                             |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | 1, 2               | -98                         |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS      | 1, 2               | -95                         |        |
| SS-RSRP <sup>Note 3,5</sup>  | dBm/SCS      | 1, 2               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/38.16MHz | 1, 2               | -63.95                      | -56.16 |
| Propagation Condition  |              | 1, 2               | ETU70                       |        |
| Antenna Configuration and Correlation Matrix   |              | 1, 2,              | 1x2 Low                     |        |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |                    |                             |        |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                    |                             |        |
| NOTE 3: SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |                    |                             |        |
| NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |              |                    |                             |        |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.  |              |                    |                             |        |

### A.12.4.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_irat\_cca\_with\_index}$  ms from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.12.4.2.4 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

##### A.12.4.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables A.12.4.2.4.1-1, A.12.4.2.4.1-2, A.12.4.2.4.1-3 and A.12.4.2.4.1-4. Cell transmits SSBs in DBT windows according to DL CCA model.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.12.4.2.4.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.12.4.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

**Table A.12.4.2.4.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR1**

| Configuration  | Description                                      |
|--|--|
| 1  | LTE FDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD |
| 2  | LTE TDD; NR with CCA: SCS 30 kHz, BW 40 MHz, TDD |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 |  |

**Table A.12.4.2.4.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter   | Unit | Test configuration | Value  |        |        |        | Comment   |
|---|------|--------------------|--|--------|--------|--------|---|
|   |      |                    | Test 1   | Test 2 | Test 3 | Test   |   |
| E-UTRA RF Channel Number  |      | 1, 2               | 1  |        |        |        | One E-UTRA carrier frequency is used.   |
| NR RF Channel Number  |      | 1, 2               | 1  |        |        |        | One FR1 NR carrier frequency under CCA is used.   |
| DL CCA model  |      |                    | As specified in clause A.3.26.2.1                  |        |        |        |   |
| UL CCA model  |      |                    | As specified in clause A.3.26.2.2                  |        |        |        |   |
| Active cell   |      | 1, 2               | E-UTRA cell 1 (PCell)                              |        |        |        | E-UTRA cell 1 is on E-UTRA RF channel number 1.   |
| Neighbour cell  |      | 1, 2               | NR cell 2  |        |        |        | NR cell 2 is on NR RF channel number 1.   |
| Gap Pattern Id  |      | 1, 2               | 0  |        | 4      |        | As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].   |
| Measurement gap offset  |      | 1, 2               | 39   |        | 19     |        | As specified in TS 36.331 [16].   |
| b2-Threshold1   | dBm  | 1, 2               | Note 1   |        |        |        | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]                         |
| b2-Threshold2NR   | dBm  | 1, 2               | Note 2   |        |        |        | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 2 for event B2 [16]                                     |
| Hysteresis  | dB   | 1, 2               | 0  |        |        |        |   |
| CP length   |      | 1, 2               | Normal   |        |        |        |   |
| TimeToTrigger   | s    | 1, 2               | 0  |        |        |        |   |
| Filter coefficient  |      | 1, 2               | 0  |        |        |        | L3 filtering is not used  |
| DRX   |      | 1, 2               | DR X.9   | DR X.1 | DR X.9 | DR X.1 | As specified in clause A.3.3  |
| Time offset between serving and neighbour cells                         |      | 1, 2               | 3µs  |        |        |        | Synchronous cells.  |
| T1  | s    | 1, 2               | 5  |        |        |        |   |
| T2  | s    | 1, 2               | $\geq T_{\text{identify\_irat\_cca\_with\_index}}$ |        |        |        | $T_{\text{identify\_irat\_cca\_with\_index}}$ is defined in clause 8.1.2.4.21A.1 and 8.1.2.4.22A.1 in TS 36.133 |
| Note 1: The value of b2-Threshold1 is defined in Table A.12.4.2.4.1-3   |      |                    |  |        |        |        |   |
| Note 2: The value of b2-Threshold2NR is defined in Table A.12.4.2.4.1-4 |      |                    |  |        |        |        |   |

**Table A.12.4.2.4.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 with SSB time index detection**

| Parameter  | Unit | Configuration | Cell 1   |    |
|--|------|---------------|--|----|
|  |      |               | T1   | T2 |
| RF channel number  |      | 1, 2          | 1  |    |
| Duplex mode  |      | 1             | FDD  |    |
|  |      | 2             | TDD  |    |
| TDD special subframe configuration <sup>Note1</sup>                    |      | 2             | 6  |    |
| TDD uplink-downlink configuration <sup>Note1</sup>                     |      | 2             | 1  |    |
| BW <sub>channel</sub>  | MHz  | 1, 2          | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100 |    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |      | 1             | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD   |    |

|  |           |      |  |                              |
|--|-----------|------|--|------------------------------|
|  |           | 2    | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD       |                              |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>  |           | 1    | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD     |                              |
|  |           | 2    | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD     |                              |
| OCNG Patterns <sup>Note2</sup>   |           | 1    | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD |                              |
|  |           | 2    | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD    |                              |
| b2-Threshold1  | dBm       | 1, 2 | -77 for RSRP   |                              |
|  | dB        | 1, 2 | 77 for RSRQ  |                              |
|  | dB        | 1, 2 | 90 for SINR  |                              |
| PBCH_RA  | dB        | 1, 2 | 0  |                              |
| PBCH_RB  |           |      |  |                              |
| PSS_RA   |           |      |  |                              |
| SSS_RA   |           |      |  |                              |
| PCFICH_RB  |           |      |  |                              |
| PHICH_RA   |           |      |  |                              |
| PHICH_RB   |           |      |  |                              |
| PDCCH_RA   |           |      |  |                              |
| PDCCH_RB   |           |      |  |                              |
| PDSCH_RA   |           |      |  |                              |
| PDSCH_RB   |           |      |  |                              |
| OCNG_RA <sup>Note3</sup>   |           |      |  |                              |
| OCNG_RB <sup>Note3</sup>   |           |      |  |                              |
| $N_{oc}$ <sup>Note4</sup>  |           |      |  |                              |
| $\bar{E}_s/N_{oc}$   | dB        | 1, 2 | 17   | 17                           |
| $\bar{E}_s/I_{ot}$ <sup>Note5</sup>  | dB        | 1, 2 | 17   | 17                           |
| RSRP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |
| SCH_RP <sup>Note5</sup>  | dBm/15kHz | 1, 2 | -87  | -87                          |
| $I_o$ <sup>Note5</sup>   | dBm/9MHz  | 1, 2 | $-59.13+10\log(N_{RB,c}/50)$                               | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition <sup>Note6</sup>   |           | 1, 2 | ETU70  |                              |
| Antenna Configuration and Correlation Matrix <sup>Note6</sup>  |           | 1, 2 | 1x2 Low  |                              |
| <p>Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].</p> <p>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.</p> <p>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 5: <math>\bar{E}_s/I_{ot}</math>, RSRP, SCH_RP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].</p> |           |      |  |                              |

**Table A.12.4.2.4.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter  | Unit         | Test configuration | Cell 2                      |        |
|--|--------------|--------------------|-----------------------------|--------|
|  |              |                    | T1                          | T2     |
| NR RF Channel Number   |              | 1, 2               | 1                           |        |
| TDD configuration  |              | 1, 2               | TDDConf.1.1 CCA             |        |
| BW <sub>channel</sub>  | MHz          | 1, 2               | 40: N <sub>RB,C</sub> = 106 |        |
| P <sub>CCA_DL</sub>  |              |                    | TBD                         |        |
| CCA model  |              | 1, 2               | TBD                         |        |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)  |              | 1, 2               | OP.1                        |        |
| SMTC configuration defined in A.3.11.1 and A.3.11.2  |              | 1, 2               | TBD                         |        |
| DBT window configuration   |              | 1, 2               | TBD                         |        |
| SSB configuration for semi-static channel access   |              | 1, 2               | SSB.1 CCA                   |        |
| SSB configuration for dynamic channel access   |              | 1, 2               | SSB.2 CCA                   |        |
| PDSCH/PDCCH subcarrier spacing   | kHz          | 1, 2               | 30                          |        |
| b2-Threshold2NR  | dBm/SCS      | 1, 2               | -98 for SS-RSRP             |        |
|  | dB           | 1, 2               | 55 for SS-RSRQ              |        |
|  |              | 1, 2               | 50 for SS-SINR              |        |
| EPRE ratio of PSS to SSS   |              | 1, 2               | 0                           |        |
| EPRE ratio of PBCH DMRS to SSS   |              |                    |                             |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |              |                    |                             |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |                    |                             |        |
| EPRE ratio of PDSCH to PDSCH   |              |                    |                             |        |
| EPRE ratio of OCNG DMRS to SSS (Note 1)  |              |                    |                             |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |              |                    |                             |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz    | 1, 2               | -98                         |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS      | 1, 2               | -95                         |        |
| SS-RSRP <sup>Note 3,5</sup>  | dBm/SCS      | 1, 2               | -Infinity                   | -88    |
| $\hat{E}_s/I_{ot}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $\hat{E}_s/N_{oc}$ <sup>Note 5</sup>   | dB           | 1, 2               | -Infinity                   | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/38.16MHz | 1, 2               | -63.95                      | -56.16 |
| Propagation Condition  |              | 1, 2               | ETU70                       |        |
| Antenna Configuration and Correlation Matrix   |              | 1, 2,              | 1x2 Low                     |        |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.   |              |                    |                             |        |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |              |                    |                             |        |
| NOTE 3: SS-RSRP and $I_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |              |                    |                             |        |
| NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |              |                    |                             |        |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.  |              |                    |                             |        |

#### A.12.4.2.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{identify\_irat\_cca\_with\_index}$  ms from the beginning of time period T2. The UE shall not send event triggered



measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_irat\_cca\_with\_index}}$  ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{\text{DCCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCCH.

## A.12.4.2.5 RSSI measurement reporting

### A.12.4.2.5.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the inter-RAT RSSI measurement reporting requirements in TS 36.133 [15, Section 8.1.2.4.21A.1.5].

### A.12.4.2.5.2 Test parameters

In the test, the UE is configured to perform inter-RAT RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.12.4.2.5.2-1. There is one cell in the test: Cell 1 is E-UTRAN PCell on a licensed band. Prior to the start of the time duration T1, the UE is connected to Cell 1. The RSSI measurement is performed on an inter-RAT carrier frequency under CCA. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.12.4.2.5.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.12.4.2.5.2-2: General test parameters.**

Editor's note: Table TBD

## A.12.4.2.6 Channel occupancy measurement reporting

### A.12.4.2.6.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the inter-RAT channel occupancy measurement reporting requirements in TS 36.133 [15, Section 8.1.2.4.21A.1.6].

### A.12.4.2.6.2 Test parameters

In the test, the UE is configured to perform inter-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.12.4.2.6.2-1. There is one cell in the test: Cell 1 which is E-UTRAN PCell on a licensed band. Prior to the start of the time duration T1, the UE is connected to Cell 1. The channel occupancy measurement is performed on an inter-RAT carrier frequency under CCA. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1.

**Table A.12.4.2.6.2-1: Supported test configurations.**

| Configuration  | Description  |
|--|--|
| 1  | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 2  | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. |  |

**Table A.12.4.2.6.2-2: General test parameters.**

Editor's note: Table is TBD

## A.12.5 Measurement performance

### A.12.5.1 E-UTRAN–NR SFTD

#### A.12.5.1.1 Inter-RAT SFTD accuracy with NR target cell under CCA

##### A.12.5.1.1.1 Test Purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for inter-RAT SFTD measurements between E-UTRA PCell and NR target cell under CCA.

##### A.12.5.1.1.2 Test Environment

Supported test configurations are shown in Table A.12.5.1.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is inter-RAT NR target cell under CCA. The test parameters of Cell 1 are given in clause A.12.5.1.1.2-2. The test parameters of Cell 2 are given in Table A.12.5.1.1.2-3. The SFTD between PCell and NR target cell shall be set by the test equipment to one of the time differences in Table A.12.5.1.1.2-4.

**Table A.12.5.1.1.2-1: Supported test configurations for SFTD accuracy with NR target cell under CCA**

| Config   | Description   |
|--|---|
| 1  | LTE FDD<br>NR with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | LTE TDD<br>NR with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.12.5.1.1.2-2: Test parameters for inter-RAT SFTD accuracy with NR target cell under CCA (Cell 1)**

| Parameter   | Unit  | Test 1  |
|---|---|---|
| E-UTRA RF Channel Number  |   | 1   |
| Duplex mode   |   | FDD or TDD  |
| TDD special subframe configuration <sup>Note1</sup>                                 |   | 6   |
| TDD uplink-downlink configuration <sup>Note1</sup>                                  |   | 1   |
| BW <sub>channel</sub>   |   | 5 MHz: N <sub>RB,c</sub> = 25<br>10 MHz: N <sub>RB,c</sub> = 50<br>20 MHz: N <sub>RB,c</sub> = 100                    |
| PDSCH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup>              |   | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD          |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel <sup>Note2</sup> |   | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD      |
| OCNG Patterns <sup>Note2</sup>  |   | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA   | dB  | 0   |
| PBCH_RB   | dB  |   |
| PSS_RA  | dB  |   |
| SSS_RA  | dB  |   |
| PCFICH_RB   | dB  |   |
| PHICH_RA  | dB  |   |
| PHICH_RB  | dB  |   |
| PDCCH_RA  | dB  |   |
| PDCCH_RB  | dB  |   |
| PDSCH_RA  | dB  |   |
| PDSCH_RB  | dB  |   |
| OCNG_RA <sup>Note3</sup>  | dB  |   |
| OCNG_RB <sup>Note3</sup>  | dB  |   |
| N <sub>oc</sub> <sup>Note4</sup>  | dBm/15 kHz  |   |
| $\bar{E}_s/N_{oc}$  | dB  | -3  |
| $\bar{E}_s/I_{ot}$  | dB  | -3  |
| RSRP <sup>Note5</sup>   | dBm/15 kHz  | -107  |
| SCH_RP <sup>Note5</sup>   | dBm/15 kHz  | -107  |
| I <sub>o</sub> <sup>Note5</sup>   | dBm/Ch BW   | -74.45<br>+10log<br>(N <sub>RB,c</sub> /50)   |
| Propagation Condition   |   | AWGN  |
| Antenna Configuration   |   | 1x2   |
| Note 1:   | Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].   |   |
| Note 2:   | DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.  |   |
| Note 3:   | OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |   |
| Note 4:   | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N <sub>oc</sub> to be fulfilled. |   |
| Note 5:   | Es/I <sub>ot</sub> , RSRP, SCH_RP and I <sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |   |

**Table A.12.5.1.1.2-3: Test parameters for inter-RAT SFTD accuracy with NR target cell under CCA (Cell 2)**

| Parameter  |                       | Unit          | Test 1                            |
|--|-----------------------|---------------|-----------------------------------|
| Duplex mode  |                       |               | TDD                               |
| TDD Configuration  |                       |               | TDDConf.1.1 CCA                   |
| BW <sub>channel</sub>  |                       | MHz           | 40: N <sub>RB,c</sub> = 106       |
| DL CCA model   |                       |               | As specified in clause A.3.20.2.1 |
| DL CCA probability for semi-static channel access <sup>Note6,8</sup>   | P <sub>CCA</sub>      |               | [0.75]                            |
| DL CCA probability for dynamic channel access <sup>Note7,8</sup>   | P <sub>CCA_DL_1</sub> |               | [0.75]                            |
|  | P <sub>CCA_DL_2</sub> |               | [0.75]                            |
| SSB configuration for semi-static channel access <sup>Note6,8</sup>  |                       |               | SSB.1 CCA                         |
| SSB configuration for dynamic channel access <sup>Note7,8</sup>  |                       |               | SSB.2 CCA                         |
| SMTC configuration   |                       |               | SMTC.1                            |
| DBT window configuration   |                       |               | DBT.1                             |
| OCNG Patterns  |                       |               | OP.1                              |
| EPRE ratio of PSS to SSS   |                       | dB            | 0                                 |
| EPRE ratio of PBCH DMRS to SSS   |                       |               |                                   |
| EPRE ratio of PBCH to PBCH DMRS  |                       |               |                                   |
| EPRE ratio of PDCCH DMRS to SSS  |                       |               |                                   |
| EPRE ratio of PDCCH to PDCCH DMRS  |                       |               |                                   |
| EPRE ratio of PDSCH DMRS to SSS  |                       |               |                                   |
| EPRE ratio of PDSCH to PDSCH DMRS  |                       |               |                                   |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>  |                       |               |                                   |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>   |                       |               |                                   |
| N <sub>oc</sub> <sup>Note2</sup>   |                       |               |                                   |
| N <sub>oc</sub> <sup>Note2</sup>   |                       | dBm/SSB SCS   | -101                              |
| $\bar{E}_s/I_{ot}$   |                       | dB            | -3                                |
| $\bar{E}_s/N_{oc}$   |                       | dB            | -3                                |
| SS-RSRP <sup>Note3</sup>   |                       | dBm/SCS       | -104                              |
| I <sub>o</sub> <sup>Note3</sup>  |                       | dBm/38.16 MHz | -68.18                            |
| Propagation condition  |                       |               | AWGN                              |
| Antenna configuration  |                       |               | 1x2                               |
| <p>Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.</p> <p>Note 3: SS-RSRP and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 8: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                       |               |                                   |

**Table A.12.5.1.1.2-4: Timing offsets for inter-RAT SFTD accuracy test with NR target cell under CCA**

| Configuration | SFN offset between PCell and NR neighbor cell | Frame boundary offset between PCell and NR neighbour cell (Ts) |
|---------------|---|--|
| 1             | 100   | -122000  |
| 2             | 300   | -60540   |
| 3             | 500   | 1000   |
| 4             | 700   | 62540  |
| 5             | 900   | 124000   |

### A.12.5.1.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and inter-RAT NR target cell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

### A.12.5.2 E-UTRAN–NR SS-RSRP

### A.12.5.3 E-UTRAN–NR SS-RSRQ

### A.12.5.4 E-UTRAN–NR SS-SINR

### A.12.5.5 E-UTRAN–NR RSSI

### A.12.5.6 E-UTRAN–NR channel occupancy

## A.13 NR Standalone Tests with NR SCell under CCA and All Other NR Cells in FR1

### A.13.1 Timing

#### A.13.1.1 UE transmit timing

#### A.13.1.2 Timing advance

### A.13.2 Signalling characteristics

#### A.13.2.1 Interruption

##### A.13.2.1.1 NR interruptions during SCell operations with CCA on SCell

###### A.13.2.1.1.1 Test Purpose and Environment

The purpose of this test is to verify NR PCell interruptions during SCell operations on an NR SCC with CCA, This test will verify the interruption requirements for NR PCell in NR SA specified in TS 38.133 clause 8.2.2 and 8.3A. Supported test configurations are shown in table A.13.2.1.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.13.2.1.1.1-2 and A.13.2.1.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 and Cell2 are PCell and SCell. Cell 1 is on a licenced band and cell 2 is subject to CCA. The test consists of five time periods, with duration of T1, T2, T3, T4 and T5. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. Throughout the test, the PCell are continuously scheduled in DL. The power of signals on cell 1 and 2 is not modified during the test.

Prior to T1, a connection is started with cell 1 as the PCell, and measurements of cell 2 are configured with gap pattern 0, such that cell 2 is reported. This ensures that cell 2 is known at the start of time period T1 and is not itself part of the tested requirement.

The point in time at which the RRC message implying SCell addition is received at the UE antenna connector, defines the start of time period T1. Measurement gap pattern 0 shall be stopped when the SCell is configured.

The point in time at which the MAC-CE message implying SCell activation is received at the UE antenna connector, defines the start of time period T2.

The point in time at which the MAC-CE message implying SCell deactivation is received at the UE antenna connector, defines the start of time period T3.

The point in time at which deactivation delay requirement in section 8.3A are satisfied defines the start of time period T4

The point in time at which the RRC message implying SCell release is received at the UE antenna connector, defines the start of time period T5.

**Table A.13.2.1.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations**

| Configuration  | Description  |
|--|--|
| 1  | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2  | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3  | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |  |

**Table A.13.2.1.1.1-2: General test parameters for Interruptions during measurements on deactivated NR SCC**

| Parameter                                | Unit | Value  | Comment                          |
|--|------|--------|----------------------------------|
| RF Channel Number                        |      | 1, 2   |                                  |
| Active PCell                             |      | Cell1  | PCell on NR RF channel number 1. |
| Configured dSCell                        |      | Cell2  | SCell on NR RF channel number 2  |
| CP length                                |      | Normal | Applicable to Cell1, Cell2       |
| DRX                                      |      | OFF    |                                  |
| Measurement gap pattern Id               |      | OFF    |                                  |
| SCell measurement cycle (measCycleSCell) | ms   | 160    |                                  |
| T1                                       | s    | <10    |                                  |
| T2                                       | s    | <10    |                                  |
| T3                                       | s    | <10    |                                  |
| T4                                       | s    | <10    |                                  |
| T5                                       | s    | <10    |                                  |

**Table A.13.2.1.1.1-3: NR cell specific test parameters for Interruptions during measurements on deactivated NR SCC**

| Parameter  |                       | Unit       | Cell1                       |    |    |    |    | Cell2                             |            |      |    |    |
|--|-----------------------|------------|-----------------------------|----|----|----|----|-----------------------------------|------------|------|----|----|
|  |                       |            | T1                          | T2 | T3 | T4 | T5 | T1                                | T2         | T3   | T4 | T5 |
| TDD configuration  | Config 1              |            | ---                         |    |    |    |    | TDDConf.1.1 CCA                   |            |      |    |    |
|  | Config 2              |            | TDDConf.1.1                 |    |    |    |    |                                   |            |      |    |    |
|  | Config 3              |            | TDDConf.2.1                 |    |    |    |    |                                   |            |      |    |    |
| BW <sub>channel</sub>  | Config 1,2            | MHz        | 10: N <sub>RB,c</sub> = 52  |    |    |    |    | 40: N <sub>RB,c</sub> = 106       |            |      |    |    |
|  | Config 3              |            | 40: N <sub>RB,c</sub> = 106 |    |    |    |    |                                   |            |      |    |    |
| DL CCA model   | Config 1,2,3          |            | ---                         |    |    |    |    | As specified in clause A.3.20.2.1 |            |      |    |    |
| DL CCA probability for semi-static channel access <sup>Note6,8</sup> | P <sub>CCA_DL</sub>   |            | ---                         |    |    |    |    | 0.9375                            |            |      |    |    |
| DL CCA probability for dynamic channel access <sup>Note7,8</sup>     | P <sub>CCA_DL_1</sub> |            | ---                         |    |    |    |    | 0.75                              |            |      |    |    |
|  | P <sub>CCA_DL_2</sub> |            | ---                         |    |    |    |    | 0.75                              |            |      |    |    |
| Initial BWP Configuration  | Config 1,2,3          |            | DLBWP.0.1                   |    |    |    |    | DLBWP.0.1                         |            |      |    |    |
| Dedicated DL BWP Configuration                                       | Config 1,2,3          |            | DLBWP.1.1                   |    |    |    |    | DLBWP.1.1                         |            |      |    |    |
| Initial UL BWP Configuration   | Config 1,2,3          |            | ULBWP.0.1                   |    |    |    |    | ULBWP.0.1                         |            |      |    |    |
| Dedicated UL BWP Configuration                                       | Config 1,2,3          |            | ULBWP.1.1                   |    |    |    |    | ULBWP.1.1                         |            |      |    |    |
| PDSCH reference measurement channel                                  | Config 1              |            | SR.1.1 FDD                  |    |    |    |    | ---                               |            |      |    |    |
|  | Config 2              |            | SR.1.1 TDD                  |    |    |    |    |                                   |            |      |    |    |
|  | Config 3              |            | SR.2.1 TDD                  |    |    |    |    |                                   |            |      |    |    |
| RMSI CORESET Parameters  | Config 1              |            | CR.1.1 FDD                  |    |    |    |    | ---                               |            |      |    |    |
|  | Config 2              |            | CR.1.1 TDD                  |    |    |    |    |                                   |            |      |    |    |
|  | Config 3              |            | CR.2.1 TDD                  |    |    |    |    |                                   |            |      |    |    |
| PDCCH CORESET Parameters   | Config 1              |            | CCR.1.1 FDD                 |    |    |    |    | ---                               |            |      |    |    |
|  | Config 2              |            | CCR.1.1 TDD                 |    |    |    |    |                                   |            |      |    |    |
|  | Config 3              |            | CCR.2.1 TDD                 |    |    |    |    |                                   |            |      |    |    |
| TRS configuration  | Config 1              |            | TRS.1.1 FDD                 |    |    |    |    | ---                               |            |      |    |    |
|  | Config 2              |            | TRS.1.1 TDD                 |    |    |    |    |                                   |            |      |    |    |
|  | Config 3              |            | TRS.1.2 TDD                 |    |    |    |    |                                   |            |      |    |    |
| OCNG Pattern   |                       |            | OP.1                        |    |    |    |    | OP.1                              |            |      |    |    |
| SSB configuration for semi-static channel access <sup>Note6,8</sup>  | Config 1,2            |            | SSB.1 FR1                   |    |    |    |    | SSB.1 CCA                         |            |      |    |    |
|  | Config 3              |            | SSB.2 FR1                   |    |    |    |    |                                   |            |      |    |    |
| SSB configuration for dynamic channel access <sup>Note7,8</sup>      | Config 1,2            |            | SSB.1 FR1                   |    |    |    |    | SSB.2 CCA                         |            |      |    |    |
|  | Config 3              |            | SSB.2 FR1                   |    |    |    |    |                                   |            |      |    |    |
| SMTC Configuration   | Config 1,2,3          |            | SMTC.1                      |    |    |    |    | SMTC.1                            |            |      |    |    |
| DBT window configuration   | Config 1,2,3          |            | ---                         |    |    |    |    | DBT.1                             |            |      |    |    |
| TCI state  |                       |            | TCI.State.0                 |    |    |    |    | ---                               |            |      |    |    |
| Correlation Matrix and Antenna Configuration                         |                       |            | 1x2 Low                     |    |    |    |    | 1x2 Low                           |            |      |    |    |
| EPRE ratio of PSS to SSS   |                       | dB         | 0                           |    |    |    |    | 0                                 |            |      |    |    |
| EPRE ratio of PBCH DMRS to SSS                                       |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| EPRE ratio of PBCH to PBCH DMRS                                      |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| EPRE ratio of PDCCH DMRS to SSS                                      |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS                                    |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| EPRE ratio of PDSCH DMRS to SSS                                      |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| EPRE ratio of PDSCH to PDSCH   |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                               |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                             |                       |            |                             |    |    |    |    |                                   |            |      |    |    |
| N <sub>oc</sub> <sup>Note 2</sup>                                    | Config 1,2,3          |            |                             |    |    |    |    |                                   | dBm/15 kHz | -104 |    |    |
| N <sub>oc</sub> <sup>Note 2</sup>                                    | Config 1,2            | dBm/SCS    | -104                        |    |    |    |    | -101                              |            |      |    |    |
|  | Config 3              |            | -101                        |    |    |    |    |                                   |            |      |    |    |
| SS-RSRP <sup>Note 3</sup>  | Config 1,2,3          | dBm/15 kHz | -87                         |    |    |    |    | -87                               |            |      |    |    |
| $\bar{E}_s/I_{ot}$   |                       | dB         | 17                          |    |    |    |    | 17                                |            |      |    |    |
| $\bar{E}_s/N_{oc}$   |                       | dB         | 17                          |    |    |    |    | 17                                |            |      |    |    |
| Propagation Condition  |                       |            | AWGN                        |    |    |    |    | AWGN                              |            |      |    |    |



|         |   |
|---------|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For Cell 2 with CCA model, OCNG is transmitted only in slots with downlink transmission bursts and is not transmitted during muted slots or during DBT windows. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| Note 4: | Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells  |
| Note 5: | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  |
| Note 6: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.   |
| Note 7: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.   |
| Note 8: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.   |

### A.13.2.1.1.2 Test Requirements

The UE shall meet the interruption requirements for SCell addition on the victim PCell in clause 8.2.1 during time T1

The UE shall meet the interruption requirements for SCell activation on the victim PCell in clause 8.2.1 during time T2. There shall be a single interruption with time window as specified in clause 8.3A.2

The UE shall meet the interruption requirements for SCell deactivation on the victim PCell in clause 8.2.1 during time T3. There shall be a single interruption with time window as specified in clause 8.3A.3

The UE shall meet the interruption requirements for deactivated SCell measurements on the victim PCell in clause 8.2.1 during time T4. The interruptions shall be within the time window as specified in clause 8.3A.3

The UE shall meet the interruption requirements for SCell release on the victim PCell in clause 8.2.1 during time T5.

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

## A.13.2.2 SCell activation and deactivation delay

### A.13.2.2.1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle

#### A.13.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell on NR-U SCC with CCA are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 160 ms.

The supported test configurations are shown in Table A.13.2.2.1.1-1.

The test parameters are given in Table A.13.2.2.1.1-2 and cell-specific parameters in Table A.13.2.2.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two carriers, each with one cell: Cell 1 (PCell) on radio channel 1 (PCC) in NR FR1, and Cell2 (SCell) on radio channel 2 (SCC) in NR with CCA. Before the test starts the UE is connected to Cell 1, but is not aware of Cell 2, as the UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. At the end of T1, the test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted  $m$ , defines the start of time period T2. The UE shall be able to report a valid CSI in PCell for the activated SCell at latest in slot  $m + \frac{T_{HARQ} + T_{activation\_time\_withCCA} + T_{CSI\_Reporting\_withCCA}}{NR\ slot\ length}$ , as defined in clause 8.3A.2. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $m + \frac{T_{HARQ} + 3ms}{NR\ slot\ length}$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed.

Any PCell interruption shall fall within the time window specified in clause 8.3A.2. At the end of T2 the test equipment sends a MAC message for deactivation of the SCell.

The point in time at which the MAC message is received by at the UE antenna connector, in a slot # denoted  $n$ , defines the start of time period T3. The UE shall complete the activation at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR slot length}}$ . Any PCell interruption shall fall within the time window specified in clause 8.3A.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received, while taking into account CCA failures on SCC.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

**Table A.13.2.2.1.1-1: Supported test configurations for SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Configuration | Description  |
|---------------|--|
| 1             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3             | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:         | The UE is only required to be tested in one of the supported test configurations   |

**Table A.13.2.2.1.1-2: General test parameters for known SCell activation with SCell under CCA, 160 ms SCell measurement cycle**

| Parameter  | Unit | Value  | Comment  |
|--|------|--|--|
| RF Channel Number                                  |      | 1,2  | Two radio channels (1, 2) are used for this test   |
| Active PCell                                       |      | Cell 1   | Primary cell on NR RF channel number 1.  |
| Configured deactivated SCell                       |      | Cell 2   | Configured deactivated secondary cell on NR RF channel number 2  |
| CP length  |      | Normal   |  |
| DRX  |      | OFF  | Continuous monitoring of primary cell  |
| CQI/PMI periodicity and offset configuration index |      | 0  | CQI reporting for SCell every fourth slot  |
| SCell measurement cycle (measCycleSCell)           | ms   | 160  |  |
| Cell2 timing offset to cell1                       | μs   | 0  |  |
| Time alignment error between cell2 and cell1       | μs   | ≤ TAE as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation.  |
| T1   | s    | 7  | During this time the PCell shall be known and the SCell configured and detected.   |
| T2   | s    | 1  | During this time the UE shall activate the SCell.  |
| T3   | s    | 1  | During this time the UE shall deactivate the SCell.  |
| T <sub>HARQ</sub>                                  | ms   | $k_1 \times \text{NR slot length}$                   | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by <i>dl-DataToUL-ACK</i> , the value of $k$ should be the minimum value defined in TS 38.213 [3] depends on UE's capability  |
| T <sub>CSI_Reporting</sub>                         | ms   | $10 + 5 \cdot 2^{\mu_{DL}}$                          | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]<br>$\mu_{DL}$ is the subcarrier spacing configuration for DL |

**Table A.13.2.2.1.1-3: Cell specific test parameters for known FR1 SCell activation case with SCell under CCA, 160 ms SCell measurement cycle**

| Parameter  |                       | Unit    | Cell 1                      |    |    | Cell 2                               |    |    |
|--|-----------------------|---------|-----------------------------|----|----|--------------------------------------|----|----|
|  |                       |         | T1                          | T2 | T3 | T1                                   | T2 | T3 |
| Duplex mode  | Config 1              |         | FDD                         |    |    | TDD                                  |    |    |
|  | Config 2,3            |         | TDD                         |    |    |                                      |    |    |
| TDD configuration  | Config 1              |         | ---                         |    |    | TDDConf.1.1 CCA                      |    |    |
|  | Config 2              |         | TDDConf.1.1                 |    |    |                                      |    |    |
|  | Config 3              |         | TDDConf.2.1                 |    |    |                                      |    |    |
| BW <sub>channel</sub>  | Config 1,2            | MHz     | 10: N <sub>RB,c</sub> = 52  |    |    | 40: N <sub>RB,c</sub> = 106          |    |    |
|  | Config 3              |         | 40: N <sub>RB,c</sub> = 106 |    |    |                                      |    |    |
| DL CCA model   |                       |         | ---                         |    |    | As specified in clause A.3.26.2.1    |    |    |
| DL CCA probability for semi-static channel access <sup>Note5,7</sup> | P <sub>CCA_DL</sub>   |         | ---                         |    |    | 0.9375                               |    |    |
| DL CCA probability for dynamic channel access <sup>Note6,7</sup>     | P <sub>CCA_DL_1</sub> |         | ---                         |    |    | 0.75                                 |    |    |
|  | P <sub>CCA_DL_2</sub> |         | ---                         |    |    | 0.75                                 |    |    |
| P <sub>CCA_UL</sub>  |                       |         |                             |    |    | 1                                    |    |    |
| L <sub>CCA_DL</sub> <sup>Note 8</sup>                                |                       |         |                             |    |    | 2                                    |    |    |
| W <sub>CCA_DL</sub> <sup>Note 8</sup>                                |                       | ms      |                             |    |    | T <sub>activation_time_withCCA</sub> |    |    |
| Initial downlink BWP configuration                                   |                       |         | DLBWP.0.2                   |    |    | DLBWP.0.2                            |    |    |
| Initial uplink BWP configuration                                     |                       |         | ULBWP.0.1                   |    |    | ULBWP.0.1                            |    |    |
| Dedicated downlink BWP configuration                                 |                       |         | DLBWP.0.2                   |    |    | DLBWP.0.2                            |    |    |
| Dedicated uplink BWP configuration                                   |                       |         | ULBWP.0.1                   |    |    | ULBWP.0.1                            |    |    |
| TCI state  |                       |         | TCI.State.0                 |    |    | TCI.State.0                          |    |    |
| TRS Configuration  | Config 1              |         | TRS.1.1 FDD                 |    |    | TRS.1.2 TDD                          |    |    |
|  | Config 2              |         | TRS.1.1 TDD                 |    |    |                                      |    |    |
|  | Config 3              |         | TRS.1.2 TDD                 |    |    |                                      |    |    |
| PDSCH Reference measurement channel                                  | Config 1              |         | SR.1.1 FDD                  |    |    | SR.1.1 CCA                           |    |    |
|  | Config 2              |         | SR.1.1 TDD                  |    |    |                                      |    |    |
|  | Config 3              |         | SR.2.1 TDD                  |    |    |                                      |    |    |
| Dedicated CORESET parameters   | Config 1              |         | CCR.1.1 FDD                 |    |    | CCR.1.3 CCA                          |    |    |
|  | Config 2              |         | CCR.1.1 TDD                 |    |    |                                      |    |    |
|  | Config 3              |         | CCR.2.1 TDD                 |    |    |                                      |    |    |
| RMSI CORESET parameters  | Config 1              |         | CR.1.1 FDD                  |    |    | CR.1.1 CCA                           |    |    |
|  | Config 2              |         | CR.1.1 TDD                  |    |    |                                      |    |    |
|  | Config 3              |         | CR.2.1 TDD                  |    |    |                                      |    |    |
| OCNG Patterns <sup>Note1</sup>                                       |                       |         | OP.1                        |    |    | OP.1                                 |    |    |
| SSB Configuration for semi-static channel access <sup>Note5,7</sup>  | Config 1,2            |         | SSB.1 FR1                   |    |    | SSB.1 CCA                            |    |    |
|  | Config 3              |         | SSB.2 FR1                   |    |    |                                      |    |    |
| SSB Configuration for dynamic channel access <sup>Note6,7</sup>      | Config 1,2            |         | SSB.1 FR1                   |    |    | SSB.2 CCA                            |    |    |
|  | Config 3              |         | SSB.2 FR1                   |    |    |                                      |    |    |
| SMTc configuration   |                       |         | SMTc.1                      |    |    | SMTc.1                               |    |    |
| DBT window configuration   |                       |         | ---                         |    |    | DBT.1                                |    |    |
| EPRE ratio of PSS to SSS   |                       | dB      | 0                           |    |    | 0                                    |    |    |
| EPRE ratio of PBCH DMRS to SSS                                       |                       |         |                             |    |    |                                      |    |    |
| EPRE ratio of PBCH to PBCH DMRS                                      |                       |         |                             |    |    |                                      |    |    |
| EPRE ratio of PDCCH DMRS to SSS                                      |                       |         |                             |    |    |                                      |    |    |
| EPRE ratio of PDCCH to PDCCH DMRS                                    |                       |         |                             |    |    |                                      |    |    |
| EPRE ratio of PDSCH DMRS to SSS                                      |                       |         |                             |    |    |                                      |    |    |
| EPRE ratio of PDSCH to PDSCH   |                       |         |                             |    |    |                                      |    |    |
| EPRE ratio of OCNG DMRS to SSS <sup>Note1</sup>                      |                       |         |                             |    |    |                                      |    |    |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note1</sup>                     |                       |         |                             |    |    |                                      |    |    |
| N <sub>oc</sub> <sup>Note2</sup>                                     | Config 1,2            |         |                             |    |    |                                      |    |    |
|  | Config 3              |         |                             |    |    |                                      |    |    |
| N <sub>oc</sub> <sup>Note2</sup>                                     | Config 1,2            | dBm/SCS | -104                        |    |    | -101                                 |    |    |
|  | Config 3              |         |                             |    |    |                                      |    |    |
| E <sub>s</sub> /I <sub>ot</sub>                                      |                       | dB      | 17                          |    |    | 17                                   |    |    |
| E <sub>s</sub> /N <sub>oc</sub>                                      |                       | dB      | 17                          |    |    | 17                                   |    |    |
| SS-RSRP <sup>Note3</sup>   | Config 1,2            | dBm/SCS | -87                         |    |    | -84                                  |    |    |
|  | Config 3              |         | -84                         |    |    | -84                                  |    |    |
| I <sub>o</sub> <sup>Note3</sup>                                      |                       |         | -58.96                      |    |    | -52.87                               |    |    |

|                       |  |   |        |        |
|-----------------------|--|---|--------|--------|
|                       | Config 3   |   | -52.87 | -52.87 |
| Propagation condition |  | - | AWGN   |        |
| Note 1:               | OCNG shall be used such that resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For Cell 2 with CCA model, OCNG is transmitted only in slots with downlink transmission bursts and is not transmitted during muted slots or during DBT windows. |   |        |        |
| Note 2:               | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.   |   |        |        |
| Note 3:               | SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |   |        |        |
| Note 4:               | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.  |   |        |        |
| Note 5:               | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |   |        |        |
| Note 6:               | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |   |        |        |
| Note 7:               | For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.  |   |        |        |
| Note 8:               | As specified in clause 8.3A for $L_{1,max}$ , $L_{2,1,max}$ , $L_{2,2,max}$ , $L_{3,1,max}$ , and $L_{3,2,max}$  |   |        |        |

### A.13.2.2.1.2 Test Requirements

During T2, the UE shall send the first CSI report for SCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $m+1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ .

During T2, conditioned on that downlink CCA failures  $L_1$  and  $L_{2,2}$  experienced in the SCell fulfill  $L_1 \leq L_{1,max}$  and  $L_{2,2} \leq L_{2,2,max}$  with  $L_{1,max} = 2$  and  $L_{2,2,max} = 2$ , respectively, the UE shall send the first valid CSI report (non-zero CQI) for the SCell no later than slot  $m + (T_{HARQ} + T_{activation\_time\_withCCA} + T_{CSI\_Reporting\_withCCA}) / NR\_slot\_length$ , where  $T_{activation\_time\_withCCA} = T_{FirstSSB} + L_1 * T_{rs} + 5ms$  and  $T_{CSI\_reporting\_withCCA} = T_{CSI\_reporting} + L_{2,2} * T_{CSI\_RS} + T_{CSI\_ReportingDelay}$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ , as defined in clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot  $m+1 + \frac{T_{HARQ}}{NR\ slot\ length}$  to slot  $m+1 + \frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$  with  $T_X = T_{FirstSSB}$ .

During T3, interruption on PCell shall not occur outside slot  $n+1 + T_{HARQ} / NR\_slot\_length$  to slot  $n+1 + (T_{HARQ} + 3ms) / NR\_slot\_length$ .

The interruption on PCell shall not be more than specified for SA in clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

### A.13.2.2.2 SCell Activation and Deactivation of known SCell under CCA, 320 ms SCell measurement cycle

#### A.13.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell on NR-U SCC with CCA are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 320 ms.

The supported test configurations are same as in Table A.13.2.2.1.1-1 above.

The test parameters are same as in Table A.13.2.2.1.1-2 above, except for parameters listed below in Table A.13.2.2.2.1-1. The cell-specific parameters are same as in Table A.13.2.2.1.1-3 above.

The test execution is the same as described in clause A.13.2.2.1 above, except that downlink CCA failures  $L_{2,1}$  and  $L_{2,2}$  with limits  $L_{2,1} \leq L_{2,1,max}$  and  $L_{2,2} \leq L_{2,2,max}$  replace  $L_1$  as described in clause 8.3A.2 for activation of known SCell with a measurement cycle larger than 160 ms.

**Table A.13.2.2.2.1-1: General test parameters for known SCell activation with SCell under CCA, 320 ms SCell measurement cycle**

| Parameter                                | Unit | Value | Comment |
|--|------|-------|---------|
| SCell measurement cycle (measCycleSCell) | ms   | 320   |         |

#### A.13.2.2.2.2 Test Requirements

During T2, the UE shall send the first CSI report for SCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $m+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$ .

During T2, conditioned on that downlink CCA failures  $L_{2,1}$  and  $L_{2,2}$  experienced in the SCell fulfill  $L_{2,1} \leq L_{2,1,max}$  and  $L_{2,2} \leq L_{2,2,max}$  with  $L_{2,1,max} = 2$  and  $L_{2,2,max} = 2$ , respectively, the UE shall send the first valid CSI report (non-zero CQI) for the SCell no later than slot  $m + (T_{HARQ}+T_{activation\_time\_withCCA} + T_{CSI\_Reporting\_withCCA})/NR\_slot\_length$ , where  $T_{activation\_time\_withCCA} = T_{FirstSSB\_MAX} + L_{2,1} * T_{SMTC\_MAX} + (1 + L_{2,2}) * T_{rs} + 5ms$  and  $T_{CSI\_reporting\_withCCA} = T_{CSI\_reporting} + T_{CSI\_ReportingDelay}$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ , as defined in clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot  $m+1+\frac{T_{HARQ}}{NR\ slot\ length}$  to slot  $m+1+\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$  with  $T_X = T_{FirstSSB}$ .

During T3, interruption on PCell shall not occur outside slot  $n+1+T_{HARQ}/NR\_slot\_length$  to slot  $n+1+(T_{HARQ}+3ms)/NR\_slot\_length$ .

The interruption on PCell shall not be more than specified for SA in clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

#### A.13.2.2.3 SCell Activation and Deactivation of unknown SCell under CCA

##### A.13.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell on NR-U SCC with CCA are within the requirements stated in clause 8.3A, when the SCell is unknown to the UE at the time of activation.

The supported test configurations are same as in Table A.13.2.2.1.1-1 above.

The test parameters are same as in Table A.13.2.2.1.1-2 above, except for parameters listed below in Table A.13.2.2.3.1-1. The cell-specific parameters are same as in Table A.13.2.2.1.1-3 above.

The test execution is the same as described in clause A.13.2.2.1 above, except that downlink CCA failures  $L_{3,1}$  and  $L_{3,2}$  with limits  $L_{3,1} \leq L_{3,1,max}$  and  $L_{3,2} \leq L_{3,2,max}$  replace  $L_1$  as described in clause 8.3A.2 for activation of unknown SCell.

**Table A.13.2.2.3.1-1: General test parameters for unknown SCell activation with SCell under CCA**

| Parameter | Unit | Value | Comment  |
|-----------|------|-------|--|
| T1        | s    | 0.1   | During this time period the PCell shall be known and the SCell configured, but not detected. |

##### A.13.2.2.3.2 Test Requirements

During T2, the UE shall send the first CSI report for SCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $m+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$ .

During T2, conditioned on that downlink CCA failures  $L_{3,1}$  and  $L_{3,2}$  experienced in the SCell fulfill  $L_{3,1} \leq L_{3,1,max}$  and  $L_{3,2} \leq L_{3,2,max}$  with  $L_{3,1,max} = 2$  and  $L_{3,2,max} = 2$ , respectively, the UE shall send the first valid CSI report (non-zero CQI)

for the SCell no later than slot  $m + (T_{\text{HARQ}} + T_{\text{activation\_time\_withCCA}} + T_{\text{CSI\_Reporting\_withCCA}}) / \text{NR\_slot\_length}$ , where  $T_{\text{activation\_time\_withCCA}} = T_{\text{FirstSSB\_MAX}} + (1 + L_{3,1}) * T_{\text{SMTc\_MAX}} + (2 + L_{3,2}) * T_{\text{rs}} + 5\text{ms}$  and  $T_{\text{CSI\_reporting\_withCCA}} = T_{\text{CSI\_reporting}} + T_{\text{CSI\_ReportingDelay}}$ , as specified in clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot  $n + \frac{T_{\text{HARQ}} + 3\text{ms}}{\text{NR\_slot\_length}}$ , as defined in clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot  $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR\_slot\_length}}$  to slot  $m + 1 + \frac{T_{\text{HARQ}} + 3 + T_X}{\text{NR\_slot\_length}}$  with  $T_X = T_{\text{FirstSSB}}$ .

During T3, interruption on PCell shall not occur outside slot  $n + 1 + T_{\text{HARQ}} / \text{NR\_slot\_length}$  to slot  $n + 1 + (T_{\text{HARQ}} + 3\text{ms}) / \text{NR\_slot\_length}$ .

The interruption on PCell shall not be more than specified for SA in clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

### A.13.2.3 Void

## A.13.3 Measurement procedure

### A.13.3.1 Intra-frequency measurements

#### A.13.3.1.1 Event-triggered reporting tests on SCC without gaps under non-DRX

##### A.13.3.1.1.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

##### A.13.3.1.1.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.1.2-1 and A.13.3.1.1.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.13.3.1.1.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3             | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE:         | The UE is only required to be tested in one of the supported test configurations.   |



**Table A.13.3.1.1.2-2: General test parameters for intra-frequency event triggered reporting without gaps**

| Parameter                             | Unit | Test configuration | Value                              |         |         | Comment   |
|---------------------------------------|------|--------------------|------------------------------------|---------|---------|---|
|                                       |      |                    | Test 1                             | Test 2  | Test 3  |   |
| Active PCell                          |      | 1, 2, 3            | Cell 1                             |         |         |   |
| Active SCell                          |      | 1, 2, 3            | Cell 2                             |         |         |   |
| Neighbour cell                        |      | 1, 2, 3            | Cell 3                             |         |         | Cell to be identified.  |
| RF Channel Number                     |      | 1, 2, 3            | 1: Cell 1<br>2: Cell 2 and Cell 3  |         |         |   |
| DL CCA model                          |      |                    | As specified in clause A.3.20.2.1  |         |         |   |
| UL CCA model                          |      |                    | As specified in clause A.3.20.2.2  |         |         |   |
| SSB configuration                     |      | 1                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |         |         |   |
|                                       |      | 2                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |         |         |   |
|                                       |      | 3                  | Cell 1: SSB.2 FR1<br>Cell 2,3: TBD |         |         |   |
| SMTC configuration                    |      | 1                  | Cell 1: SMTC.2<br>Cell 2,3: N/A    |         |         |   |
|                                       |      | 2                  | Cell 1: SMTC.1<br>Cell 2,3: N/A    |         |         |   |
|                                       |      | 3                  | Cell 1: SMTC.1<br>Cell 2,3: N/A    |         |         |   |
| DBT window configuration              |      | 1, 2, 3            | Cell 1: N/A<br>Cell 2,3: TBD       |         |         |   |
| A3-Offset                             | dB   | 1, 2, 3            | -4.5                               |         |         |   |
| Event A3 measurement quantity         |      |                    | SS-RSRP                            | SS-RSRQ | SS-SINR |   |
| CP length                             |      | 1, 2, 3            | Normal                             |         |         |   |
| Hysteresis                            | dB   | 1, 2, 3            | 0                                  |         |         |   |
| Time To Trigger                       | s    | 1, 2, 3            | 0                                  |         |         |   |
| Filter coefficient                    |      | 1, 2, 3            | 0                                  |         |         | L3 filtering is not used  |
| DRX                                   |      | 1, 2, 3            |                                    |         |         | OFF   |
| Time offset between Cell 2 and Cell 3 |      | 1                  | 3 ms                               |         |         | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|                                       |      | 2                  | 3 $\mu$ s                          |         |         | Synchronous cells   |
|                                       |      | 3                  | 3 $\mu$ s                          |         |         | Synchronous cells   |
| T1                                    | s    | 1, 2, 3            | TBD                                |         |         |   |
| T2                                    | s    | 1, 2, 3            | TBD                                |         |         |   |

**Table A.13.3.1.1.2-3: Cell-specific test parameters for intra-frequency event-triggered reporting without gaps**

| Parameter                            | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |     | Cell 3                 |     |
|--------------------------------------|---------------|--------------------|------------------------|--------|------------------------|-----|------------------------|-----|
|                                      |               |                    | T1                     | T2     | T1                     | T2  | T1                     | T2  |
| DL CCA probability<br>$P_{CCA\_DL}$  |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| UL CCA probability<br>$P_{CCA\_UL}$  |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| TDD configuration                    |               | 1                  | N/A                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | TDDConf.1.1            |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | TDDConf.2.1            |        | TBD                    |     | TBD                    |     |
| PDSCH RMC configuration              |               | 1                  | SR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | SR.1.1 TDD             |        |                        |     |                        |     |
|                                      |               | 3                  | SR.2.1 TDD             |        |                        |     |                        |     |
| RMSI CORESET RMC configuration       |               | 1                  | CR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | CR.1.1 TDD             |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | CR.2.1 TDD             |        | TBD                    |     | TBD                    |     |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | CCR.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | CCR.2.1 TDD            |        | TBD                    |     | TBD                    |     |
| OCNG Patterns                        |               | 1, 2, 3            | OP.1                   |        | TBD                    |     | TBD                    |     |
| TRS Configuration                    |               | 1                  | TRS.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | TRS.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | TRS.1.2 TDD            |        | TBD                    |     | TBD                    |     |
| Initial BWP configuration            |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |     | DLBWP.0.1<br>ULBWP.0.1 |     |
| Active DL BWP configuration          |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.1              |     | DLBWP.1.1              |     |
| Active UL BWP configuration          |               | 1, 2, 3            | ULBWP.1.1              |        | ULBWP.1.1              |     | ULBWP.1.1              |     |
| RLM-RS                               |               | 1, 2, 3            | SSB                    |        | SSB                    |     | SSB                    |     |
| $N_{oc}$ <sup>Note 2</sup>           | dBm/SCS       | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $N_{oc}$ <sup>Note 2</sup>           | dBm/15 kHz    | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $\hat{E}_s/I_{ot}$ <sup>Note 5</sup> | dB            | 1                  | 4                      | -1.46  | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| $\hat{E}_s/N_{oc}$ <sup>Note 5</sup> | dB            | 1                  | 4                      | 4      | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| SS-RSRP <sup>Note 3,5</sup>          | dBm/SCS kHz   | 1                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 2                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 3                  | -91                    | -91    | TBD                    | TBD | -Infinity              | TBD |
| I <sub>o</sub>                       | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|                                      | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|                                      | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | TBD                    | TBD | TBD                    | TBD |
| Propagation Condition                |               | 1, 2, 3            | AWGN                   |        |                        |     |                        |     |

|   |
|---|
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.          |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| NOTE 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy. |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.   |

### A.13.3.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

*Editor's note: D1=TBD.*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.13.3.1.2 Event-triggered reporting tests on SCC without gaps under DRX

#### A.13.3.1.2.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.5.1 and 9.2A.5.2.

#### A.13.3.1.2.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.2.2-1 and A.13.3.1.2.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In Test 1 and Test 2, the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In Test 3 and Test 4, the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In Test 5 and Test 6, the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.13.3.1.2.2-1: Supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3             | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

NOTE: The UE is only required to be tested in one of the supported test configurations.

**Table A.13.3.1.2.2-2: General test parameters for intra-frequency event triggered reporting without gaps with DRX**

| Parameter                             | Unit | Test configuration | Value                              |        |         |        |         |        | Comment  |
|---------------------------------------|------|--------------------|------------------------------------|--------|---------|--------|---------|--------|--|
|                                       |      |                    | Test 1                             | Test 2 | Test 3  | Test 4 | Test 5  | Test 6 |  |
| Active PCell                          |      | 1, 2, 3            | Cell 1                             |        |         |        |         |        |  |
| Active SCell                          |      | 1, 2, 3            | Cell 2                             |        |         |        |         |        |  |
| Neighbour cell                        |      | 1, 2, 3            | Cell 3                             |        |         |        |         |        | Cell to be identified.   |
| RF Channel Number                     |      | 1, 2, 3            | 1: Cell 1<br>2: Cell 2 and Cell 3  |        |         |        |         |        |  |
| DL CCA model                          |      |                    | As specified in clause A.3.20.2.1  |        |         |        |         |        |  |
| UL CCA model                          |      |                    | As specified in clause A.3.20.2.2  |        |         |        |         |        |  |
| SSB configuration                     |      | 1                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |        |         |        |         |        |  |
|                                       |      | 2                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |        |         |        |         |        |  |
|                                       |      | 3                  | Cell 1: SSB.2 FR1<br>Cell 2,3: TBD |        |         |        |         |        |  |
| SMTTC configuration                   |      | 1                  | Cell 1: SMTTC.2<br>Cell 2,3: N/A   |        |         |        |         |        |  |
|                                       |      | 2                  | Cell 1: SMTTC.1<br>Cell 2,3: N/A   |        |         |        |         |        |  |
|                                       |      | 3                  | Cell 1: SMTTC.1<br>Cell 2,3: N/A   |        |         |        |         |        |  |
| DBT window configuration              |      | 1, 2, 3            | Cell 1: N/A<br>Cell 2,3: TBD       |        |         |        |         |        |  |
| A3-Offset                             | dB   | 1, 2, 3            | -4.5                               |        |         |        |         |        |  |
| Event A3 measurement quantity         |      |                    | SS-RSRP                            |        | SS-RSRQ |        | SS-SINR |        |  |
| CP length                             |      | 1, 2, 3            | Normal                             |        |         |        |         |        |  |
| Hysteresis                            | dB   | 1, 2, 3            | 0                                  |        |         |        |         |        |  |
| Time To Trigger                       | s    | 1, 2, 3            | 0                                  |        |         |        |         |        |  |
| Filter coefficient                    |      | 1, 2, 3            | 0                                  |        |         |        |         |        | L3 filtering is not used   |
| DRX                                   |      | 1, 2, 3            | DRX.1                              | DRX.2  | DRX.1   | DRX.2  | DRX.1   | DRX.2  |  |
| Time offset between Cell 2 and Cell 3 |      | 1                  | 3 ms                               |        |         |        |         |        | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|                                       |      | 2                  | 3 μs                               |        |         |        |         |        | Synchronous cells  |
|                                       |      | 3                  | 3 μs                               |        |         |        |         |        | Synchronous cells  |
| T1                                    | s    | 1, 2, 3            | TBD                                |        |         |        |         |        |  |
| T2                                    | s    | 1, 2, 3            | TBD                                | TBD    | TBD     | TBD    | TBD     | TBD    |  |

**Table A.13.3.1.2.2-3: Cell-specific test parameters for intra-frequency event-triggered reporting without gaps**

| Parameter                            | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |     | Cell 3                 |     |
|--------------------------------------|---------------|--------------------|------------------------|--------|------------------------|-----|------------------------|-----|
|                                      |               |                    | T1                     | T2     | T1                     | T2  | T1                     | T2  |
| DL CCA probability<br>$P_{CCA\_DL}$  |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| UL CCA probability<br>$P_{CCA\_UL}$  |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| TDD configuration                    |               | 1                  | N/A                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | TDDConf.1.1            |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | TDDConf.2.1            |        | TBD                    |     | TBD                    |     |
| PDSCH RMC configuration              |               | 1                  | SR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | SR.1.1 TDD             |        |                        |     |                        |     |
|                                      |               | 3                  | SR.2.1 TDD             |        |                        |     |                        |     |
| RMSI CORESET RMC configuration       |               | 1                  | CR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | CR.1.1 TDD             |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | CR.2.1 TDD             |        | TBD                    |     | TBD                    |     |
| Dedicated CORESET RMC configuration  |               | 1                  | CCR.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | CCR.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | CCR.2.1 TDD            |        | TBD                    |     | TBD                    |     |
| OCNG Patterns                        |               | 1, 2, 3            | OP.1                   |        | TBD                    |     | TBD                    |     |
| TRS Configuration                    |               | 1                  | TRS.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | TRS.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | TRS.1.2 TDD            |        | TBD                    |     | TBD                    |     |
| Initial BWP configuration            |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |     | DLBWP.0.1<br>ULBWP.0.1 |     |
| Active DL BWP configuration          |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.1              |     | DLBWP.1.1              |     |
| Active UL BWP configuration          |               | 1, 2, 3            | ULBWP.1.1              |        | ULBWP.1.1              |     | ULBWP.1.1              |     |
| RLM-RS                               |               | 1, 2, 3            | SSB                    |        | SSB                    |     | SSB                    |     |
| $N_{oc}$ <sup>Note 2</sup>           | dBm/SCS       | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $N_{oc}$ <sup>Note 2</sup>           | dBm/15 kHz    | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|                                      |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $\hat{E}_s/I_{ot}$ <sup>Note 5</sup> | dB            | 1                  | 4                      | -1.46  | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| $\hat{E}_s/N_{oc}$ <sup>Note 5</sup> | dB            | 1                  | 4                      | 4      | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| SS-RSRP <sup>Note 3,5</sup>          | dBm/SCS kHz   | 1                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 2                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|                                      |               | 3                  | -91                    | -91    | TBD                    | TBD | -Infinity              | TBD |
| I <sub>o</sub>                       | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|                                      | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|                                      | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | TBD                    | TBD | TBD                    | TBD |
| Propagation Condition                |               | 1, 2, 3            | AWGN                   |        |                        |     |                        |     |

|   |
|---|
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.          |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| NOTE 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy. |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.   |

### A.13.3.1.2.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

*Editor's note: D1=TBD (D1 is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.13.3.1.3 Event-triggered reporting tests on SCC with per-UE gaps under non-DRX

#### A.13.3.1.3.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

#### A.13.3.1.3.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.3.2-1 and A.13.3.1.3.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.



Table A.13.3.1.3.2-1: Supported test configurations

| Configuration | Description   |
|---------------|---|
| 1             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3             | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

NOTE: The UE is only required to be tested in one of the supported test configurations.

Table A.13.3.1.3.2-2: General test parameters for intra-frequency event triggered reporting with per-UE gaps

| Parameter                              | Unit | Test configuration | Value                              |         |         | Comment   |
|--|------|--------------------|------------------------------------|---------|---------|---|
|  |      |                    | Test 1                             | Test 2  | Test 3  |   |
| Active PCell                           |      | 1, 2, 3            | Cell 1                             |         |         |   |
| Active SCell                           |      | 1, 2, 3            | Cell 2                             |         |         |   |
| Neighbour cell                         |      | 1, 2, 3            | Cell 3                             |         |         | Cell to be identified.  |
| RF Channel Number                      |      | 1, 2, 3            | 1: Cell 1<br>2: Cell 2 and Cell 3  |         |         |   |
| Measurement gap type                   |      | 1, 2, 3            | Per-UE gaps                        |         |         |   |
| Measurement gap repetition periodicity | ms   | 1, 2, 3            | 40                                 |         |         |   |
| Measurement gap length                 | ms   | 1, 2, 3            | [6]                                |         |         |   |
| Measurement gap offset                 | ms   | 1, 2, 3            | [39]                               |         |         |   |
| DL CCA model                           |      |                    | As specified in clause A.3.20.2.1  |         |         |   |
| UL CCA model                           |      |                    | As specified in clause A.3.20.2.2  |         |         |   |
| SSB configuration                      |      | 1                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |         |         |   |
|  |      | 2                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |         |         |   |
|  |      | 3                  | Cell 1: SSB.2 FR1<br>Cell 2,3: TBD |         |         |   |
| SMTC configuration                     |      | 1                  | Cell 1: SMTC.2<br>Cell 2,3: N/A    |         |         |   |
|  |      | 2                  | Cell 1: SMTC.1<br>Cell 2,3: N/A    |         |         |   |
|  |      | 3                  | Cell 1: SMTC.1<br>Cell 2,3: N/A    |         |         |   |
| DBT window configuration               |      | 1, 2, 3            | Cell 1: N/A<br>Cell 2,3: TBD       |         |         |   |
| CSI-RS parameters in Cell 1            |      | 1                  | CSI-RS.1.2 FDD resource #0         |         |         |   |
|  |      | 2                  | CSI-RS.1.2 TDD resource #0         |         |         |   |
|  |      | 3                  | CSI-RS.2.2 TDD resource #0         |         |         |   |
| A3-Offset                              | dB   | 1, 2, 3            | -4.5                               |         |         |   |
| Event A3 measurement quantity          |      |                    | SS-RSRP                            | SS-RSRQ | SS-SINR |   |
| CP length                              |      | 1, 2, 3            | Normal                             |         |         |   |
| Hysteresis                             | dB   | 1, 2, 3            | 0                                  |         |         |   |
| Time To Trigger                        | s    | 1, 2, 3            | 0                                  |         |         |   |
| Filter coefficient                     |      | 1, 2, 3            | 0                                  |         |         | L3 filtering is not used  |
| DRX                                    |      | 1, 2, 3            |                                    |         |         | OFF   |
| Time offset between Cell 2 and Cell 3  |      | 1                  | 3 ms                               |         |         | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |      | 2                  | 3 $\mu$ s                          |         |         | Synchronous cells   |
|  |      | 3                  | 3 $\mu$ s                          |         |         | Synchronous cells   |
| T1                                     | s    | 1, 2, 3            | TBD                                |         |         |   |
| T2                                     | s    | 1, 2, 3            | TBD                                |         |         |   |

**Table A.13.3.1.3.2-3: Cell-specific test parameters for intra-frequency event-triggered reporting without gap**

| Parameter                                | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |     | Cell 3                 |     |
|--|---------------|--------------------|------------------------|--------|------------------------|-----|------------------------|-----|
|  |               |                    | T1                     | T2     | T1                     | T2  | T1                     | T2  |
| DL CCA probability<br>$P_{CCA\_DL}$      |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| UL CCA probability<br>$P_{CCA\_UL}$      |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| TDD configuration                        |               | 1                  | N/A                    |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | TDDConf.1.1            |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | TDDConf.2.1            |        | TBD                    |     | TBD                    |     |
| PDSCH RMC configuration                  |               | 1                  | SR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | SR.1.1 TDD             |        |                        |     |                        |     |
|  |               | 3                  | SR.2.1 TDD             |        |                        |     |                        |     |
| RMSI CORESET RMC configuration           |               | 1                  | CR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | CR.1.1 TDD             |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | CR.2.1 TDD             |        | TBD                    |     | TBD                    |     |
| Dedicated CORESET RMC configuration      |               | 1                  | CCR.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | CCR.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | CCR.2.1 TDD            |        | TBD                    |     | TBD                    |     |
| OCNG Patterns                            |               | 1, 2, 3            | OP.1                   |        | TBD                    |     | TBD                    |     |
| TRS Configuration                        |               | 1                  | TRS.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | TRS.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | TRS.1.2 TDD            |        | TBD                    |     | TBD                    |     |
| Initial BWP configuration                |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |     | DLBWP.0.1<br>ULBWP.0.1 |     |
| Active DL BWP configuration              |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.2              |     | DLBWP.1.1              |     |
| Active UL BWP configuration              |               | 1, 2, 3            | ULBWP.1.1              |        | DLBWP.1.2              |     | ULBWP.1.1              |     |
| RLM-RS                                   |               | 1, 2, 3            | SSB                    |        | SSB                    |     | SSB                    |     |
| $N_{oc}$ <small>Note 2</small>           | dBm/SCS       | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $N_{oc}$ <small>Note 2</small>           | dBm/15 kHz    | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $\hat{E}_s/I_{ot}$ <small>Note 5</small> | dB            | 1                  | 4                      | -1.46  | TBD                    | TBD | -Infinity              | TBD |
|  |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|  |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| $\hat{E}_s/N_{oc}$ <small>Note 5</small> | dB            | 1                  | 4                      | 4      | TBD                    | TBD | -Infinity              | TBD |
|  |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|  |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| SS-RSRP <small>Note 3,5</small>          | dBm/SCS kHz   | 1                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|  |               | 2                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|  |               | 3                  | -91                    | -91    | TBD                    | TBD | -Infinity              | TBD |
| I <sub>o</sub>                           | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|  | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|  | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | TBD                    | TBD | TBD                    | TBD |
| Propagation Condition                    |               | 1, 2, 3            | AWGN                   |        |                        |     |                        |     |

|   |
|---|
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.          |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| NOTE 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy. |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.   |

### A.13.3.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

*Editor's note: D1=TBD.*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.13.3.1.4 Event-triggered reporting tests on SCC with per-UE gaps under DRX

#### A.13.3.1.4.1 Test purpose and environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2A.6.1 and 9.2A.6.2.

#### A.13.3.1.4.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.4.2-1 and A.13.3.1.4.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In Test 1 and Test 2, the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In Test 3 and Test 4, the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In Test 5 and Test 6, the UE is configured with SS-SINR as Event A3 measurement quantity.

Table A.13.3.1.4.2-1: Supported test configurations

| Configuration | Description   |
|---------------|---|
| 1             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3             | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

NOTE: The UE is only required to be tested in one of the supported test configurations.

Table A.13.3.1.4.2-2: General test parameters for intra-frequency event triggered reporting without gap with DRX

| Parameter                              | Unit | Test configuration | Value                              |        |         |        |         |        | Comment   |
|--|------|--------------------|------------------------------------|--------|---------|--------|---------|--------|---|
|  |      |                    | Test 1                             | Test 2 | Test 3  | Test 4 | Test 5  | Test 6 |   |
| Active PCell                           |      | 1, 2, 3            | Cell 1                             |        |         |        |         |        |   |
| Active SCell                           |      | 1, 2, 3            | Cell 2                             |        |         |        |         |        |   |
| Neighbour cell                         |      | 1, 2, 3            | Cell 3                             |        |         |        |         |        | Cell to be identified.  |
| RF Channel Number                      |      | 1, 2, 3            | 1: Cell 1<br>2: Cell 2 and Cell 3  |        |         |        |         |        |   |
| Measurement gap type                   |      | 1, 2, 3            | Per-UE gaps                        |        |         |        |         |        |   |
| Measurement gap repetition periodicity | ms   | 1, 2, 3            | 40                                 |        |         |        |         |        |   |
| Measurement gap length                 | ms   | 1, 2, 3            | [6]                                |        |         |        |         |        |   |
| Measurement gap offset                 | ms   | 1, 2, 3            | [39]                               |        |         |        |         |        |   |
| DL CCA model                           |      |                    | As specified in clause A.3.20.2.1  |        |         |        |         |        |   |
| UL CCA model                           |      |                    | As specified in clause A.3.20.2.2  |        |         |        |         |        |   |
| SSB configuration                      |      | 1                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |        |         |        |         |        |   |
|  |      | 2                  | Cell 1: SSB.1 FR1<br>Cell 2,3: TBD |        |         |        |         |        |   |
|  |      | 3                  | Cell 1: SSB.2 FR1<br>Cell 2,3: TBD |        |         |        |         |        |   |
| SMTC configuration                     |      | 1                  | Cell 1: SMTC.2<br>Cell 2,3: N/A    |        |         |        |         |        |   |
|  |      | 2                  | Cell 1: SMTC.1<br>Cell 2,3: N/A    |        |         |        |         |        |   |
|  |      | 3                  | Cell 1: SMTC.1<br>Cell 2,3: N/A    |        |         |        |         |        |   |
| DBT window configuration               |      | 1, 2, 3            | Cell 1: N/A<br>Cell 2,3: TBD       |        |         |        |         |        |   |
| CSI-RS parameters in Cell 1            |      | 1                  | CSI-RS.1.2 FDD resource #0         |        |         |        |         |        |   |
|  |      | 2                  | CSI-RS.1.2 TDD resource #0         |        |         |        |         |        |   |
|  |      | 3                  | CSI-RS.2.2 TDD resource #0         |        |         |        |         |        |   |
| A3-Offset                              | dB   | 1, 2, 3            | -4.5                               |        |         |        |         |        |   |
| Event A3 measurement quantity          |      |                    | SS-RSRP                            |        | SS-RSRQ |        | SS-SINR |        |   |
| CP length                              |      | 1, 2, 3            | Normal                             |        |         |        |         |        |   |
| Hysteresis                             | dB   | 1, 2, 3            | 0                                  |        |         |        |         |        |   |
| Time To Trigger                        | s    | 1, 2, 3            | 0                                  |        |         |        |         |        |   |
| Filter coefficient                     |      | 1, 2, 3            | 0                                  |        |         |        |         |        | L3 filtering is not used  |
| DRX                                    |      | 1, 2, 3            | DRX.1                              | DRX.2  | DRX.1   | DRX.2  | DRX.1   | DRX.2  |   |
| Time offset between Cell 2 and Cell 3  |      | 1                  | 3 ms                               |        |         |        |         |        | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |      | 2                  | 3 μs                               |        |         |        |         |        | Synchronous cells   |
|  |      | 3                  | 3 μs                               |        |         |        |         |        | Synchronous cells   |
| T1                                     | s    | 1, 2, 3            | TBD                                |        |         |        |         |        |   |
| T2                                     | s    | 1, 2, 3            | TBD                                | TBD    | TBD     | TBD    | TBD     | TBD    |   |

**Table A.13.3.1.4.2-3: Cell-specific test parameters for intra-frequency event-triggered reporting without gap**

| Parameter                                | Unit          | Test configuration | Cell 1                 |        | Cell 2                 |     | Cell 3                 |     |
|--|---------------|--------------------|------------------------|--------|------------------------|-----|------------------------|-----|
|  |               |                    | T1                     | T2     | T1                     | T2  | T1                     | T2  |
| DL CCA probability<br>$P_{CCA\_DL}$      |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| UL CCA probability<br>$P_{CCA\_UL}$      |               | 1, 2, 3            | N/A                    |        | TBD                    | TBD | TBD                    | TBD |
| TDD configuration                        |               | 1                  | N/A                    |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | TDDConf.1.1            |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | TDDConf.2.1            |        | TBD                    |     | TBD                    |     |
| PDSCH RMC configuration                  |               | 1                  | SR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | SR.1.1 TDD             |        |                        |     |                        |     |
|  |               | 3                  | SR.2.1 TDD             |        |                        |     |                        |     |
| RMSI CORESET RMC configuration           |               | 1                  | CR.1.1 FDD             |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | CR.1.1 TDD             |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | CR.2.1 TDD             |        | TBD                    |     | TBD                    |     |
| Dedicated CORESET RMC configuration      |               | 1                  | CCR.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | CCR.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | CCR.2.1 TDD            |        | TBD                    |     | TBD                    |     |
| OCNG Patterns                            |               | 1, 2, 3            | OP.1                   |        | TBD                    |     | TBD                    |     |
| TRS Configuration                        |               | 1                  | TRS.1.1 FDD            |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | TRS.1.1 TDD            |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | TRS.1.2 TDD            |        | TBD                    |     | TBD                    |     |
| Initial BWP configuration                |               | 1, 2, 3            | DLBWP.0.1<br>ULBWP.0.1 |        | DLBWP.0.1<br>ULBWP.0.1 |     | DLBWP.0.1<br>ULBWP.0.1 |     |
| Active DL BWP configuration              |               | 1, 2, 3            | DLBWP.1.1              |        | DLBWP.1.2              |     | DLBWP.1.1              |     |
| Active UL BWP configuration              |               | 1, 2, 3            | ULBWP.1.1              |        | DLBWP.1.2              |     | ULBWP.1.1              |     |
| RLM-RS                                   |               | 1, 2, 3            | SSB                    |        | SSB                    |     | SSB                    |     |
| $N_{oc}$ <small>Note 2</small>           | dBm/SCS       | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $N_{oc}$ <small>Note 2</small>           | dBm/15 kHz    | 1                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 2                  | -98                    |        | TBD                    |     | TBD                    |     |
|  |               | 3                  | -95                    |        | TBD                    |     | TBD                    |     |
| $\hat{E}_s/I_{ot}$ <small>Note 5</small> | dB            | 1                  | 4                      | -1.46  | TBD                    | TBD | -Infinity              | TBD |
|  |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|  |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| $\hat{E}_s/N_{oc}$ <small>Note 5</small> | dB            | 1                  | 4                      | 4      | TBD                    | TBD | -Infinity              | TBD |
|  |               | 2                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
|  |               | 3                  |                        |        | TBD                    | TBD | -Infinity              | TBD |
| SS-RSRP <small>Note 3,5</small>          | dBm/SCS kHz   | 1                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|  |               | 2                  | -94                    | -94    | TBD                    | TBD | -Infinity              | TBD |
|  |               | 3                  | -91                    | -91    | TBD                    | TBD | -Infinity              | TBD |
| I <sub>o</sub>                           | dBm/9.36 MHz  | 1                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|  | dBm/9.36 MHz  | 2                  | -64.60                 | -62.25 | TBD                    | TBD | TBD                    | TBD |
|  | dBm/38.16 MHz | 3                  | -58.50                 | -56.16 | TBD                    | TBD | TBD                    | TBD |
| Propagation Condition                    |               | 1, 2, 3            | AWGN                   |        |                        |     |                        |     |

|   |
|---|
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.          |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.   |
| NOTE 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy. |
| NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.   |

#### A.13.3.1.4.3 Test Requirements

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

*Editor's note: D1=TBD (D1 is different for different DRX configurations).*

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

FFS: NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.13.3.1.5 RSSI measurement reporting on SCC

##### A.13.3.1.5.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the intra-frequency RSSI measurement reporting requirements in Section 9.2A.7.1.

##### A.13.3.1.5.2 Test parameters

In the test, the UE is configured to perform intra-frequency RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.13.3.1.5.2-1. There are two cells in the test: Cell 1 is PCell on a licensed FR1 band, and Cell 2 is SCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2.



Table A.13.3.1.5.2-1: Supported test configurations.

| Configuration | Description   |
|---------------|---|
| 1             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3             | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

NOTE: The UE is only required to be tested in one of the supported test configurations.

Table A.13.3.1.5.2-2: General test parameters.

| Parameter  | Configurations | Unit      | Test 1                           |                   |
|--|----------------|-----------|----------------------------------|-------------------|
|  |                |           | Cell 1                           | Cell 2            |
| RF Channel Number  |                |           | 1                                | 2                 |
| $BW_{channel}$   |                | MHz       | 40                               | 40                |
| DL CCA model   |                |           | N/A                              | $P_{CCA\_DL}=1.0$ |
| UL CCA model   |                |           | N/A                              | $P_{CCA\_UL}=1.0$ |
| Measurement bandwidth  |                | $n_{PRE}$ | Same as channel access bandwidth |                   |
| Channel access bandwidth   |                | $n_{PRE}$ | TBD                              |                   |
| PDSCH Reference measurement channel defined in TBD   |                |           | TBD                              | TBD               |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in TBD  |                |           | TBD                              | TBD               |
| OCNG Patterns defined in TBD   |                |           | TBD                              | TBD               |
| Other general configuration parameters: TBD  |                |           | TBD                              | TBD               |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)                        |                | dBm/SCS   | TBD                              | TBD               |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)                            |                | dBm/SCS   | TBD                              | TBD               |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC)              |                | dB        | TBD                              | TBD               |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)                  |                | dB        | TBD                              | TBD               |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)                         |                | dBm/SCS   | TBD                              | TBD               |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                             |                |           | TBD                              | TBD               |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)     |                | dBm/BW    | TBD                              | TBD               |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) |                | dBm/BW    | TBD                              | TBD               |
| Propagation condition  |                | -         | AWGN                             |                   |

### A.13.3.1.6 Channel occupancy measurement reporting on SCC

#### A.13.3.1.6.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the intra-frequency channel occupancy measurement reporting requirements in Section 9.2A.7.2.

#### A.13.3.1.6.2 Test parameters

In the test, the UE is configured to perform intra-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.13.3.1.6.2-1. There are two cells in the test: Cell 1 is PCell on a licensed FR1 band, and Cell 2 is SCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2.

**Table A.13.3.1.6.2-1: Supported test configurations.**

| Configuration   | Description   |
|---|---|
| 1   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3   | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.13.3.1.6.2-2: General test parameters.**

Editor's note: Table is TBD

### A.13.3.2 Inter-frequency measurements

#### A.13.3.2.1 RSSI measurement reporting

##### A.13.3.2.1.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports RSSI measurements. This test will partly verify the inter-frequency RSSI measurement reporting requirements in Section 9.3A.8.

##### A.13.3.2.1.2 Test parameters

In the test, the UE is configured to perform inter-frequency RSSI measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.13.3.2.1.2-1. There are two cells in the test: Cell 1 is PCell on a licensed FR1 band, and Cell 2 is SCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2. The RSSI measurement is performed on an inter-frequency under CCA.

**Table A.13.3.2.1.2-1: Supported test configurations.**

| Configuration   | Description   |
|---|---|
| 1   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3   | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.13.3.2.1.2-2: General test parameters.**

Editor's note: Table TBD

### A.13.3.2.2 Channel occupancy measurement reporting

#### A.13.3.2.2.1 Test purpose and environment

The purpose of this test is to verify that the UE correctly reports channel occupancy measurements. This test will partly verify the inter-frequency channel occupancy measurement reporting requirements in Section 9.3A.13.

#### A.13.3.2.2.2 Test parameters

In the test, the UE is configured to perform inter-frequency channel occupancy measurements on a carrier frequency under CCA.

Supported test configurations are shown in Table A.13.3.2.2.2-1. There are two cells in the test: Cell 1 is PCell on a licensed FR1 band, and Cell 2 is SCell operating on a carrier frequency under CCA. Prior to the start of the time duration T1, the UE is connected to Cell 1 and Cell 2. The channel occupancy measurement is performed on an inter-frequency under CCA.

**Table A.13.3.2.2.2-1: Supported test configurations.**

| Configuration   | Description   |
|---|---|
| 1   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3   | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.13.3.2.2.2-2: General test parameters.**

Editor's note: Table is TBD

### A.13.3.2.3 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is not used

#### A.13.3.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: NR cell 1 as PCell in FR1 on NR RF channel 1, NR cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables A.13.3.2.3.1-1, A.13.3.2.3.1-2 and A.13.3.2.3.1-3.

In test 1, measurement gap pattern configuration # 0 as defined in Table A.13.3.2.3.1-2 is provided for UE that does not support per-FR gap. In test 2, measurement gap pattern configuration #4 as defined in Table A.13.3.2.3.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.13.3.2.3.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode     |
| 2  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode     |
| 3  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode,<br>NR cell without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.13.3.2.3.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value   |        | Comment  |
|---|------|--------------------|---|--------|--|
|   |      |                    | Test 1  | Test 2 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2, 3                                       |        | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA.                |
| Active cells                                    |      | Config 1,2,3       | NR cell 1 (PCell), NR cell 2 with CCA (SCell) |        | NR cell 1 is on NR RF channel number 1. NR cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 3 with CCA                            |        | NR cell 3 is on NR RF channel number 3 with CCA.   |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1             |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2             |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0   | 4      | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9   | 9      |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6  |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0   |        |  |
| CP length                                       |      | Config 1,2,3       | Normal  |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0   |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0   |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | OFF   |        | DRX is not used  |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3μs   |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5   |        |  |
| T2  | s    | Config 1,2,3       | 1.7   | 1.7    |  |

**Table A.13.3.2.3.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                 |  | Unit    | Test configuration | Cell 1               |    | Cell 2   |    | Cell 3   |    |
|---|--|---------|--------------------|----------------------|----|--|----|--|----|
|   |  |         |                    | T1                   | T2 | T1   | T2 | T1   | T2 |
| NR RF Channel Number                      |  |         | Config 1,2,3       | 1                    |    | 2  |    | 3  |    |
| Duplex mode                               |  |         | Config 1           | FDD                  |    | TDD  |    | TDD  |    |
|   |  |         | Config 2,3         | TDD                  |    | TDD  |    | TDD  |    |
| TDD configuration                         |  |         | Config 1           | Not Applicable       |    | TDDConf.1.1 CCA                                |    | TDDConf.1.1 CCA                                |    |
|   |  |         | Config 2           | TDDConf.1.1          |    | TDDConf.1.1 CCA                                |    | TDDConf.1.1 CCA                                |    |
|   |  |         | Config 3           | TDDConf.2.1          |    | TDDConf.1.1 CCA                                |    | TDDConf.1.1 CCA                                |    |
| DL CCA probability<br>$P_{CCA\_DL}$       | Semi-static channel access<br>Note 5,7       |         | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_DL}=0.9375$                           |    | $P_{CCA\_DL}=0.9375$                           |    |
|   | Dynami<br>c<br>channel<br>access<br>Note 6,7 |         | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    |
| UL CCA probability<br>$P_{CCA\_UL}$       | Semi-static channel access<br>Note 5,7       |         | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_UL}=1$                                |    | $P_{CCA\_UL}=1$                                |    |
|   | Dynami<br>c<br>channel<br>access<br>Note 6,7 |         | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_UL}=1$                                |    | $P_{CCA\_UL}=1$                                |    |
| LCCA_DL                                   |  |         | Config 1,2,3       | Not Applicable       |    | 12   |    | 12   |    |
| $W_{CCA\_DL}$                             |  | ms      | Config 1,2,3       | Not Applicable       |    | $T_{PSS/SSS\_sync\_inter\_cca}$                |    | $T_{PSS/SSS\_sync\_inter\_cca}$                |    |
| BW <sub>channel</sub>                     |  | MH<br>z | Config 1,2         | 10: $N_{RB,c} = 52$  |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
|   |  |         | Config 3           | 40: $N_{RB,c} = 106$ |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
| BWP BW                                    |  | MH<br>z | Config 1,2         | 10: $N_{RB,c} = 52$  |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
|   |  |         | Config 3           | 40: $N_{RB,c} = 106$ |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
| BWP configuration                         | Initial DL BWP                               |         | Config 1,2,3       | DLBWP.0.1            |    | DLBWP.0.1                                      |    |  |    |
|   | Initial UL BWP                               |         |                    | ULBWP.0.1            |    | ULBWP.0.1                                      |    |  |    |
|   | Dedicated DL BWP                             |         |                    | DLBWP.1.1            |    | DLBWP.1.1                                      |    |  |    |
|   | Dedicated UL BWP                             |         |                    | ULBWP.1.1            |    | ULBWP.1.1                                      |    |  |    |
| TRS configuration                         |  |         | Config 1           | TRS.1.1 FDD          |    | TRS.1.2 TDD                                    |    |  |    |
|   |  |         | Config 2           | TRS.1.1 TDD          |    | TRS.1.2 TDD                                    |    |  |    |
|   |  |         | Config 3           | TRS.1.2 TDD          |    | TRS.1.2 TDD                                    |    |  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |         | Config 1,2,3       | OP.1                 |    | OP.1   |    | OP.1   |    |
| PDSCH Reference measurement channel       |  |         | Config 1           | SR.1.1 FDD           |    | SR.1.1 CCA                                     |    |  |    |
|   |  |         | Config 2           | SR.1.1 TDD           |    | SR.1.1 CCA                                     |    |  |    |
|   |  |         | Config 3           | SR2.1 TDD            |    | SR.1.1 CCA                                     |    |  |    |
| CORESET Reference Channel                 |  |         | Config 1           | CR.1.1 FDD           |    | CR.1.1 CCA                                     |    |  |    |
|   |  |         | Config 2           | CR.1.1 TDD           |    | CR.1.1 CCA                                     |    |  |    |
|   |  |         | Config 3           | CR2.1 TDD            |    | CR.1.1 CCA                                     |    |  |    |
| SSB parameters                            | Semi-static channel access<br>Note 5,7       |         | Config 1           | SSB.1 FR1            |    | SSB.1 CCA                                      |    | SSB.1 CCA                                      |    |
|   |  |         | Config 2           | SSB.1 FR1            |    | SSB.1 CCA                                      |    | SSB.1 CCA                                      |    |
|   |  |         | Config 3           | SSB.2 FR1            |    | SSB.1 CCA                                      |    | SSB.1 CCA                                      |    |

|  |                                    |              |              |                |        |                        |           |                        |  |
|--|------------------------------------|--------------|--------------|----------------|--------|------------------------|-----------|------------------------|--|
|  | Dynamic channel Access<br>Note 6,7 |              | Config 1     | SSB.1 FR1      |        | SSB.2 CCA              |           | SSB.2 CCA              |  |
|  |                                    |              | Config 2     | SSB.1 FR1      |        | SSB.2 CCA              |           | SSB.2 CCA              |  |
|  |                                    |              | Config 3     | SSB.2 FR1      |        | SSB.2 CCA              |           | SSB.2 CCA              |  |
| DBT window configuration                 |                                    |              | Config 1,2,3 | Not Applicable |        | As defined in A.3.28.1 |           | As defined in A.3.28.1 |  |
| SMTC configuration defined in A.3.11     |                                    |              | Config 1,2,3 | SMTC.1         |        | SMTC.1                 |           | SMTC.4                 |  |
| PDSCH/PDCCH subcarrier spacing           | kHz                                |              | Config 1     | 15             |        | 30                     |           | 30                     |  |
|  |                                    |              | Config 2     | 15             |        | 30                     |           | 30                     |  |
|  |                                    |              | Config 3     | 30             |        | 30                     |           | 30                     |  |
| EPRE ratio of PSS to SSS                 |                                    | Config 1,2,3 | 0            |                | 0      |                        | 0         |                        |  |
| EPRE ratio of PBCH DMRS to SSS           |                                    |              |              |                |        |                        |           |                        |  |
| EPRE ratio of PBCH to PBCH DMRS          |                                    |              |              |                |        |                        |           |                        |  |
| EPRE ratio of PDCCH DMRS to SSS          |                                    |              |              |                |        |                        |           |                        |  |
| EPRE ratio of PDCCH to PDCCH DMRS        |                                    |              |              |                |        |                        |           |                        |  |
| EPRE ratio of PDSCH DMRS to SSS          |                                    |              |              |                |        |                        |           |                        |  |
| EPRE ratio of PDSCH to PDSCH             |                                    |              |              |                |        |                        |           |                        |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                                    |              |              |                |        |                        |           |                        |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                                    |              |              |                |        |                        |           |                        |  |
| $N_{oc}^{Note2}$                         | dB m/15kHz                         | Config 1,2,3 | -98          |                | -104   |                        | -104      |                        |  |
| $N_{oc}^{Note2}$                         | dB m/S CS                          | Config 1,2   | -98          |                | -101   |                        | -101      |                        |  |
|  |                                    | Config 3     | -95          |                | -101   |                        | -101      |                        |  |
| SS-RSRP <sup>Note 3</sup>                | dB m/S CS                          | Config 1,2   | -94          | -94            | -91    | -91                    | -Infinity | -88                    |  |
|  |                                    | Config 3     | -91          | -91            | -91    | -91                    | -Infinity | -88                    |  |
| $\hat{E}_s/I_{ot}$                       | dB                                 | Config 1,2   | 4            | 4              | 4      | 4                      | -Infinity | 7                      |  |
| $\hat{E}_s/N_{oc}$                       | dB                                 | Config 1,2   | 4            | 4              | 4      | 4                      | -Infinity | 7                      |  |
| $I_o^{Note3}$                            | dB m/9.36MHz                       | Config 1,2   | -64.59       | -64.59         | -58.49 | -58.49                 | -63.94    | -56.15                 |  |
|  | dB m/38.16MHz                      | Config 3     | -58.49       | -58.49         | -58.49 | -58.49                 | -63.94    | -56.15                 |  |
| Propagation Condition                    |                                    | Config 1,2,3 | AWGN         |                | AWGN   |                        | AWGN      |                        |  |

|         |  |
|---------|--|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{ac}$ to be fulfilled. |
| Note 3: | SS-RSRP and $I_0$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.   |

### A.13.3.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.13.3.2.4 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is used

#### A.13.3.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: NR cell 1 as PCell in FR1 on NR RF channel 1, NR cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables A.13.3.2.4.1-1, A.13.3.2.4.1-2 and A.13.3.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.13.3.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.13.3.2.4.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.



**Table A.13.3.2.4.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1 with CCA**

| <b>Config</b> | <b>Description</b>  |
|---------------|---|
| 1             | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode     |
| 2             | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode     |
| 3             | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode,<br>NR cell without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations

**Table A.13.3.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value   |        |        |        | Comment  |
|---|------|--------------------|---|--------|--------|--------|--|
|   |      |                    | Test 1  | Test 2 | Test 3 | Test 4 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2, 3                                       |        |        |        | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA.                |
| Active cells                                    |      | Config 1,2,3       | NR cell 1 (PCell), NR cell 2 with CCA (SCell) |        |        |        | NR cell 1 is on NR RF channel number 1. NR cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 3 with CCA                            |        |        |        | NR cell 3 is on NR RF channel number 3 with CCA.   |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1             |        |        |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2             |        |        |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0   |        | 4      |        | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9   |        | 9      |        |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6  |        |        |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0   |        |        |        |  |
| CP length                                       |      | Config 1,2,3       | Normal  |        |        |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0   |        |        |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0   |        |        |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | DRX .1  | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3   |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3 $\mu$ s                                     |        |        |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5   |        |        |        |  |
| T2  | s    | Config 1,2,3       | 2.5   | 17     | 2.5    | 17     |  |

**Table A.13.3.2.4.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA without SSB time index detection**

| Parameter                                 |  | Unit | Test configuration | Cell 1              |                      | Cell 2   |                      | Cell 3   |                      |
|---|--|------|--------------------|---------------------|----------------------|--|----------------------|--|----------------------|
|   |  |      |                    | T1                  | T2                   | T1   | T2                   | T1   | T2                   |
| NR RF Channel Number                      |  |      | Config 1,2,3       | 1                   |                      | 2  |                      | 3  |                      |
| Duplex mode                               |  |      | Config 1           | FDD                 |                      | TDD  |                      | TDD  |                      |
|   |  |      | Config 2,3         | TDD                 |                      | TDD  |                      | TDD  |                      |
| TDD configuration                         |  |      | Config 1           | Not Applicable      |                      | TDDConf.1.1 CCA                                |                      | TDDConf.1.1 CCA                                |                      |
|   |  |      | Config 2           | TDDConf.1.1         |                      | TDDConf.1.1 CCA                                |                      | TDDConf.1.1 CCA                                |                      |
|   |  |      | Config 3           | TDDConf.2.1         |                      | TDDConf.1.1 CCA                                |                      | TDDConf.1.1 CCA                                |                      |
| DL CCA probability<br>$P_{CCA\_DL}$       | Semi-static channel access<br>Note 5,7 |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_DL}=0.9375$                           |                      | $P_{CCA\_DL}=0.9375$                           |                      |
|   | Dynamic channel access<br>Note 6,7     |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |                      | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |                      |
| UL CCA probability<br>$P_{CCA\_UL}$       | Semi-static channel access<br>Note 5,7 |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_UL}=1$                                |                      | $P_{CCA\_UL}=1$                                |                      |
|   | Dynamic channel access<br>Note 6,7     |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_UL}=1$                                |                      | $P_{CCA\_UL}=1$                                |                      |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2         | 10: $N_{RB,c} = 52$ |                      | 40: $N_{RB,c} = 106$                           |                      | 40: $N_{RB,c} = 106$                           |                      |
|   |  |      |                    | Config 3            | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |
| BWP BW                                    |  | MHz  | Config 1,2         | 10: $N_{RB,c} = 52$ |                      | 40: $N_{RB,c} = 106$                           |                      | 40: $N_{RB,c} = 106$                           |                      |
|   |  |      |                    | Config 3            | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |
| BWP configuration                         | Initial DL BWP                         |      | Config 1,2,3       | DLBWP.0.1           |                      | DLBWP.0.1                                      |                      |  |                      |
|   | Initial UL BWP                         |      |                    | ULBWP.0.1           |                      | ULBWP.0.1                                      |                      |  |                      |
|   | Dedicated DL BWP                       |      |                    | DLBWP.1.1           |                      | DLBWP.1.1                                      |                      |  |                      |
|   | Dedicated UL BWP                       |      |                    | ULBWP.1.1           |                      | ULBWP.1.1                                      |                      |  |                      |
| TRS configuration                         |  |      | Config 1           | TRS.1.1 FDD         |                      | TRS.1.2 TDD                                    |                      |  |                      |
|   |  |      | Config 2           | TRS.1.1 TDD         |                      | TRS.1.2 TDD                                    |                      |  |                      |
|   |  |      | Config 3           | TRS.1.2 TDD         |                      | TRS.1.2 TDD                                    |                      |  |                      |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |      | Config 1,2,3       | OP.1                |                      | OP.1   |                      | OP.1   |                      |
| PDSCH Reference measurement channel       |  |      | Config 1           | SR.1.1 FDD          |                      | SR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 2           | SR.1.1 TDD          |                      | SR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 3           | SR2.1 TDD           |                      | SR.1.1 CCA                                     |                      |  |                      |
| CORESET Reference Channel                 |  |      | Config 1           | CR.1.1 FDD          |                      | CR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 2           | CR.1.1 TDD          |                      | CR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 3           | CR2.1 TDD           |                      | CR.1.1 CCA                                     |                      |  |                      |
| SSB parameters                            | Semi-static channel<br>Note 5,7        |      | Config 1           | SSB.1 FR1           |                      | SSB.1 CCA                                      |                      | SSB.1 CCA                                      |                      |
|   |  |      | Config 2           | SSB.1 FR1           |                      | SSB.1 CCA                                      |                      | SSB.1 CCA                                      |                      |
|   |  |      | Config 3           | SSB.2 FR1           |                      | SSB.1 CCA                                      |                      | SSB.1 CCA                                      |                      |
|   | Dynamic channel                        |      | Config 1           | SSB.1 FR1           |                      | SSB.2 CCA                                      |                      | SSB.2 CCA                                      |                      |
|   |  |      | Config 2           | SSB.1 FR1           |                      | SSB.2 CCA                                      |                      | SSB.2 CCA                                      |                      |

|  | Access<br>Note 6,7 |              | Config 3     | SSB.2 FR1      | SSB.2 CCA              | SSB.2 CCA              |              |        |
|--|--------------------|--------------|--------------|----------------|------------------------|------------------------|--------------|--------|
| DBT window configuration   |                    |              | Config 1,2,3 | Not Applicable | As defined in A.3.28.1 | As defined in A.3.28.1 |              |        |
| SMTTC configuration defined in A.3.11  |                    |              | Config 1,2,3 | SMTTC.1        | SMTTC.1                | SMTTC.4                |              |        |
| PDSCH/PDCCH subcarrier spacing   | kHz                |              | Config 1     | 15             | 30                     | 30                     |              |        |
|  |                    |              | Config 2     | 15             | 30                     | 30                     |              |        |
|  |                    |              | Config 3     | 30             | 30                     | 30                     |              |        |
| EPRE ratio of PSS to SSS   |                    | Config 1,2,3 | 0            | 0              | 0                      |                        |              |        |
| EPRE ratio of PBCH DMRS to SSS   |                    |              |              |                |                        |                        |              |        |
| EPRE ratio of PBCH to PBCH DMRS  |                    |              |              |                |                        |                        |              |        |
| EPRE ratio of PDCCH DMRS to SSS  |                    |              |              |                |                        |                        |              |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                    |              |              |                |                        |                        |              |        |
| EPRE ratio of PDSCH DMRS to SSS  |                    |              |              |                |                        |                        |              |        |
| EPRE ratio of PDSCH to PDSCH   |                    |              |              |                |                        |                        |              |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |              |              |                |                        |                        |              |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                    |              |              |                |                        |                        |              |        |
| $N_{oc}$ <sup>Note2</sup>  | dBm/15kHz          |              |              |                |                        |                        | Config 1,2,3 | -98    |
| $N_{oc}$ <sup>Note2</sup>  | dBm/SCS            | Config 1,2   | -98          | -101           | -101                   |                        |              |        |
|  |                    | Config 3     | -95          | -101           | -101                   |                        |              |        |
| SS-RSRP <sup>Note 3</sup>  | dBm/SCS            | Config 1,2   | -94          | -94            | -91                    | -91                    | -Infinity    | -88    |
|  |                    | Config 3     | -91          | -91            | -91                    | -91                    | -Infinity    | -88    |
| $\hat{E}_s/I_{ot}$   | dB                 | Config 1,2   | 4            | 4              | 4                      | 4                      | -Infinity    | 7      |
| $\hat{E}_s/N_{oc}$   | dB                 | Config 1,2   | 4            | 4              | 4                      | 4                      | -Infinity    | 7      |
| $I_o$ <sup>Note3</sup>   | dBm/9.36 MHz       | Config 1,2   | -64.59       | -64.59         | -58.49                 | -58.49                 | -63.94       | -56.15 |
|  | dBm/38.16 MHz      | Config 3     | -58.49       | -58.49         | -58.49                 | -58.49                 | -63.94       | -56.15 |
| Propagation Condition  |                    | Config 1,2,3 | AWGN         |                | AWGN                   |                        | AWGN         |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |                    |              |              |                |                        |                        |              |        |

**Table A.13.3.2.4.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.13.3.2.4.1-5: TimeAlignmentTimer-Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

#### A.13.3.2.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_without\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

$T_{\text{identify\_inter\_cca\_without\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.13.3.2.5 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is not used

#### A.13.3.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: NR cell 1 as PCell in FR1 on NR RF channel 1, NR cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables A.13.3.2.5.1-1, A.13.3.2.5.1-2 and A.13.3.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.13.3.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.13.3.2.5.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

**Table A.13.3.2.5.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode     |
| 2  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode     |
| 3  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode,<br>NR cell without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.13.3.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value   |        | Comment  |
|---|------|--------------------|---|--------|--|
|   |      |                    | Test 1  | Test 2 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2, 3                                       |        | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA.                |
| Active cells                                    |      | Config 1,2,3       | NR cell 1 (PCell), NR cell 2 with CCA (SCell) |        | NR cell 1 is on NR RF channel number 1. NR cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 3 with CCA                            |        | NR cell 3 is on NR RF channel number 3 with CCA.   |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1             |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2             |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0   | 4      | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9   | 9      |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6  |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0   |        |  |
| CP length                                       |      | Config 1,2,3       | Normal  |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0   |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0   |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | OFF   |        | DRX is not used  |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3 $\mu$ s                                     |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5   |        |  |
| T2  | s    | Config 1,2,3       | 2   | 2      |  |

**Table A.13.3.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**



| Parameter                                       |  | Unit | Test configuration | Cell 1               |    | Cell 2   |    | Cell 3   |    |
|---|--|------|--------------------|----------------------|----|--|----|--|----|
|   |  |      |                    | T1                   | T2 | T1   | T2 | T1   | T2 |
| NR RF Channel Number                            |  |      | Config 1,2,3       | 1                    |    | 2  |    | 3  |    |
| Duplex mode                                     |  |      | Config 1           | FDD                  |    | TDD  |    | TDD  |    |
|   |  |      | Config 2,3         | TDD                  |    | TDD  |    | TDD  |    |
| TDD configuration                               |  |      | Config 1           | Not Applicable       |    | TDDConf.1.1 CCA                                |    | TDDConf.1.1 CCA                                |    |
|   |  |      | Config 2           | TDDConf.1.1          |    | TDDConf.1.1 CCA                                |    | TDDConf.1.1 CCA                                |    |
|   |  |      | Config 3           | TDDConf.2.1          |    | TDDConf.1.1 CCA                                |    | TDDConf.1.1 CCA                                |    |
| DL CCA probability<br>$P_{CCA\_DL}$<br>Note 5,7 | Semi-static channel access             |      | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_DL}=0.9375$                           |    | $P_{CCA\_DL}=0.9375$                           |    |
|   | Dynamic channel access                 |      | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |    |
| UL CCA probability<br>$P_{CCA\_UL}$<br>Note 5,7 | Semi-static channel access             |      | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_UL}=1$                                |    | $P_{CCA\_UL}=1$                                |    |
|   | Dynamic channel access                 |      | Config 1,2,3       | Not Applicable       |    | $P_{CCA\_UL}=1$                                |    | $P_{CCA\_UL}=1$                                |    |
| $L_{CCA\_DL}$                                   |  |      | Config 1,2,3       | Not Applicable       |    | 5  |    | 5  |    |
| $W_{CCA\_DL}$                                   |  | ms   | Config 1,2,3       | Not Applicable       |    | $T_{PSS/SSS\_sync\_inter\_cca}$                |    | $T_{PSS/SSS\_sync\_inter\_cca}$                |    |
| $BW_{channel}$                                  |  | MHz  | Config 1,2         | 10: $N_{RB,c} = 52$  |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
|   |  |      | Config 3           | 40: $N_{RB,c} = 106$ |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
| $BWP\ BW$                                       |  | MHz  | Config 1,2         | 10: $N_{RB,c} = 52$  |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
|   |  |      | Config 3           | 40: $N_{RB,c} = 106$ |    | 40: $N_{RB,c} = 106$                           |    | 40: $N_{RB,c} = 106$                           |    |
| BWP configuration                               | Initial DL BWP                         |      | Config 1,2,3       | DLBWP.0.1            |    | DLBWP.0.1                                      |    |  |    |
|   | Initial UL BWP                         |      |                    | ULBWP.0.1            |    | ULBWP.0.1                                      |    |  |    |
|   | Dedicated DL BWP                       |      |                    | DLBWP.1.1            |    | DLBWP.1.1                                      |    |  |    |
|   | Dedicated UL BWP                       |      |                    | ULBWP.1.1            |    | ULBWP.1.1                                      |    |  |    |
| TRS configuration                               |  |      | Config 1           | TRS.1.1 FDD          |    | TRS.1.2 TDD                                    |    |  |    |
|   |  |      | Config 2           | TRS.1.1 TDD          |    | TRS.1.2 TDD                                    |    |  |    |
|   |  |      | Config 3           | TRS.1.2 TDD          |    | TRS.1.2 TDD                                    |    |  |    |
| OCNG Patterns defined in A.3.2.1.1 (OP.1)       |  |      | Config 1,2,3       | OP.1                 |    | OP.1   |    | OP.1   |    |
| PDSCH Reference measurement channel             |  |      | Config 1           | SR.1.1 FDD           |    | SR.1.1 CCA                                     |    |  |    |
|   |  |      | Config 2           | SR.1.1 TDD           |    | SR.1.1 CCA                                     |    |  |    |
|   |  |      | Config 3           | SR2.1 TDD            |    | SR.1.1 CCA                                     |    |  |    |
| CORESET Reference Channel                       |  |      | Config 1           | CR.1.1 FDD           |    | CR.1.1 CCA                                     |    |  |    |
|   |  |      | Config 2           | CR.1.1 TDD           |    | CR.1.1 CCA                                     |    |  |    |
|   |  |      | Config 3           | CR2.1 TDD            |    | CR.1.1 CCA                                     |    |  |    |
| SSB parameters                                  | Semi-static channel access<br>Note 5,7 |      | Config 1           | SSB.1 FR1            |    | SSB.1 CCA                                      |    | SSB.1 CCA                                      |    |
|   |  |      | Config 2           | SSB.1 FR1            |    | SSB.1 CCA                                      |    | SSB.1 CCA                                      |    |
|   |  |      | Config 3           | SSB.2 FR1            |    | SSB.1 CCA                                      |    | SSB.1 CCA                                      |    |

|   |                                    |              |                |                        |                        |                        |                        |              |
|---|------------------------------------|--------------|----------------|------------------------|------------------------|------------------------|------------------------|--------------|
|   | Dynamic channel Access<br>Note 6,7 |              | Config 1       | SSB.1 FR1              | SSB.2 CCA              | SSB.2 CCA              | SSB.2 CCA              |              |
|   |                                    |              | Config 2       | SSB.1 FR1              | SSB.2 CCA              | SSB.2 CCA              | SSB.2 CCA              |              |
|   |                                    |              | Config 3       | SSB.2 FR1              | SSB.2 CCA              | SSB.2 CCA              | SSB.2 CCA              |              |
| DBT window configuration  |                                    | Config 1,2,3 | Not Applicable | As defined in A.3.28.1 | As defined in A.3.28.1 | As defined in A.3.28.1 | As defined in A.3.28.1 |              |
| SMTTC configuration defined in A.3.11   |                                    | Config 1,2,3 | SMTTC.1        | SMTTC.1                | SMTTC.1                | SMTTC.1                | SMTTC.4                |              |
| PDSCH/PDCCH subcarrier spacing  | kHz                                | Config 1     | 15             | 30                     | 30                     | 30                     | 30                     |              |
|   |                                    | Config 2     | 15             | 30                     | 30                     | 30                     | 30                     |              |
|   |                                    | Config 3     | 30             | 30                     | 30                     | 30                     | 30                     |              |
| EPRE ratio of PSS to SSS  |                                    | Config 1,2,3 | 0              | 0                      | 0                      | 0                      | 0                      |              |
| EPRE ratio of PBCH DMRS to SSS  |                                    |              |                |                        |                        |                        |                        |              |
| EPRE ratio of PBCH to PBCH DMRS   |                                    |              |                |                        |                        |                        |                        |              |
| EPRE ratio of PDCCH DMRS to SSS   |                                    |              |                |                        |                        |                        |                        |              |
| EPRE ratio of PDCCH to PDCCH DMRS   |                                    |              |                |                        |                        |                        |                        |              |
| EPRE ratio of PDSCH DMRS to SSS   |                                    |              |                |                        |                        |                        |                        |              |
| EPRE ratio of PDSCH to PDSCH  |                                    |              |                |                        |                        |                        |                        |              |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |                                    |              |                |                        |                        |                        |                        |              |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |                                    |              |                |                        |                        |                        |                        |              |
| $N_{oc}$ <sup>Note2</sup>   | dBm/15kHz                          |              |                |                        |                        |                        |                        | Config 1,2,3 |
| $N_{oc}$ <sup>Note2</sup>   | dBm/SCS                            | Config 1,2   | -98            | -101                   | -101                   | -101                   | -101                   |              |
|   |                                    | Config 3     | -95            | -101                   | -101                   | -101                   | -101                   |              |
| SS-RSRP <sup>Note 3</sup>   | dBm/SCS                            | Config 1,2   | -94            | -94                    | -91                    | -91                    | -Infinity              | -88          |
|   |                                    | Config 3     | -91            | -91                    | -91                    | -91                    | -Infinity              | -88          |
| $\hat{E}_s/I_{ot}$  | dB                                 | Config 1,2   | 4              | 4                      | 4                      | 4                      | -Infinity              | 7            |
| $\hat{E}_s/N_{oc}$  | dB                                 | Config 1,2   | 4              | 4                      | 4                      | 4                      | -Infinity              | 7            |
| $I_o$ <sup>Note3</sup>  | dBm/9.36 MHz                       | Config 1,2   | -64.59         | -64.59                 | -58.49                 | -58.49                 | -63.94                 | -56.15       |
|   | dBm/38.16 MHz                      | Config 3     | -58.49         | -58.49                 | -58.49                 | -58.49                 | -63.94                 | -56.15       |
| Propagation Condition   |                                    | Config 1,2,3 | AWGN           | AWGN                   | AWGN                   | AWGN                   | AWGN                   |              |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration</p> |                                    |              |                |                        |                        |                        |                        |              |

### A.13.3.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times T_{\text{TTI}_{\text{DCCH}}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.13.3.2.6 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is used

#### A.13.3.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3A.4 and 9.3A.5.

In this test, there are three cells: NR cell 1 as PCell in FR1 on NR RF channel 1, NR cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables A.13.3.2.6.1-1, A.13.3.2.6.1-2 and A.13.3.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.13.3.2.6.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.13.3.2.6.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

**Table A.13.3.2.6.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1 with CCA**

| Config   | Description   |
|--|---|
| 1  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode     |
| 2  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode     |
| 3  | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode,<br>NR cell without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations |   |

**Table A.13.3.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                       | Unit | Test configuration | Value   |        |        |        | Comment  |
|---|------|--------------------|---|--------|--------|--------|--|
|   |      |                    | Test 1  | Test 2 | Test 3 | Test 4 |  |
| NR RF Channel Number                            |      | Config 1,2,3       | 1, 2, 3                                       |        |        |        | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA.                |
| Active cells                                    |      | Config 1,2,3       | NR cell 1 (PCell), NR cell 2 with CCA (SCell) |        |        |        | NR cell 1 is on NR RF channel number 1. NR cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell                                  |      | Config 1,2,3       | NR cell 3 with CCA                            |        |        |        | NR cell 3 is on NR RF channel number 3 with CCA.   |
| DL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.1             |        |        |        |  |
| UL CCA model                                    |      | Config 1,2,3       | As specified in clause A.3.26.2.2             |        |        |        |  |
| Gap Pattern Id                                  |      | Config 1,2,3       | 0   |        | 4      |        | As specified in clause 9.1.2-1.  |
| Measurement gap offset                          |      | Config 1,2,3       | 9   |        | 9      |        |  |
| A3-Offset                                       | dB   | Config 1,2,3       | -6  |        |        |        |  |
| Hysteresis                                      | dB   | Config 1,2,3       | 0   |        |        |        |  |
| CP length                                       |      | Config 1,2,3       | Normal  |        |        |        |  |
| TimeToTrigger                                   | s    | Config 1,2,3       | 0   |        |        |        |  |
| Filter coefficient                              |      | Config 1,2,3       | 0   |        |        |        | L3 filtering is not used   |
| DRX   |      | Config 1,2,3       | DRX .1  | DRX .2 | DRX .1 | DRX .2 | As specified in clause A.3.3   |
| Time offset between serving and neighbour cells |      | Config 1,2,3       | 3μs   |        |        |        | Synchronous cells.   |
| T1  | s    | Config 1,2,3       | 5   |        |        |        |  |
| T2  | s    | Config 1,2,3       | 3   | 20     | 3      | 20     |  |

**Table A.13.3.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with CCA with SSB time index detection**

| Parameter                                 |  | Unit | Test configuration | Cell 1              |                      | Cell 2   |                      | Cell 3   |                      |
|---|--|------|--------------------|---------------------|----------------------|--|----------------------|--|----------------------|
|   |  |      |                    | T1                  | T2                   | T1   | T2                   | T1   | T2                   |
| NR RF Channel Number                      |  |      | Config 1,2,3       | 1                   |                      | 2  |                      | 3  |                      |
| Duplex mode                               |  |      | Config 1           | FDD                 |                      | TDD  |                      | TDD  |                      |
|   |  |      | Config 2,3         | TDD                 |                      | TDD  |                      | TDD  |                      |
| TDD configuration                         |  |      | Config 1           | Not Applicable      |                      | TDDConf.1.1 CCA                                |                      | TDDConf.1.1 CCA                                |                      |
|   |  |      | Config 2           | TDDConf.1.1         |                      | TDDConf.1.1 CCA                                |                      | TDDConf.1.1 CCA                                |                      |
|   |  |      | Config 3           | TDDConf.2.1         |                      | TDDConf.1.1 CCA                                |                      | TDDConf.1.1 CCA                                |                      |
| DL CCA probability<br>$P_{CCA\_DL}$       | Semi-static channel access<br>Note 5,7 |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_DL}=0.9375$                           |                      | $P_{CCA\_DL}=0.9375$                           |                      |
|   | Dynamic channel access<br>Note 6,7     |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |                      | $P_{CCA\_DL\_1}=0.75$<br>$P_{CCA\_DL\_2}=0.75$ |                      |
| UL CCA probability<br>$P_{CCA\_UL}$       | Semi-static channel access<br>Note 5,7 |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_UL}=1$                                |                      | $P_{CCA\_UL}=1$                                |                      |
|   | Dynamic channel access<br>Note 6,7     |      | Config 1,2,3       | Not Applicable      |                      | $P_{CCA\_UL}=1$                                |                      | $P_{CCA\_UL}=1$                                |                      |
| BW <sub>channel</sub>                     |  | MHz  | Config 1,2         | 10: $N_{RB,c} = 52$ |                      | 40: $N_{RB,c} = 106$                           |                      | 40: $N_{RB,c} = 106$                           |                      |
|   |  |      |                    | Config 3            | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |
| BWP BW                                    |  | MHz  | Config 1,2         | 10: $N_{RB,c} = 52$ |                      | 40: $N_{RB,c} = 106$                           |                      | 40: $N_{RB,c} = 106$                           |                      |
|   |  |      |                    | Config 3            | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |  | 40: $N_{RB,c} = 106$ |
| BWP configuration                         | Initial DL BWP                         |      | Config 1,2,3       | DLBWP.0.1           |                      | DLBWP.0.1                                      |                      |  |                      |
|   | Initial UL BWP                         |      |                    | ULBWP.0.1           |                      | ULBWP.0.1                                      |                      |  |                      |
|   | Dedicated DL BWP                       |      |                    | DLBWP.1.1           |                      | DLBWP.1.1                                      |                      |  |                      |
|   | Dedicated UL BWP                       |      |                    | ULBWP.1.1           |                      | ULBWP.1.1                                      |                      |  |                      |
| TRS configuration                         |  |      | Config 1           | TRS.1.1 FDD         |                      | TRS.1.2 TDD                                    |                      |  |                      |
|   |  |      | Config 2           | TRS.1.1 TDD         |                      | TRS.1.2 TDD                                    |                      |  |                      |
|   |  |      | Config 3           | TRS.1.2 TDD         |                      | TRS.1.2 TDD                                    |                      |  |                      |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  |      | Config 1,2,3       | OP.1                |                      | OP.1   |                      | OP.1   |                      |
| PDSCH Reference measurement channel       |  |      | Config 1           | SR.1.1 FDD          |                      | SR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 2           | SR.1.1 TDD          |                      | SR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 3           | SR2.1 TDD           |                      | SR.1.1 CCA                                     |                      |  |                      |
| CORESET Reference Channel                 |  |      | Config 1           | CR.1.1 FDD          |                      | CR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 2           | CR.1.1 TDD          |                      | CR.1.1 CCA                                     |                      |  |                      |
|   |  |      | Config 3           | CR2.1 TDD           |                      | CR.1.1 CCA                                     |                      |  |                      |
| SSB parameters                            | Semi-static channel<br>Note 5,7        |      | Config 1           | SSB.1 FR1           |                      | SSB.1 CCA                                      |                      | SSB.1 CCA                                      |                      |
|   |  |      | Config 2           | SSB.1 FR1           |                      | SSB.1 CCA                                      |                      | SSB.1 CCA                                      |                      |
|   |  |      | Config 3           | SSB.2 FR1           |                      | SSB.1 CCA                                      |                      | SSB.1 CCA                                      |                      |
|   | Dynamic channel                        |      | Config 1           | SSB.1 FR1           |                      | SSB.2 CCA                                      |                      | SSB.2 CCA                                      |                      |
|   |  |      | Config 2           | SSB.1 FR1           |                      | SSB.2 CCA                                      |                      | SSB.2 CCA                                      |                      |

|  | Access<br>Note 6,7 |              | Config 3     | SSB.2 FR1      | SSB.2 CCA              | SSB.2 CCA              | SSB.2 CCA |              |
|--|--------------------|--------------|--------------|----------------|------------------------|------------------------|-----------|--------------|
| DBT window configuration   |                    |              | Config 1,2,3 | Not Applicable | As defined in A.3.28.1 | As defined in A.3.28.1 |           |              |
| SMTTC configuration defined in A.3.11  |                    |              | Config 1,2,3 | SMTTC.1        | SMTTC.1                | SMTTC.1                | SMTTC.4   |              |
| PDSCH/PDCCH subcarrier spacing   | kHz                |              | Config 1     | 15             | 30                     | 30                     | 30        |              |
|  |                    |              | Config 2     | 15             | 30                     | 30                     | 30        |              |
|  |                    |              | Config 3     | 30             | 30                     | 30                     | 30        |              |
| EPRE ratio of PSS to SSS   |                    | Config 1,2,3 | 0            | 0              | 0                      | 0                      |           |              |
| EPRE ratio of PBCH DMRS to SSS   |                    |              |              |                |                        |                        |           |              |
| EPRE ratio of PBCH to PBCH DMRS  |                    |              |              |                |                        |                        |           |              |
| EPRE ratio of PDCCH DMRS to SSS  |                    |              |              |                |                        |                        |           |              |
| EPRE ratio of PDCCH to PDCCH DMRS  |                    |              |              |                |                        |                        |           |              |
| EPRE ratio of PDSCH DMRS to SSS  |                    |              |              |                |                        |                        |           |              |
| EPRE ratio of PDSCH to PDSCH   |                    |              |              |                |                        |                        |           |              |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                    |              |              |                |                        |                        |           |              |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)   |                    |              |              |                |                        |                        |           |              |
| $N_{oc}^{Note2}$   | dBm/15kHz          |              |              |                |                        |                        |           | Config 1,2,3 |
| $N_{oc}^{Note2}$   | dBm/SCS            | Config 1,2   | -98          | -101           | -101                   | -101                   |           |              |
|  |                    | Config 3     | -95          | -101           | -101                   | -101                   |           |              |
| SS-RSRP Note 3   | dBm/SCS            | Config 1,2   | -94          | -94            | -91                    | -91                    | -Infinity | -88          |
|  |                    | Config 3     | -91          | -91            | -91                    | -91                    | -Infinity | -88          |
| $\hat{E}_s/I_{ot}$   | dB                 | Config 1,2   | 4            | 4              | 4                      | 4                      | -Infinity | 7            |
| $\hat{E}_s/N_{oc}$   | dB                 | Config 1,2   | 4            | 4              | 4                      | 4                      | -Infinity | 7            |
| $I_o^{Note3}$  | dBm/9.36 MHz       | Config 1,2   | -64.59       | -64.59         | -58.49                 | -58.49                 | -63.94    | -56.15       |
|  | dBm/38.16 MHz      | Config 3     | -58.49       | -58.49         | -58.49                 | -58.49                 | -63.94    | -56.15       |
| Propagation Condition  |                    | Config 1,2,3 | AWGN         |                | AWGN                   |                        | AWGN      |              |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.</p> |                    |              |              |                |                        |                        |           |              |

**Table A.13.3.2.6.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field                     | Test1&3 | Test2&4 | Comment                                       |
|---------------------------|---------|---------|---|
|                           | Value   | Value   |   |
| drx-onDurationTimer       | ms1     | ms1     | As specified in clause 6.3.2 in TS 38.331 [2] |
| drx-InactivityTimer       | ms1     | ms1     |   |
| drx-RetransmissionTimerDL | sl1     | sl1     |   |
| drx-RetransmissionTimerUL | sl1     | sl1     |   |
| drx-LongCycleStartOffset  | ms40    | Ms640   |   |
| shortDRX                  | disable | disable |   |

**Table A.13.3.2.6.1-5: TimeAlignmentTimer-Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field              | Value | Comment                                       |
|--------------------|-------|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [2] |

### A.13.3.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than  $T_{\text{identify\_inter\_cca\_with\_index}}$  from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

$T_{\text{identify\_inter\_cca\_with\_index}} = (T_{\text{PSS/SSS\_sync\_inter\_cca}} + T_{\text{SSB\_measurement\_period\_inter\_cca}} + T_{\text{SSB\_time\_index\_inter\_cca}})$  ms, where

$T_{\text{PSS/SSS\_sync\_inter\_cca}}$ : it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{\text{SSB\_time\_index\_inter\_cca}}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3A.4-2.

$T_{\text{SSB\_measurement\_period\_inter\_cca}}$ : equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

For tests 1 and 2, MGRP = 40 ms and for tests 3 and 4 MGRP = 20 ms.

For tests 1 and 3, DRX cycle = 40 ms and for tests 2 and 4 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to  $2 \times TTI_{\text{DCCH}}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.



### A.13.3.3 L1-RSRP measurements for beam reporting

#### A.13.3.3.1 SSB based L1-RSRP measurement when DRX is not used

##### A.13.3.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.13.3.3.1.1-1.

**Table A.13.3.3.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3      | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations  |

##### A.13.3.3.1.2 Test parameters

There are two cells in the tests, FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 and Cell 2 are given in Table A.13.3.3.1.2-1 and Table A.13.3.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

**Table A.13.3.3.1.2-1: General test parameters**

| Parameter                           | Config | Unit | Value                       |  |
|-------------------------------------|--------|------|-----------------------------|--|
|                                     |        |      | Cell 1                      | Cell 2   |
| Active PCell/SCell Configuration    |        |      | PCell                       | SCell  |
| RF Channel Number                   |        |      | 1                           | 2  |
| DL CCA model                        | 1~3    |      | N/A                         | As specified in A.3.20.2.1   |
| UL CCA model                        | 1~3    |      | N/A                         | As specified in A.3.20.2.2   |
| Duplex mode                         | 1      |      | FDD                         | TDD  |
|                                     | 2      |      | TDD                         |  |
|                                     | 3      |      | TDD                         |  |
| TDD Configuration                   | 1      |      | N/A                         | TDDConf.1.1 CCA  |
|                                     | 2      |      | TDDConf.1.1                 |  |
|                                     | 3      |      | TDDConf.2.1                 |  |
| BW <sub>channel</sub>               | 1      | MHz  | 10: N <sub>RB,c</sub> = 52  | 40: N <sub>RB,c</sub> = 106  |
|                                     | 2      |      | 10: N <sub>RB,c</sub> = 52  |  |
|                                     | 3      |      | 40: N <sub>RB,c</sub> = 106 |  |
| PDSCH Reference measurement channel | 1      |      | SR.1.1 FDD                  | SR.1.1 CCA   |
|                                     | 2      |      | SR.1.1 TDD                  |  |
|                                     | 3      |      | SR.2.1 TDD                  |  |
| RMSI CORESET Reference Channel      | 1      |      | CR.1.1 FDD                  | CR.1.1 CCA   |
|                                     | 2      |      | CR.1.1 TDD                  |  |
|                                     | 3      |      | CR.2.1 TDD                  |  |
| Dedicated CORESET Reference Channel | 1      |      | CCR.1.1 FDD                 | CCR.1.1 CCA  |
|                                     | 2      |      | CCR.1.1 TDD                 |  |
|                                     | 3      |      | CCR.2.1 TDD                 |  |
| SSB configuration                   | 1      |      | SSB.3 FR1                   | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
|                                     | 2      |      | SSB.3 FR1                   |  |
|                                     | 3      |      | SSB.4 FR1                   |  |
| OCNG Patterns                       | 1~3    |      | OP.1                        | OP.1   |
| Initial BWP Configuration           | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration         | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1   |
| SMTc configuration                  | 1~3    |      | SMTc.1                      | N/A  |
| DBT Window Configuration            | 1~3    |      | N/A                         | DBT.1  |
| TRS Configuration                   | 1      |      | TRS.1.1 FDD                 | TRS.1.2 TDD  |
|                                     | 2      |      | TRS.1.1 TDD                 |  |
|                                     | 3      |      | TRS.1.2 TDD                 |  |
| DRX configuration                   | 1~3    |      | Off                         | Off  |
| reportConfigType                    | 1~3    |      | periodic                    | periodic   |
| reportQuantity                      | 1~3    |      | ssb-Index-RSRP              | ssb-Index-RSRP   |
| Number of reported RS               | 1~3    |      | 2                           | 2  |
| L1-RSRP reporting period            | 1~3    | slot | 80                          | 80   |
| T1                                  | 1~3    | s    | 5                           | 5  |
| T2                                  | 1~3    | s    | 1                           | 1  |
| EPRE ratio of PSS to SSS            | 1~3    | dB   | 0                           | 0  |
| EPRE ratio of PBCH DMRS to SSS      |        |      |                             |  |
| EPRE ratio of PBCH to PBCH DMRS     |        |      |                             |  |
| EPRE ratio of PDCCH DMRS to SSS     |        |      |                             |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |  |
| EPRE ratio of PDSCH DMRS to SSS     |        |      |                             |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |  |

|   |     |  |           |
|---|-----|--|-----------|
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |     |  |           |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |     |  |           |
| Propagation condition   | 1~3 |  | AWGN AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |     |  |           |

**Table A.13.3.3.1.2-2: SSB specific test parameters**

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <sup>Note 4,6</sup>   | 1,2,3  |               | [0.9375]      | [0.9375]      | [0.9375]      | [0.9375]      |
| DL CCA Probability<br>$P_{CCA\_DL}$ <sup>Note 4.7</sup>   | 1,2,3  |               | [0.75]/[0.75] | [0.75]/[0.75] | [0.75]/[0.75] | [0.75]/[0.75] |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1,2,3  |               | [1.0]         | [1.0]         | [1.0]         | [1.0]         |
| $N_{oc}$ <sup>Note2</sup>   | 1,2,3  | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <sup>Note2</sup>   | 1,2,3  | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s / I_{ot}$  | 1,2,3  | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <sup>Note3</sup>   | 1,2,3  | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <sup>Note3</sup>  | 1,2,3  | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s / N_{oc}$  | 1,2,3  | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

**A.13.3.3.1.3 Test Requirements**

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

NOTE: The actual overall delays measured in the test may be up to 2xTTI DCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.13.3.3.2 SSB based L1-RSRP measurement when DRX is used

#### A.13.3.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5A.4.1, with the testing configurations for NR cells in Table A.13.3.3.1.1-1.

**Table A.13.3.3.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3      | Without CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  |
| Note:  | The UE is only required to be tested in one of the supported test configurations  |

#### A.13.3.3.2.2 Test parameters

There are two cells in the tests, FR1 Pcell (Cell 1) and FR1 Scell (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 and Cell 2 are given in Table A.13.3.3.2.2-1 and Table A.13.3.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

**Table A.13.3.3.2.2-1: General test parameters**

| Parameter                           | Config | Unit | Value                       |  |
|-------------------------------------|--------|------|-----------------------------|--|
|                                     |        |      | Cell 1                      | Cell 2   |
| Active Pcell/Scell Configuration    |        |      | Pcell                       | Scell  |
| RF Channel Number                   |        |      | 1                           | 2  |
| DL CCA model                        | 1~3    |      | N/A                         | As specified in A.3.20.2.1   |
| UL CCA model                        | 1~3    |      | N/A                         | As specified in A.3.20.2.2   |
| Duplex mode                         | 1      |      | FDD                         | TDD  |
|                                     | 2      |      | TDD                         |  |
|                                     | 3      |      | TDD                         |  |
| TDD Configuration                   | 1      |      | N/A                         | TDDConf.1.1 CCA  |
|                                     | 2      |      | TDDConf.1.1                 |  |
|                                     | 3      |      | TDDConf.2.1                 |  |
| BW <sub>channel</sub>               | 1      | MHz  | 10: N <sub>RB,c</sub> = 52  | 40: N <sub>RB,c</sub> = 106  |
|                                     | 2      |      | 10: N <sub>RB,c</sub> = 52  |  |
|                                     | 3      |      | 40: N <sub>RB,c</sub> = 106 |  |
| PDSCH Reference measurement channel | 1      |      | SR.1.1 FDD                  | SR.1.1 CCA   |
|                                     | 2      |      | SR.1.1 TDD                  |  |
|                                     | 3      |      | SR.2.1 TDD                  |  |
| RMSI CORESET Reference Channel      | 1      |      | CR.1.1 FDD                  | CR.1.1 CCA   |
|                                     | 2      |      | CR.1.1 TDD                  |  |
|                                     | 3      |      | CR.2.1 TDD                  |  |
| Dedicated CORESET Reference Channel | 1      |      | CCR.1.1 FDD                 | CCR.1.1 CCA  |
|                                     | 2      |      | CCR.1.1 TDD                 |  |
|                                     | 3      |      | CCR.2.1 TDD                 |  |
| SSB configuration                   | 1      |      | SSB.3 FR1                   | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
|                                     | 2      |      | SSB.3 FR1                   |  |
|                                     | 3      |      | SSB.4 FR1                   |  |
| OCNG Patterns                       | 1~3    |      | OP.1                        | OP.1   |
| Initial BWP Configuration           | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      | DLBWP.0.1<br>ULBWP.0.1   |
| Dedicated BWP configuration         | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      | DLBWP.1.1<br>ULBWP.1.1   |
| SMTc configuration                  | 1~3    |      | SMTc.1                      | N/A  |
| DBT Window Configuration            | 1~3    |      | N/A                         | DBT.1  |
| TRS Configuration                   | 1      |      | TRS.1.1 FDD                 | TRS.1.2 TDD  |
|                                     | 2      |      | TRS.1.1 TDD                 |  |
|                                     | 3      |      | TRS.1.2 TDD                 |  |
| DRX configuration                   | 1~3    |      | DRX.3                       | DRX.3  |
| reportConfigType                    | 1~3    |      | periodic                    | periodic   |
| reportQuantity                      | 1~3    |      | ssb-Index-RSRP              | ssb-Index-RSRP   |
| Number of reported RS               | 1~3    |      | 2                           | 2  |
| L1-RSRP reporting period            | 1~3    | slot | 80                          | 80   |
| T1                                  | 1~3    | s    | 5                           | 5  |
| T2                                  | 1~3    | s    | 1                           | 1  |
| EPRE ratio of PSS to SSS            | 1~3    | dB   | 0                           | 0  |
| EPRE ratio of PBCH DMRS to SSS      |        |      |                             |  |
| EPRE ratio of PBCH to PBCH DMRS     |        |      |                             |  |
| EPRE ratio of PDCCH DMRS to SSS     |        |      |                             |  |
| EPRE ratio of PDCCH to PDCCH DMRS   |        |      |                             |  |
| EPRE ratio of PDSCH DMRS to SSS     |        |      |                             |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |  |
| EPRE ratio of PDSCH to PDSCH DMRS   |        |      |                             |  |

|   |     |  |           |
|---|-----|--|-----------|
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |     |  |           |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup>   |     |  |           |
| Propagation condition   | 1~3 |  | AWGN AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |     |  |           |

**Table A.13.3.3.2.2-2: SSB specific test parameters**

| Parameter   | Config | Unit          | SSB#0         |               | SSB#1         |               |
|---|--------|---------------|---------------|---------------|---------------|---------------|
|   |        |               | T1            | T2            | T1            | T2            |
| DL CCA Probability<br>$P_{CCA\_DL}$ <sup>Note 4,6</sup>   | 1,2,3  |               | [0.9375]      | [0.9375]      | [0.9375]      | [0.9375]      |
| DL CCA Probability<br>$P_{CCA\_DL}$ <sup>Note 4.7</sup>   | 1,2,3  |               | [0.75]/[0.75] | [0.75]/[0.75] | [0.75]/[0.75] | [0.75]/[0.75] |
| UL CCA probability<br>$P_{CCA\_UL}$   | 1,2,3  |               | [1.0]         | [1.0]         | [1.0]         | [1.0]         |
| $N_{oc}$ <sup>Note2</sup>   | 1,2,3  | dBm/15kHz     | -94.65        |               |               |               |
| $N_{oc}$ <sup>Note2</sup>   | 1,2,3  | dBm/SSB SCS   | -91.65        |               |               |               |
| $\hat{E}_s / I_{ot}$  | 1,2,3  | dB            | 0             | 0             | -Infinity     | 3             |
| SSB RSRP <sup>Note3</sup>   | 1,2,3  | dBm/SSB SCS   | -91.65        | -91.65        | -Infinity     | -88.65        |
| $I_o$ <sup>Note3</sup>  | 1,2,3  | dBm/38.16 MHz | -57.59        | -57.59        | -60.61        | -55.84        |
| $\hat{E}_s / N_{oc}$  | 1,2,3  | dB            | 0             | 0             | -Infinity     | 3             |
| <p>Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRP and <math>I_o</math> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.</p> <p>Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows.</p> <p>Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds <math>P_{CCA\_DL1}</math> and the second value corresponds to the <math>P_{CCA\_DL2}</math>.</p> |        |               |               |               |               |               |

**A.13.3.3.2.3 Test Requirements**

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

NOTE: The actual overall delays measured in the test may be up to 2xTTI DCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.



## A.13.4 Measurement performance

### A.13.4.1 SS-RSRP

#### A.13.4.1.1 Intra-frequency measurement accuracy on a carrier frequency with CCA

##### A.13.4.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will verify the requirements in clauses 10.1.36.1.1 and 10.1.36.1.2 for intra-frequency measurements under CCA.

##### A.13.4.1.1.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). Supported test configurations are shown in table A.13.4.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in A.13.4.1.1.2-2.

**Table A.13.4.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Config | Description   |
|--------|---|
| 1      | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2      | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3      | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Note: The UE is only required to be tested in one of the supported test configurations for each supported band

**Table A.13.4.1.1.2-2: SS-RSRP Intra frequency test parameters**

| Parameter | Unit | Test 1 |        | Test 2 |        | Test 3 |        |
|-----------|------|--------|--------|--------|--------|--------|--------|
|           |      | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

|  |              |                              |  |                                  |                                   |              |                  |              |        |
|--|--------------|------------------------------|--|----------------------------------|-----------------------------------|--------------|------------------|--------------|--------|
| Cell ID  |              |                              | 489  | 0                                | 489                               | 0            | 489              | 0            |        |
| SSB ARFCN  |              |                              | freq1  |                                  | freq1                             |              | freq1            |              |        |
| DL CCA model   |              |                              | As specified in clause A.3.26.2.1                          |                                  |                                   |              |                  |              |        |
| UL CCA model   |              |                              | As specified in clause A.3.26.2.2                          |                                  |                                   |              |                  |              |        |
| P <sub>CCA_DL</sub> for dynamic channel access <sup>Note 7,9</sup>     |              |                              | P <sub>CCA_DL_1</sub> =0.75<br>P <sub>CCA_DL_2</sub> =0.75 |                                  |                                   |              |                  |              |        |
| P <sub>CCA_DL</sub> for semi-static channel access <sup>Note 8,9</sup> |              |                              | P <sub>CCA_DL</sub> =0.9375                                |                                  |                                   |              |                  |              |        |
| P <sub>CCA_UL</sub>  |              |                              | 1  |                                  |                                   |              |                  |              |        |
| TDD configuration  | Config 1,2,3 |                              | TDDConf.1.1 CCA  |                                  |                                   |              |                  |              |        |
| BW <sub>channel</sub>  | Config 1,2,3 | MHz                          | 40: N <sub>RB,c</sub> = 106                                |                                  |                                   |              |                  |              |        |
| BWP BW   | Config 1,2,3 |                              | 40: N <sub>RB,c</sub> = 106                                |                                  |                                   |              |                  |              |        |
| CCA model  | Config 1,2,3 |                              | TBD  |                                  |                                   |              |                  |              |        |
| Downlink initial BWP configuration                                     |              |                              | DLBWP.0.1  |                                  |                                   |              |                  |              |        |
| Downlink dedicated BWP configuration                                   |              |                              | DLBWP.1.1  |                                  |                                   |              |                  |              |        |
| Uplink initial BWP configuration                                       |              |                              | ULBWP.0.1  |                                  |                                   |              |                  |              |        |
| Uplink dedicated BWP configuration                                     |              |                              | ULBWP.1.1  |                                  |                                   |              |                  |              |        |
| TRS configuration  | Config 1,2,3 |                              | TRS.1.<br>2 TDD  | NA                               | TRS.1<br>.2<br>TDD                | NA           | TRS.1.<br>2 TDD  | NA           |        |
| DRX Cycle  |              | ms                           | Not Applicable   |                                  |                                   |              |                  |              |        |
| PDSCH Reference measurement channel                                    | Config 1,2,3 |                              | SR.1.1<br>CCA  | -                                | SR.1.1<br>CCA                     | -            | SR.1.1<br>CCA    | -            |        |
| RMSI CORESET Reference Channel   | Config 1,2,3 |                              | CR.1.1<br>CCA  | -                                | CR.1.1<br>CCA                     | -            | CR.1.1<br>CCA    | -            |        |
| Control channel RMC  | Config 1,2,3 |                              | CR.1.1<br>CCA  | -                                | CR.1.1<br>CCA                     | -            | CR.1.1<br>CCA    | -            |        |
| SSB configuration for semi-static channel access                       | Config 1,2,3 |                              | SSB.1<br>CCA   | SSB.1<br>CCA                     | SSB.1<br>CCA                      | SSB.1<br>CCA | SSB.1<br>CCA     | SSB.1<br>CCA |        |
| SSB configuration for dynamic channel access                           | Config 1,2,3 |                              | SSB.2<br>CCA   | SSB.2<br>CCA                     | SSB.2<br>CCA                      | SSB.2<br>CCA | SSB.2<br>CCA     | SSB.2<br>CCA |        |
| DBT window configuration   | Config 1,2,3 |                              | DBT.1  | DBT.1                            | DBT.1                             | DBT.1        | DBT.1            | DBT.1        |        |
| Time offset with Cell 1  | Config 1,2,3 | μs                           | -  | 3                                | -                                 | 3            | -                | 3            |        |
| SMTC configuration   | Config 1,2,3 |                              | SMTC.1   |                                  |                                   |              |                  |              |        |
| OCNG Patterns  |              |                              | OCNG pattern 1   |                                  |                                   |              |                  |              |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1,2,3 | kHz                          | 30 kHz   |                                  |                                   |              |                  |              |        |
| EPRE ratio of PSS to SSS   |              | dB                           | 0  | 0                                | 0                                 | 0            | 0                | 0            |        |
| EPRE ratio of PBCH DMRS to SSS   |              |                              |  |                                  |                                   |              |                  |              |        |
| EPRE ratio of PBCH to PBCH DMRS  |              |                              |  |                                  |                                   |              |                  |              |        |
| EPRE ratio of PDCCH DMRS to SSS  |              |                              |  |                                  |                                   |              |                  |              |        |
| EPRE ratio of PDCCH to PDCCH DMRS                                      |              |                              |  |                                  |                                   |              |                  |              |        |
| EPRE ratio of PDSCH DMRS to SSS  |              |                              |  |                                  |                                   |              |                  |              |        |
| EPRE ratio of PDSCH to PDSCH   |              |                              |  |                                  |                                   |              |                  |              |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                 |              |                              |  |                                  |                                   |              |                  |              |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                               |              |                              |  |                                  |                                   |              |                  |              |        |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1,2,3 | NR_CCA_FR1_I<br>NR_CCA_FR1_J | Not applicable <sup>Note 5</sup>                           |                                  | -94                               |              | -110<br>-109.5   |              |        |
| N <sub>oc</sub> <sup>Note2</sup>                                       | Config 1,2,3 | NR_CCA_FR1_I<br>NR_CCA_FR1_J | dBm/SCS<br>Not applicable <sup>Note 5</sup>                |                                  | -91                               |              | -107.0<br>-106.5 |              |        |
| $\hat{E}_s/I_{ot}$ <sup>Note6</sup>                                    |              |                              | dB   | 2.46                             | -5.97                             | 2.46         | -5.97            | -2.01        | -3.54  |
| $\hat{E}_s/N_{oc}$ <sup>Note6</sup>                                    |              |                              | dB   | 6                                | 1                                 | 6            | 1                | 1            | 0      |
| SS-RSRP <sup>Not e3,6</sup>  | Config 1,2,3 | NR_CCA_FR1_I                 | dBm/SCS  | Not applicable <sup>Note 5</sup> | Not applicable <sup>Not e 5</sup> | -85          | -90              | -            | -      |
|  |              | NR_CCA_FR1_J                 |  |                                  |                                   |              |                  | 106.00       | 107.00 |
| I <sub>o</sub> <sup>Note3</sup>  | Config 1,2,3 | NR_CCA_FR1_I                 | dBm/<br>38.16MHz   | Not applicable <sup>Note 5</sup> | -51.99                            |              |                  | -            | -      |
|  |              | NR_CCA_FR1_J                 |  |                                  |                                   |              |                  | 105.50       | 106.50 |
| Propagation condition  |              |                              | -  | AWGN                             |                                   |              |                  |              |        |
| Antenna configuration  |              |                              |  | 1x2                              |                                   |              |                  |              |        |

- NOTE 1: OCNB shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- NOTE 3: SS-RSRP and  $I_0$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- NOTE 5: Subtest 1 is not used when testing with 30kHz SSB SCS.
- NOTE 6: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
- NOTE 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
- NOTE 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
- NOTE 9: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### A.13.4.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 2 and cell 3 shall fulfil absolute requirement in clause 10.1.36.1.1 and relative requirement in clause 10.1.36.1.2.

## A.13.4.2 SS-RSRQ

### A.13.4.2.1 Intra-frequency measurement accuracy on SCC

#### A.13.4.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.29.1.1.

#### A.13.4.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.13.4.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is tested by using the parameters in Table A.13.4.2.1.2-2 and Table A.13.4.2.1.2-3. In all test cases, Cell 1 is the PCell, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA. Three sub-tests (Test 1, Test 2, and Test 3) are provided different  $N_{oc}$  on Cells 1, 2, and 3.

**Table A.13.4.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations**

| Config | Description   |
|--------|---|
| 1      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3      | Without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations  |

**Table A.13.4.2.1.2-2: SS-RSRQ Intra frequency test parameters**

| Parameter  |                  | Unit         | Test 1   |        | Test 2      |        | Test 3       |        |
|--|------------------|--------------|--|--------|-------------|--------|--------------|--------|
|  |                  |              | Cell 2   | Cell 3 | Cell 2      | Cell 3 | Cell 2       | Cell 3 |
| SSB ARFCN  |                  |              | freq2  | freq2  | freq2       | freq2  | freq2        | freq2  |
| DL CCA model   | Config 1, 2, 3   |              | As specified in clause A.3.26.2.1  |        |             |        |              |        |
| UL CCA model   | Config 1, 2, 3   |              | As specified in clause A.3.26.2.2  |        |             |        |              |        |
| UL CCA probability   | $P_{CCA\_UL}$    |              | 1.0  | -      | 1.0         | -      | 1.0          | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | $P_{CCA\_DL}$    |              | 0.9375   | -      | 0.9375      | -      | 0.9375       | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | $P_{CCA\_DL\_1}$ |              | 0.75   | -      | 0.75        | -      | 0.75         | -      |
|  | $P_{CCA\_DL\_2}$ |              | 0.75   | -      | 0.75        | -      | 0.75         | -      |
| Duplex mode  | Config 1, 2, 3   |              | TDD  |        |             |        |              |        |
| TDD configuration  | Config 1, 2, 3   |              | TDDConf.1.1 CCA  |        |             |        |              |        |
| $BW_{channel}$   | Config 1, 2, 3   | MHz          | 40: $N_{RB,c} = 106$   |        |             |        |              |        |
| Gap Pattern ID   |                  |              | 0  |        |             |        |              |        |
| BWP configuration  | Initial DL BWP   |              | DLBWP.0.1  |        |             |        |              |        |
|  | Dedicated DL BWP |              | DLBWP.1.1  |        |             |        |              |        |
|  | Initial UL BWP   |              | ULBWP.0.1  |        |             |        |              |        |
|  | Dedicated UL BWP |              | ULBWP.1.1  |        |             |        |              |        |
| DRX Cycle  |                  | ms           | Not Applicable   |        |             |        |              |        |
| PDSCH Reference measurement channel  | Config 1, 2, 3   |              | SR1.1 CCA  |        | SR1.1 CCA   |        | SR1.1 CCA    |        |
| RMSI CORESET Reference Channel   | Config 1, 2, 3   |              | CR.1.1 CCA   |        | CR.1.1 CCA  |        | CR.1.1 CCA   |        |
| Control Channel RMC  | Config 1, 2, 3   |              | CCR.1.1 CCA  |        | CCR.1.1 CCA |        | CCR.1.1 CCA  |        |
| TRS Configuration  | Config 1, 2, 3   |              | TRS.1.2 TDD  |        | TRS.1.2 TDD |        | TRS.1.2 TDD  |        |
| OCNG Patterns  |                  |              | OP. 1  |        |             |        |              |        |
| SS-RSSI-Measurement  |                  |              | Not Applicable   |        |             |        |              |        |
| Time offset with Cell 1  | Config 1, 2, 3   | $\mu s$      | 3  | 3      | 3           | 3      | 3            | 3      |
| DBT Window configuration   | Config 1, 2, 3   |              | DBT.1  |        |             |        |              |        |
| SSB configuration  | Config 1, 2, 3   |              | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |             |        |              |        |
| SMTC configuration   | Config 1, 2, 3   |              | SMTC.1   |        |             |        |              |        |
| CSI-RS for tracking  | Config 1, 2, 3   |              | TRS.1.2 TDD  |        |             |        |              |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2, 3   | kHz          | 30 kHz   |        |             |        |              |        |
| EPRE ratio of PSS to SSS   |                  | dB           | 0  | 0      | 0           | 0      | 0            | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                  |              |  |        |             |        |              |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |              |  |        |             |        |              |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |              |  |        |             |        |              |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |              |  |        |             |        |              |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |              |  |        |             |        |              |        |
| EPRE ratio of PDSCH to PDSCH   |                  |              |  |        |             |        |              |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                     |                  |              |  |        |             |        |              |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |              |  |        |             |        |              |        |
| $N_{oc}$ <small>Note2</small>  | NR_CCA_FR1_I     | dBm/15kHz    | -91  |        | -           |        | -110         |        |
|  |                  |              |  |        |             |        | NR_CCA_FR1_J | -109.5 |
| $N_{oc}$ <small>Note2</small>  | Config 1, 2, 3   | NR_CCA_FR1_I | -88  |        | -           |        | -107         |        |
|  |                  |              |  |        |             |        | NR_CCA_FR1_J | -106.5 |
| $\hat{E}_s/I_{\alpha}$   |                  | dB           | -1.76  |        | -4.7        |        | -5.46        | -5.46  |
| $\hat{E}_s/N_{oc}$   |                  | dB           | 3  | 3      | -2.9        | -2.9   | -4           | -4     |
| SS-RSRP <small>Note 3</small>  | Config 1, 2, 3   | NR_CCA_FR1_I | -85  | -85    | -           | -      | -111         | -111   |
|  |                  | NR_CCA_FR1_J |  |        |             |        | -110.5       | -110.5 |

|   |                |              |                  |        |        |        |        |        |        |
|---|----------------|--------------|------------------|--------|--------|--------|--------|--------|--------|
| SS-RSRQ <sup>Note3</sup>  |                | NR_CCA_FR1_I | dB               | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
|   |                | NR_CCA_FR1_J |                  |        |        |        |        |        |        |
| I <sub>o</sub> <sup>Note3</sup>   | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/<br>38.16MHz | -50    |        | -      |        | -73.4  |        |
|   |                | NR_CCA_FR1_J |                  |        |        |        |        |        |        |
| Propagation condition   |                |              | -                | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   | AWGN   |
| Antenna configuration   |                |              |                  | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.</p> <p>Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 9: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                |              |                  |        |        |        |        |        |        |

Table A.13.4.2.1.2-3: SS-RSRQ Intra frequency test parameters for NR PCell

| Parameter                           |                  | Unit | Test 1                      | Test 2 | Test 3 |
|-------------------------------------|------------------|------|-----------------------------|--------|--------|
|                                     |                  |      | Cell 1                      | Cell 1 | Cell 1 |
| SSB ARFCN                           |                  |      | freq1                       |        |        |
| Duplex mode                         | Config 1         |      | FDD                         |        |        |
|                                     | Config 2,3       |      | TDD                         |        |        |
| TDD configuration                   | Config 1         |      | Not Applicable              |        |        |
|                                     | Config 2         |      | TDDConf.1.1                 |        |        |
|                                     | Config 3         |      | TDDConf.2.1                 |        |        |
| BW <sub>channel</sub>               | Config 1         | MHz  | 10: N <sub>RB,c</sub> = 52  |        |        |
|                                     | Config 2         |      | 10: N <sub>RB,c</sub> = 52  |        |        |
|                                     | Config 3         |      | 40: N <sub>RB,c</sub> = 106 |        |        |
| Gap Pattern ID                      |                  |      | 0                           |        |        |
| BWP configuration                   | Initial DL BWP   |      | DLBWP.0.1                   |        |        |
|                                     | Dedicated DL BWP |      | DLBWP.1.1                   |        |        |
|                                     | Initial UL BWP   |      | ULBWP.0.1                   |        |        |
|                                     | Dedicated UL BWP |      | ULBWP.1.1                   |        |        |
| DRX Cycle                           |                  | ms   | Not Applicable              |        |        |
| PDSCH Reference measurement channel | Config 1         |      | SR.1.1 FDD                  |        |        |
|                                     | Config 2         |      | SR.1.1 TDD                  |        |        |
|                                     | Config 3         |      | SR2.1 TDD                   |        |        |
| RMSI CORESET Reference Channel      | Config 1         |      | CR.1.1 FDD                  |        |        |
|                                     | Config 2         |      | CR.1.1 TDD                  |        |        |
|                                     | Config 3         |      | CR.2.1 TDD                  |        |        |
| Control Channel RMC                 | Config 1         |      | CCR.1.1 FDD                 |        |        |
|                                     | Config 2         |      | CCR.1.1 TDD                 |        |        |
|                                     | Config 3         |      | CCR.2.1 TDD                 |        |        |
| TRS Configuration                   | Config 1         |      | TRS.1.1 FDD                 |        |        |
|                                     | Config 2         |      | TRS.1.1 TDD                 |        |        |
|                                     | Config 3         |      | TRS.1.2 TDD                 |        |        |
| OCNG Patterns                       |                  |      | OP. 1                       |        |        |
| SS-RSSI-Measurement                 |                  |      | Not Applicable              |        |        |
| SMTC configuration                  | Config 1         |      | SMTC.2                      |        |        |
|                                     | Config 2,3       |      | SMTC.1                      |        |        |
| SSB configuration                   | Config 1,2       |      | SSB.1 FR1                   |        |        |
|                                     | Config 3         |      | SSB.2 FR1                   |        |        |
| CSI-RS for tracking                 | Config 1         |      | TRS.1.1 FDD                 |        |        |
|                                     | Config 2         |      | TRS.1.1 TDD                 |        |        |
|                                     | Config 3         |      | TRS.1.2 TDD                 |        |        |

|  |            |   |           |        |      |        |
|--|------------|---|-----------|--------|------|--------|
| PDSCH/PDCCH subcarrier spacing           |            | Config 1,2                              | kHz       | 15 kHz |      |        |
|  |            | Config 3                                |           | 30 kHz |      |        |
| EPRE ratio of PSS to SSS                 |            |   | dB        | 0      |      |        |
| EPRE ratio of PBCH DMRS to SSS           |            |   |           |        |      |        |
| EPRE ratio of PBCH to PBCH DMRS          |            |   |           |        |      |        |
| EPRE ratio of PDCCH DMRS to SSS          |            |   |           |        |      |        |
| EPRE ratio of PDCCH to PDCCH DMRS        |            |   |           |        |      |        |
| EPRE ratio of PDSCH DMRS to SSS          |            |   |           |        |      |        |
| EPRE ratio of PDSCH to PDSCH             |            |   |           |        |      |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |            |   |           |        |      |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |            |   |           |        |      |        |
| N <sub>oc</sub> <sup>Note2</sup>         | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/15kHz | -85    | -101 | -114   |
|  |            | NR_FDD_FR1_B                            |           |        |      | -113.5 |
|  |            | NR_TDD_FR1_C                            |           |        |      | -113   |
|  |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |           |        |      | -112.5 |
|  |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |           |        |      | -112   |
|  |            | NR_FDD_FR1_F                            |           |        |      | -111.5 |
|  |            | NR_FDD_FR1_G                            |           |        |      | -111   |
|  |            | NR_FDD_FR1_H                            |           |        |      | -110.5 |



|                                  |            |   |         |     |        |        |       |      |       |  |  |
|----------------------------------|------------|---|---------|-----|--------|--------|-------|------|-------|--|--|
|                                  | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |         | -91 | -      | -114   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_B                            |         |     |        | -113.5 |       |      |       |  |  |
|                                  |            | NR_TDD_FR1_C                            |         |     |        | -113   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |     |        | -112.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |     |        | -112   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_F                            |         |     |        | -111.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_G                            |         |     |        | -111   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_H                            |         |     |        | -110.5 |       |      |       |  |  |
| N <sub>oc</sub> <sup>Note2</sup> | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -85 | -101   | -114   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_B                            |         |     |        | -113.5 |       |      |       |  |  |
|                                  |            | NR_TDD_FR1_C                            |         |     |        | -113   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |     |        | -112.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |     |        | -112   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_F                            |         |     |        | -111.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_G                            |         |     |        | -111   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_H                            |         |     |        | -110.5 |       |      |       |  |  |
|                                  | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |         | -88 | -      | -111   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_B                            |         |     |        | -110.5 |       |      |       |  |  |
|                                  |            | NR_TDD_FR1_C                            |         |     |        | -110   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |     |        | -109.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |     |        | -109   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_F                            |         |     |        | -108.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_G                            |         |     |        | -108   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_H                            |         |     |        | -107.5 |       |      |       |  |  |
|                                  |            | $\hat{E}_s/I_{ot}$                      |         |     |        | dB     | -1.76 | -4.7 | -5.46 |  |  |
|                                  |            | $\hat{E}_s/N_{oc}$                      |         |     |        | dB     | 3     | -2.9 | -4    |  |  |
| SS-<br>RSRP <sup>Note3</sup>     | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -82 | -103.9 | -118   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_B                            |         |     |        | -117.5 |       |      |       |  |  |
|                                  |            | NR_TDD_FR1_C                            |         |     |        | -117   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |     |        | -116.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |     |        | -116   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_F                            |         |     |        | -115.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_G                            |         |     |        | -115   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_H                            |         |     |        | -114.5 |       |      |       |  |  |
|                                  | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |         | -85 | -      | -115   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_B                            |         |     |        | -114.5 |       |      |       |  |  |
|                                  |            | NR_TDD_FR1_C                            |         |     |        | -114   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |     |        | -113.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |     |        | -113   |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_F                            |         |     |        | -112.5 |       |      |       |  |  |
|                                  |            | NR_FDD_FR1_G                            |         |     |        | -112   |       |      |       |  |  |

|   |            |   |                  |        |        |        |  |       |
|---|------------|---|------------------|--------|--------|--------|--|-------|
|   |            | NR_FDD_FR1_H                            |                  |        |        | -111.5 |  |       |
| SS-RSRQ <sup>Note3</sup>  |            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dB               | -14.77 | -16.76 | -17.34 |  |       |
|   |            | NR_FDD_FR1_B                            |                  |        |        |        |  |       |
|   |            | NR_TDD_FR1_C                            |                  |        |        |        |  |       |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |  |       |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |  |       |
|   |            | NR_FDD_FR1_F                            |                  |        |        |        |  |       |
|   |            | NR_FDD_FR1_G                            |                  |        |        |        |  |       |
|   |            | NR_FDD_FR1_H                            |                  |        |        |        |  |       |
| Io <sup>Note3</sup>   | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz  | -50    | -70    | -83.5  |  |       |
|   |            | NR_FDD_FR1_B                            |                  |        |        |        |  | -83   |
|   |            | NR_TDD_FR1_C                            |                  |        |        |        |  | -82.5 |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |  | -82   |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |  | -81.5 |
|   |            | NR_FDD_FR1_F                            |                  |        |        |        |  | -81   |
|   |            | NR_FDD_FR1_G                            |                  |        |        |        |  | -80.5 |
|   |            | NR_FDD_FR1_H                            |                  |        |        |        |  | -80   |
|   | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MHz | -50    | -      | -77.4  |  |       |
|   |            | NR_FDD_FR1_B                            |                  |        |        |        |  | -76.9 |
|   |            | NR_TDD_FR1_C                            |                  |        |        |        |  | -76.4 |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |        |  | -75.9 |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |        |  | -75.4 |
|   |            | NR_FDD_FR1_F                            |                  |        |        |        |  | -74.9 |
|   |            | NR_FDD_FR1_G                            |                  |        |        |        |  | -74.4 |
|   |            | NR_FDD_FR1_H                            |                  |        |        |        |  | -73.9 |
| Propagation condition   |            |   | -                | AWGN   | AWGN   | AWGN   |  |       |
| Antenna configuration   |            |   |                  | 1x2    | 1x2    | 1x2    |  |       |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |            |   |                  |        |        |        |  |       |

A.13.4.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.29.1.1.

## A.13.4.3 SS-SINR

### A.13.4.3.1 Intra-frequency measurement accuracy on SCC

#### A.13.4.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.31.1.1.

#### A.13.4.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.13.4.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.13.4.3.1.2-2 and Table A.13.4.3.1.2-3. In all test cases, Cell 1 is the PCell, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA. Two sub-tests (Test 1 and Test 2) are provided different  $N_{oc}$  on Cells 1, 2, and 3.

**Table A.13.4.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations**

| Config | Description   |
|--------|---|
| 1      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3      | Without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations  |

**A.13.4.3.1.2-2: SS-SINR Intra frequency test parameters**

| Parameter  |                  | Unit      | Test 1   |        | Test 2         |        |
|--|------------------|-----------|--|--------|----------------|--------|
|  |                  |           | Cell 2   | Cell 3 | Cell 2         | Cell 3 |
| SSB ARFCN  |                  |           | freq2  | freq2  | freq2          | freq2  |
| DL CCA model   | Config 1, 2, 3   |           | As specified in clause A.3.26.2.1  |        |                |        |
| UL CCA model   | Config 1, 2, 3   |           | As specified in clause A.3.26.2.2  |        |                |        |
| UL CCA probability   | $P_{CCA\_UL}$    |           | 1.0  | -      | 1.0            | -      |
| DL CCA probability for semi-static channel access <small>Note 7, 8</small> | $P_{CCA\_DL}$    |           | 0.9375   | -      | 0.9375         | -      |
| DL CCA probability for dynamic channel access <small>Note 8, 9</small>     | $P_{CCA\_DL\_1}$ |           | 0.75   | -      | 0.75           | -      |
|  | $P_{CCA\_DL\_2}$ |           | 0.75   | -      | 0.75           | -      |
| Duplex mode  | Config 1, 2, 3   |           | TDD  |        |                |        |
| TDD configuration  | Config 1, 2, 3   |           | TDDConf.1.1 CCA  |        |                |        |
| Downlink initial BWP configuration   |                  |           | DLBWP.0.1  |        |                |        |
| Downlink dedicated BWP configuration                                       |                  |           | DLBWP.1.1  |        |                |        |
| Uplink initial BWP configuration   |                  |           | ULBWP.0.1  |        |                |        |
| Uplink dedicated BWP configuration   |                  |           | ULBWP.1.1  |        |                |        |
| DRX Cycle configuration  |                  | ms        | Not Applicable   |        |                |        |
| TRS configuration  | Config 1, 2, 3   |           | TRS.1.2 TDD  |        | TRS.1.2 TDD    |        |
| PDSCH Reference measurement channel  | Config 1, 2, 3   |           | SR.1.1 CCA   |        | SR.1.1 CCA     |        |
| RMSI CORESET Reference Channel   | Config 1, 2, 3   |           | CR.1.1 CCA   |        | CR.1.1 CCA     |        |
| Dedicated CORESET Reference Channel  | Config 1, 2, 3   |           | CCR.1.1 CCA  |        | CCR.1.1 CCA    |        |
| OCNG Patterns  |                  |           | OP.1   |        |                |        |
| SS-RSSI-Measurement  |                  |           | Not Applicable   |        |                |        |
| DBT Window configuration   | Config 1, 2, 3   |           | DBT.1  |        |                |        |
| Time offset with Cell 1  | Config 1, 2, 3   | $\mu$ s   | 3 (for Cell 2)   | 3      | 3 (for Cell 2) | 3      |
| SSB configuration  | Config 1, 2, 3   |           | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access |        |                |        |
| SMTCC configuration  | Config 1, 2, 3   |           | SMTCC.1  |        |                |        |
| PDSCH/PDCCH subcarrier spacing   | Config 1, 2, 3   | kHz       | 30   |        |                |        |
| EPRE ratio of PSS to SSS   |                  | dB        | 0  | 0      | 0              | 0      |
| EPRE ratio of PBCH DMRS to SSS   |                  |           |  |        |                |        |
| EPRE ratio of PBCH to PBCH DMRS  |                  |           |  |        |                |        |
| EPRE ratio of PDCCH DMRS to SSS  |                  |           |  |        |                |        |
| EPRE ratio of PDCCH to PDCCH DMRS  |                  |           |  |        |                |        |
| EPRE ratio of PDSCH DMRS to SSS  |                  |           |  |        |                |        |
| EPRE ratio of PDSCH to PDSCH   |                  |           |  |        |                |        |
| EPRE ratio of OCNG DMRS to SSS(Note 1)                                     |                  |           |  |        |                |        |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)                                   |                  |           |  |        |                |        |
| $N_{oc}$ <small>Note2</small>  | NR_CCA_FR1_I     | dBm/15kHz | -93  |        | -112           |        |
|  | NR_CCA_FR1_J     |           |  |        |                |        |
| $N_{oc}$ <small>Note2</small>  | Config 1, 2, 3   | dBm/SCS   | -90  |        | -109           |        |
|  |                  |           |  |        |                |        |
| $\hat{E}_s / I_{ot}$   |                  | dB        | 0  | -3.19  | -5.46          | -5.46  |
| $\hat{E}_s / N_{oc}$   |                  | dB        | 4.54   | 2.66   | -4             | -4     |
| SS-RSRP <sup>Not e3</sup>  | Config 1, 2, 3   | dBm/SCS   | -85.46   | -87.34 | -113           | -113   |
|  |                  |           |  |        |                |        |
| SS-SINR <small>Note3</small>   | NR_CCA_FR1_I     | dB        | 0  | -3.19  | -5.46          | -5.46  |
|  | NR_CCA_FR1_J     |           |  |        |                |        |

|   |                   |              |                  |        |        |
|---|-------------------|--------------|------------------|--------|--------|
| I <sub>o</sub> <sup>Note3</sup>   | Config 1,<br>2, 3 | NR_CCA_FR1_I | dBm/<br>38.16MHz | -51.41 | -75.41 |
|   |                   | NR_CCA_FR1_J |                  |        | -74.91 |
| Propagation condition   |                   |              | -                | AWGN   |        |
| Antenna configuration   |                   |              | -                | 1x2    |        |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and I<sub>o</sub> levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.</p> <p>Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 9: For UE supporting both semi-static and dynamic channel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.</p> |                   |              |                  |        |        |

**A.13.4.3.1.2-3: SS-SINR Intra frequency test parameters for NR PCell**

| Parameter                            |            | Unit | Test 1         | Test 2         |
|--------------------------------------|------------|------|----------------|----------------|
|                                      |            |      | Cell 1         | Cell 1         |
| SSB ARFCN                            |            |      | freq1          | freq1          |
| Duplex mode                          | Config 1   |      | FDD            | FDD            |
|                                      | Config 2,3 |      | TDD            | TDD            |
| TDD configuration                    | Config 1   |      | Not Applicable | Not Applicable |
|                                      | Config 2   |      | TDDConf.1.1    | TDDConf.1.1    |
|                                      | Config 3   |      | TDDConf.2.1    | TDDConf.2.1    |
| Downlink initial BWP configuration   |            |      | DLBWP.0.1      | DLBWP.0.1      |
| Downlink dedicated BWP configuration |            |      | DLBWP.1.1      | DLBWP.1.1      |
| Uplink initial BWP configuration     |            |      | ULBWP.0.1      | ULBWP.0.1      |
| Uplink dedicated BWP configuration   |            |      | ULBWP.1.1      | ULBWP.1.1      |
| DRX Cycle configuration              |            | ms   | Not Applicable | Not Applicable |
| TRS configuration                    | Config 1   |      | TRS.1.1 FDD    | TRS.1.1 FDD    |
|                                      | Config 2   |      | TRS.1.1 TDD    | TRS.1.1 TDD    |
|                                      | Config 3   |      | TRS.1.2 TDD    | TRS.1.2 TDD    |

|  |                                      |        |                |                |
|--|--------------------------------------|--------|----------------|----------------|
| PDSCH Reference measurement channel      | Config 1                             |        | SR.1.1 FDD     | SR.1.1 FDD     |
|  | Config 2                             |        | SR.1.1 TDD     | SR.1.1 TDD     |
|  | Config 3                             |        | SR.2.1 TDD     | SR.2.1 TDD     |
| RMSI CORESET Reference Channel           | Config 1                             |        | CR.1.1 FDD     | CR.1.1 FDD     |
|  | Config 2                             |        | CR.1.1 TDD     | CR.1.1 TDD     |
|  | Config 3                             |        | CR.2.1 TDD     | CR.2.1 TDD     |
| Dedicated CORESET Reference Channel      | Config 1                             |        | CCR.1.1 FDD    | CCR.1.1 FDD    |
|  | Config 2                             |        | CCR.1.1 TDD    | CCR.1.1 TDD    |
|  | Config 3                             |        | CCR.2.1 TDD    | CCR.2.1 TDD    |
| OCNG Patterns                            |                                      |        | OP.1           | OP.1           |
| SS-RSSI-Measurement                      |                                      |        | Not Applicable | Not Applicable |
| SMTTC configuration                      | Config 1                             |        | SMTTC.2        | SMTTC.2        |
|  | Config 2,3                           |        | SMTTC.1        | SMTTC.1        |
| SSB configuration                        | Config 1,2                           |        | SSB.1 FR1      | SSB.1 FR1      |
|  | Config 3                             |        | SSB.2 FR1      | SSB.2 FR1      |
| PDSCH/PDCCH subcarrier spacing           | Config 1,2                           | kHz    | 15             | 15             |
|  | Config 3                             |        | 30             | 30             |
| EPRE ratio of PSS to SSS                 |                                      | dB     | 0              | 0              |
| EPRE ratio of PBCH DMRS to SSS           |                                      |        |                |                |
| EPRE ratio of PBCH to PBCH DMRS          |                                      |        |                |                |
| EPRE ratio of PDCCH DMRS to SSS          |                                      |        |                |                |
| EPRE ratio of PDCCH to PDCCH DMRS        |                                      |        |                |                |
| EPRE ratio of PDSCH DMRS to SSS          |                                      |        |                |                |
| EPRE ratio of PDSCH to PDSCH             |                                      |        |                |                |
| EPRE ratio of OCNG DMRS to SSS(Note 1)   |                                      |        |                |                |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |                                      |        |                |                |
| $N_{oc}$ <sup>Note2</sup>                | NR_FDD_FR1_A, NR_TDD_FR1_A<br>NOTE 6 |        |                |                |
|  | NR_FDD_FR1_B                         | -115.5 |                |                |
|  | NR_TDD_FR1_C                         | -115   |                |                |
|  | NR_FDD_FR1_D, NR_TDD_FR1_D           | -114.5 |                |                |
|  | NR_FDD_FR1_E, NR_TDD_FR1_E           | -114   |                |                |
|  | NR_FDD_FR1_F                         | -113.5 |                |                |
|  | NR_FDD_FR1_G                         | -113   |                |                |
|  | NR_FDD_FR1_H                         | -112.5 |                |                |

|                                  |                               |   |         |        |                           |   |
|----------------------------------|-------------------------------|---|---------|--------|---------------------------|---|
| $N_{oc}$<br>Note2                | Config 1,2                    |   | dBm/SCS | -93    | Same as Noc<br>for 15 kHz |   |
|                                  | Config 3                      | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |         | -90    | -113                      |   |
|                                  |                               | NR_FDD_FR1_B                            |         |        |                           | -112.5                                  |
|                                  |                               | NR_TDD_FR1_C                            |         |        |                           | -112                                    |
|                                  |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |        |                           | -111.5                                  |
|                                  |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |        |                           | -111                                    |
|                                  |                               | NR_FDD_FR1_F                            |         |        |                           | -110.5                                  |
|                                  |                               | NR_FDD_FR1_G                            |         |        |                           | -110                                    |
|                                  |                               | NR_FDD_FR1_H                            |         |        |                           | -109.5                                  |
| $\hat{E}_s / I_{ot}$             |                               |   | dB      | 0      | -5.46                     |   |
| $\hat{E}_s / N_{oc}$             |                               |   | dB      | 4.54   | -4                        |   |
| SS-<br>RSRP <sup>Not</sup><br>e3 | Config 1,2                    | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -88.46 | -120                      |   |
|                                  |                               | NR_FDD_FR1_B                            |         |        |                           | -119.5                                  |
|                                  |                               | NR_TDD_FR1_C                            |         |        |                           | -119                                    |
|                                  |                               | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |         |        |                           | -118.5                                  |
|                                  |                               | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |         |        |                           | -118                                    |
|                                  |                               | NR_FDD_FR1_F                            |         |        |                           | -117.5                                  |
|                                  |                               | NR_FDD_FR1_G                            |         |        |                           | -117                                    |
|                                  |                               | NR_FDD_FR1_H                            |         |        |                           | -116.5                                  |
|                                  |                               | Config 3                                |         |        |                           | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 |
|                                  | NR_FDD_FR1_B                  |   | -116.5  |        |                           |   |
|                                  | NR_TDD_FR1_C                  |   | -116    |        |                           |   |
|                                  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D |   | -115.5  |        |                           |   |
|                                  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E |   | -115    |        |                           |   |
|                                  | NR_FDD_FR1_F                  |   | -114.5  |        |                           |   |
|                                  | NR_FDD_FR1_G                  |   | -114    |        |                           |   |
|                                  | NR_FDD_FR1_H                  |   | -113.5  |        |                           |   |



|   |            |   |                  |        |        |
|---|------------|---|------------------|--------|--------|
| SS-SINR <sup>Note3</sup>  |            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dB               | 0      | -5.46  |
|   |            | NR_FDD_FR1_B                            |                  |        |        |
|   |            | NR_TDD_FR1_C                            |                  |        |        |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        |        |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        |        |
|   |            | NR_FDD_FR1_F                            |                  |        |        |
|   |            | NR_FDD_FR1_G                            |                  |        |        |
|   |            | NR_FDD_FR1_H                            |                  |        |        |
| Io <sup>Note3</sup>   | Config 1,2 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>9.36MHz  | -57.5  | -85.51 |
|   |            | NR_FDD_FR1_B                            |                  |        | -85.01 |
|   |            | NR_TDD_FR1_C                            |                  |        | -84.51 |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        | -84.01 |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        | -83.51 |
|   |            | NR_FDD_FR1_F                            |                  |        | -83.01 |
|   |            | NR_FDD_FR1_G                            |                  |        | -82.51 |
|   |            | NR_FDD_FR1_H                            |                  |        | -82.01 |
|   | Config 3   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/<br>38.16MHz | -51.41 | -79.41 |
|   |            | NR_FDD_FR1_B                            |                  |        | -78.91 |
|   |            | NR_TDD_FR1_C                            |                  |        | -78.41 |
|   |            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |                  |        | -77.91 |
|   |            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |                  |        | -77.41 |
|   |            | NR_FDD_FR1_F                            |                  |        | -76.91 |
| NR_FDD_FR1_G  | -76.41     |   |                  |        |        |
| NR_FDD_FR1_H  | -75.91     |   |                  |        |        |
| Propagation condition   |            |   | -                | AWGN   | AWGN   |
| Antenna configuration   |            |   | -                | 1x2    | 1x2    |
| <p>Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for <math>N_{oc}</math> to be fulfilled.</p> <p>Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</p> <p>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</p> <p>Note 5: NR operating band groups are as defined in clause 3.5.2.</p> <p>Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.</p> |            |   |                  |        |        |

A.13.4.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.31.1.1.

## A.13.4.4 L1-RSRP measurement for beam reporting with CCA serving cell

### A.13.4.4.1 SSB based L1-RSRP measurement

#### A.13.4.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.33.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.13.4.4.1.1-1.

**Table A.13.4.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description   |
|--------|---|
| 1      | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2      | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3      | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note:  | The UE is only required to be tested in one of the supported test configurations  |

#### A.13.4.4.1.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a SCell under CCA (Cell2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model.

Two sub-tests (Test 1 and Test 2) are provided with different  $N_{oc}$  on Cell 2. The test parameters for the Cell 1 and Cell 2 are given in Table A.13.4.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.13.4.4.1.2-1.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. On Cell 2, UE is configured to perform L1-RSRP measurement based on the SSB resources 0 and 1.

**Table A.13.4.4.1.2-1: FR1 SSB based L1-RSRP test parameters**

| Parameter  | Config | Unit | Test 1                      |                             | Test 2                      |                             |
|--|--------|------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  |        |      | Cell 1                      | Cell 2                      | Cell 1                      | Cell 2                      |
| Active PCell/SCell Configuration                 | 1~3    |      | PCell                       | SCell                       | PCell                       | SCell                       |
| SSB GSCN   | 1~3    |      | freq1                       | freq2                       | freq1                       | freq2                       |
| DL CCA model                                     | 1~3    |      | N/A                         | As specified in A.3.20.2.1  | N/A                         | As specified in A.3.20.2.1  |
| UL CCA model                                     | 1~3    |      | N/A                         | As specified in A.3.20.2.2  | N/A                         | As specified in A.3.20.2.2  |
| Duplex mode                                      | 1      |      | FDD                         | TDD                         | FDD                         | TDD                         |
|  | 2,3    |      | TDD                         |                             | TDD                         |                             |
| TDD configuration                                | 1      |      | N/A                         | TDDConf.1.1 CCA             | N/A                         | TDDConf.1.1 CCA             |
|  | 2      |      | TDDConf.1.1                 |                             | TDDConf.1.1                 |                             |
|  | 3      |      | TDDConf.2.1                 |                             | TDDConf.2.1                 |                             |
| BW <sub>channel</sub>                            | 1      | MHz  | 10: N <sub>RB,c</sub> = 52  | 40: N <sub>RB,c</sub> = 106 | 10: N <sub>RB,c</sub> = 52  | 40: N <sub>RB,c</sub> = 106 |
|  | 2      |      | 10: N <sub>RB,c</sub> = 52  |                             | 10: N <sub>RB,c</sub> = 52  |                             |
|  | 3      |      | 40: N <sub>RB,c</sub> = 106 |                             | 40: N <sub>RB,c</sub> = 106 |                             |
| PDSCH Reference measurement channel              | 1      |      | SR.1.1 FDD                  | SR.1.1 CCA                  | SR.1.1 FDD                  | SR.1.1 CCA                  |
|  | 2      |      | SR.1.1 TDD                  |                             | SR.1.1 TDD                  |                             |
|  | 3      |      | SR.2.1 TDD                  |                             | SR.2.1 TDD                  |                             |
| RMSI CORESET Reference Channel                   | 1      |      | CR.1.1 FDD                  | CR.1.1 CCA                  | CR.1.1 FDD                  | CR.1.1 CCA                  |
|  | 2      |      | CR.1.1 TDD                  |                             | CR.1.1 TDD                  |                             |
|  | 3      |      | CR.2.1 TDD                  |                             | CR.2.1 TDD                  |                             |
| Dedicated CORESET Reference Channel              | 1      |      | CCR.1.1 FDD                 | CCR.1.1 CCA                 | CCR.1.1 FDD                 | CCR.1.1 CCA                 |
|  | 2      |      | CCR.1.1 TDD                 |                             | CCR.1.1 TDD                 |                             |
|  | 3      |      | CCR.2.1 TDD                 |                             | CCR.2.1 TDD                 |                             |
| SSB configuration for Semi-static channel access | 1      |      | SSB.3 FR1                   | SSB.3 CCA                   | SSB.3 FR1                   | SSB.3 CCA                   |
|  | 2      |      | SSB.3 FR1                   |                             | SSB.3 FR1                   |                             |
|  | 3      |      | SSB.4 FR1                   |                             | SSB.4 FR1                   |                             |
| SSB configuration for Dynamic channel access     | 1      |      | SSB.3 FR1                   | SSB.4 CCA                   | SSB.3 FR1                   | SSB.4 CCA                   |
|  | 2      |      | SSB.3 FR1                   |                             | SSB.3 FR1                   |                             |
|  | 3      |      | SSB.4 FR1                   |                             | SSB.4 FR1                   |                             |
| TRS configuration                                | 1      |      | TRS.1.1 FDD                 | TRS.1.2 TDD                 | TRS.1.1 FDD                 | TRS.1.2 TDD                 |
|  | 2      |      | TRS.1.1 TDD                 |                             | TRS.1.1 TDD                 |                             |
|  | 3      |      | TRS.1.2 TDD                 |                             | TRS.1.2 TDD                 |                             |
| OCNG Patterns                                    | 1~3    |      | OP.1                        |                             | OP.1                        |                             |
| Initial BWP Configuration                        | 1~3    |      | DLBWP.0.1<br>ULBWP.0.1      |                             | DLBWP.0.1<br>ULBWP.0.1      |                             |
| Dedicated BWP configuration                      | 1~3    |      | DLBWP.1.1<br>ULBWP.1.1      |                             | DLBWP.1.1<br>ULBWP.1.1      |                             |
| SMTc configuration                               | 1~3    |      | SMTc.1                      | N/A                         | SMTc.1                      | N/A                         |
| DBT Window Configuration                         | 1~3    |      | N/A                         | DBT.1                       | N/A                         | DBT.1                       |
| reportConfigType                                 | 1~3    |      | periodic                    |                             | periodic                    |                             |
| reportQuantity                                   | 1~3    |      | ssb-Index-RSRP              |                             | ssb-Index-RSRP              |                             |
| Number of reported RS                            | 1~3    |      | 2                           |                             | 2                           |                             |
| L1-RSRP reporting period                         | 1~3    |      | slot80                      |                             | slot80                      |                             |
| EPRE ratio of PSS to SSS                         | 1~3    | dB   | 0                           |                             | 0                           |                             |
| EPRE ratio of PBCH DMRS to SSS                   |        |      |                             |                             |                             |                             |
| EPRE ratio of PBCH to PBCH DMRS                  |        |      |                             |                             |                             |                             |

|   |   |     |                      |        |        |      |
|---|---|-----|----------------------|--------|--------|------|
| EPRE ratio of PDCCH DMRS to SSS                   |   |     |                      |        |        |      |
| EPRE ratio of PDCCH to PDCCH DMRS                 |   |     |                      |        |        |      |
| EPRE ratio of PDSCH DMRS to SSS                   |   |     |                      |        |        |      |
| EPRE ratio of PDSCH to PDSCH DMRS                 |   |     |                      |        |        |      |
| EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>  |   |     |                      |        |        |      |
| EPRE ratio of OCNG to OCNG DMRS <sup>Note 1</sup> |   |     |                      |        |        |      |
| $N_{oc}$<br>Note2                                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1~3 | dBm/15<br>kHz        | -94.65 | -94.65 | -    |
|   | NR_FDD_FR1_B                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_C                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                      |        |        | -    |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                      |        |        | -    |
|   | NR_FDD_FR1_F                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_G                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_H                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_I                            |     |                      |        |        | -    |
| $N_{oc}$<br>Note2                                 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1~3 | dBm/S<br>SB<br>SCS   | -91.65 | -91.65 | -    |
|   | NR_FDD_FR1_B                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_C                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                      |        |        | -    |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                      |        |        | -    |
|   | NR_FDD_FR1_F                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_G                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_H                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_I                            |     |                      |        |        | -    |
| $\hat{E}_s/I_{ot}$                                |   | 1~3 | dB                   | 10     | 10     | -3   |
| SS-RSRP <sup>Note3</sup>                          | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1~3 | dBm/S<br>CS          | -81.65 | -81.65 | -    |
|   | NR_FDD_FR1_B                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_C                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                      |        |        | -    |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                      |        |        | -    |
|   | NR_FDD_FR1_F                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_G                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_H                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_I                            |     |                      |        |        | -    |
| $I_o$ <sup>Note3</sup>                            | NR_FDD_FR1_A,<br>NR_TDD_FR1_A<br>NOTE 5 | 1~3 | dBm/<br>38.16M<br>Hz | -50.19 | -50.19 | -    |
|   | NR_FDD_FR1_B                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_C                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_D,<br>NR_TDD_FR1_D           |     |                      |        |        | -    |
|   | NR_FDD_FR1_E,<br>NR_TDD_FR1_E           |     |                      |        |        | -    |
|   | NR_FDD_FR1_F                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_G                            |     |                      |        |        | -    |
|   | NR_FDD_FR1_H                            |     |                      |        |        | -    |
|   | NR_TDD_FR1_I                            |     |                      |        |        | -    |
| $\hat{E}_s/N_{oc}$                                |   | 1~3 | dB                   | 10     | 10     | -3   |
| Propagation condition                             |   | 1~3 |                      | AWGN   |        | AWGN |
| Antenna configuration                             |   | 1~3 |                      | 1x2    |        | 1x2  |

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: RSRP and  $I_o$  levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

#### A.13.4.4.1.3 Test Requirements

In both Test 1 and Test 2, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.33.1.

### A.13.4.5 RSSI

#### A.13.4.5.1 Intra-frequency RSSI measurement accuracy on a carrier with CCA

##### A.13.4.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.1.

##### A.13.4.5.1.2 Test parameters

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the SCell with CCA. RSSI is measured on channel number 2. Supported test configurations are shown in table A.13.4.5.1.2-1. The accuracy of RSSI intra-frequency measurements is tested by using the parameters in A.13.4.5.1.2-2 and A.13.4.5.1.2-3.

**Table A.13.4.5.1.2-1: Intra frequency RSSI supported test configurations**

| Configuration | Description   |
|---------------|---|
| 1             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2             | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3             | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE:         | The UE is only required to be tested in one of the supported test configurations.   |

**Table A.13.4.5.1.2-2: RSSI Intra frequency test parameters**

| Parameter   |   | Configurations | Unit      | Test 1   |                            |
|---|---|----------------|-----------|--|----------------------------|
|   |   |                |           | Cell 1   | Cell 2                     |
| RF Channel Number   |   |                |           | 1  | 2                          |
| BW <sub>channel</sub>   |   |                | MHz       | 40   | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.2 CCA                  |
| P <sub>CCA_DL</sub>   |   |                |           | 1  | TBD                        |
| P <sub>CCA_UL</sub>   |   |                |           | 1  | TBD                        |
| DL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRB}$ | Same as channel access bandwidth                                 |                            |
| Channel access bandwidth  |   |                | MHz       | 20   |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable   |                            |
| PDSCH Reference measurement channel   | 1                                       |                |           | SR.1.1 FDD   | SR.1.1 CCA                 |
|   | 2,3                                     |                |           | SR.1.1 TDD   |                            |
| RMSI CORESET Reference Channel  | 1                                       |                |           | CR.1.1 FDD   | CR.1.1 CCA                 |
|   | 2,3                                     |                |           | CR.1.1 TDD   |                            |
| Dedicated CORESET Reference Channel   | 1                                       |                |           | CCR.1.1 FDD  | CCR.1.1 CCA                |
|   | 2,3                                     |                |           | CCR.1.1 TDD  |                            |
| OCNG Patterns   |   |                |           | OP.1   | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0  | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106   | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5  | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5  | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5   | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5   | -Infinity                  |



|  |  |         |        |        |
|--|--|---------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/SCS | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/SCS | -101.6 | -87    |
| Propagation condition  |  | -       | AWGN   |        |
| <p>Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |  |         |        |        |

**Table A.13.4.5.1.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.13.4.5.1.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.1. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## A.13.4.5.2 Inter-frequency RSSI measurement accuracy on a carrier with CCA

### A.13.4.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in Section 10.1.34.2.

### A.13.4.5.2.2 Test parameters

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the neighbour with CCA. RSSI is measured on channel number 2. Supported test configurations are shown in table A.13.4.5.2.2-1. The accuracy of RSSI inter-frequency measurements is tested by using the parameters in A.13.4.5.2.2-2 and A.13.4.5.2.3.

**Table A.13.4.5.2.2-1: Inter frequency RSSI supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3   | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.13.4.5.2.2-2: RSSI Inter frequency test parameters**

| Parameter   |   | Configurations | Unit      | Test 1   |                            |
|---|---|----------------|-----------|--|----------------------------|
|   |   |                |           | Cell 1   | Cell 2                     |
| RF Channel Number   |   |                |           | 1  | 2                          |
| $BW_{channel}$  |   |                | MHz       | 40   | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.2 CCA                  |
| $P_{CCA\_DL}$   |   |                |           | 1  | TBD                        |
| $P_{CCA\_UL}$   |   |                |           | 1  | TBD                        |
| DL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRB}$ | Same as channel access bandwidth                                 |                            |
| Channel access bandwidth  |   |                | MHz       | 20   |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable   |                            |
| PDSCH Reference measurement channel   | 1                                       |                |           | SR.1.1 FDD   | NA                         |
|   | 2,3                                     |                |           | SR.1.1 TDD   |                            |
| RMSI CORESET Reference Channel  | 1                                       |                |           | CR.1.1 FDD   | NA                         |
|   | 2,3                                     |                |           | CR.1.1 TDD   |                            |
| Dedicated CORESET Reference Channel   | 1                                       |                |           | CCR.1.1 FDD  | NA                         |
|   | 2,3                                     |                |           | CCR.1.1 TDD  |                            |
| OCNG Patterns   |   |                |           | OP.1   | NA                         |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0  | NA                         |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106   | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5  | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5  | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5   | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5   | -Infinity                  |

|   |  |         |        |        |
|---|--|---------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)  |  | dBm/SCS | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)  |  | dBm/SCS | -101.6 | -87    |
| Propagation condition   |  | -       | AWGN   |        |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |  |         |        |        |

**Table A.13.4.5.2.2-3: RSSI RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.13.4.5.2.3 Test Requirements

The average RSSI measurement accuracy shall fulfil the requirements in sections 10.1.34.2. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## A.13.4.6 Channel occupancy

### A.13.4.6.1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA

#### A.13.4.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.35.1.

#### A.13.4.6.1.2 Test parameters

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the SCell with CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in table A.13.4.6.1.2-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in A.13.4.6.1.2-2 and A.13.4.6.1.2-3.

**Table A.13.4.6.1.2-1: Intra frequency CO supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3   | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.13.4.6.1.2-2: CO Intra frequency test parameters**

| Parameter   |   | Configurations | Unit      | Test 1   |                            |
|---|---|----------------|-----------|--|----------------------------|
|   |   |                |           | Cell 1   | Cell 2                     |
| RF Channel Number   |   |                |           | 1  | 2                          |
| BW <sub>channel</sub>   |   |                | MHz       | 40   | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.2 CCA                  |
| P <sub>CCA_DL</sub>   |   |                |           | 1  | TBD                        |
| P <sub>CCA_UL</sub>   |   |                |           | 1  | TBD                        |
| DL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRB}$ | Same as channel access bandwidth                                 |                            |
| Channel access bandwidth  |   |                | MHz       | 20   |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable   |                            |
| PDSCH Reference measurement channel   | 1                                       |                |           | SR.1.1 FDD   | SR.1.1 CCA                 |
|   | 2,3                                     |                |           | SR.1.1 TDD   |                            |
| RMSI CORESET Reference Channel  | 1                                       |                |           | CR.1.1 FDD   | CR.1.1 CCA                 |
|   | 2,3                                     |                |           | CR.1.1 TDD   |                            |
| Dedicated CORESET Reference Channel   | 1                                       |                |           | CCR.1.1 FDD  | CCR.1.1 CCA                |
|   | 2,3                                     |                |           | CCR.1.1 TDD  |                            |
| OCNG Patterns   |   |                |           | OP.1   | OP.1                       |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0  | 0                          |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106   | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5  | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5  | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5   | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5   | -Infinity                  |

|   |  |        |        |        |
|---|--|--------|--------|--------|
| lo within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)  |  | dBm/BW | -101.6 | -101.6 |
| lo within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)  |  | dBm/BW | -101.6 | -87    |
| Propagation condition   |  | -      | AWGN   |        |
| channelOccupancyThreshold   |  | dBm    | -83    |        |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |  |        |        |        |

**Table A.13.4.6.1.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.13.4.6.1.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## A.13.4.6.2 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA

### A.13.4.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in Section 10.1.35.2.

### A.13.4.6.2.2 Test parameters

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the neighbour with CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in table A.13.4.6.2.2-1. The accuracy of channel occupancy inter-frequency measurements is tested by using the parameters in A.13.4.6.2.2-2 and A.13.4.6.2.3.

**Table A.13.4.6.2.2-1: Inter frequency CO supported test configurations**

| Configuration   | Description   |
|---|---|
| 1   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2   | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3   | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |   |

**Table A.13.4.6.2.2-2: CO Inter frequency test parameters**



| Parameter   |   | Configurations | Unit      | Test 1   |                            |
|---|---|----------------|-----------|--|----------------------------|
|   |   |                |           | Cell 1   | Cell 2                     |
| RF Channel Number   |   |                |           | 1  | 2                          |
| BW <sub>channel</sub>   |   |                | MHz       | 40   | 40                         |
| SSB configuration   | Semi-static channel access<br>Note 1, 3 | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.1 CCA                  |
|   | Dynamic channel access<br>Note 2, 3     | 1,2,3          |           | Configuration 1,2:<br>SSB.1 FR1<br>Configuration 3:<br>SSB.2 FR1 | SSB.2 CCA                  |
| P <sub>CCA_DL</sub>   |   |                |           | 1  | TBD                        |
| P <sub>CCA_UL</sub>   |   |                |           | 1  | TBD                        |
| DL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.1 |
| UL CCA model  |   |                |           | N/A  | As specified in A.3.20.2.2 |
| Measurement bandwidth   |   |                | $n_{PRB}$ | Same as channel access bandwidth                                 |                            |
| Channel access bandwidth  |   |                | MHz       | 20   |                            |
| DRX Cycle configuration   |   |                | ms        | Not Applicable   |                            |
| PDSCH Reference measurement channel   | 1                                       |                |           | SR.1.1 FDD   | NA                         |
|   | 2,3                                     |                |           | SR.1.1 TDD   |                            |
| RMSI CORESET Reference Channel  | 1                                       |                |           | CR.1.1 FDD   | NA                         |
|   | 2,3                                     |                |           | CR.1.1 TDD   |                            |
| Dedicated CORESET Reference Channel   | 1                                       |                |           | CCR.1.1 FDD  | NA                         |
|   | 2,3                                     |                |           | CCR.1.1 TDD  |                            |
| OCNG Patterns   |   |                |           | OP.1   | NA                         |
| EPRE ratio of PSS to SSS  |   |                | dB        | 0  | NA                         |
| EPRE ratio of PBCH DMRS to SSS  |   |                |           |  |                            |
| EPRE ratio of PBCH to PBCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDCCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDCCH to PDCCH DMRS   |   |                |           |  |                            |
| EPRE ratio of PDSCH DMRS to SSS   |   |                |           |  |                            |
| EPRE ratio of PDSCH to PDSCH  |   |                |           |  |                            |
| EPRE ratio of OCNG DMRS to SSS(Note 1)  |   |                |           |  |                            |
| EPRE ratio of OCNG to OCNG DMRS (Note 1)  |   |                |           |  |                            |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC)           |   |                |           |  |                            |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC)               |   |                | dBm/SCS   | -106   | -87                        |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) |   |                | dB        | 2.5  | 2.5                        |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC)     |   |                | dB        | 2.5  | -Infinity                  |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC)            |   |                | dBm/SCS   | -103.5   | -103.5                     |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC)                |   |                |           | -103.5   | -Infinity                  |

|  |  |        |        |        |
|--|--|--------|--------|--------|
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/BW | -101.6 | -101.6 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC)   |  | dBm/BW | -101.6 | -87    |
| Propagation condition  |  | -      | AWGN   |        |
| channelOccupancyThreshold  |  | dBm    | -83    |        |
| <p>Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.</p> <p>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.</p> <p>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.</p> |  |        |        |        |

**Table A.13.4.6.2.2-3: CO RMTC parameters**

|                         |           |
|-------------------------|-----------|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16    | ms40      |
| rmtc-SubframeOffset-r16 | 20        |
| ref-SCS-CP-r16          | kHz15     |
| ReportInterval          | ms120     |

### A.13.4.6.2.3 Test Requirements

The nominal reported *channelOccupancy* shall be TBD. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## Annex B (normative): Conditions for RRM requirements applicability for operating bands

### B.1 Conditions for NR RRC\_IDLE state mobility

#### B.1.1 Introduction

In Annex B.1, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency measurements procedures and requirements in clause 4,
- UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in clause 4.

#### B.1.2 Conditions for measurements on NR intra-frequency cells for cell re-selection

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

The conditions are defined in Table B.1.2-2 for FR2 NR cells.

**Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB <sub>RP</sub>   |                             | SSB $\hat{E}_s/I_{ot}$ |
|------------|---|-----------------------------|-----------------------------|------------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             | dB                     |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |                        |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A                | -124                        | -121                        | ≥ -4                   |
|            | NR_FDD_FR1_B                              | -123.5                      | -120.5                      |                        |
|            | NR_TDD_FR1_C                              | -123                        | -120                        |                        |
|            | NR_FDD_FR1_D, NR_TDD_FR1_D                | -122.5                      | -119.5                      |                        |
|            | NR_FDD_FR1_E, NR_TDD_FR1_E                | -122                        | -119                        |                        |
|            | NR_FDD_FR1_F                              | -121.5                      | -118.5                      |                        |
|            | NR_FDD_FR1_G                              | -121                        | -118                        |                        |
|            | NR_FDD_FR1_H                              | -120.5                      | -117.5                      |                        |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

Table B.1.2-2: Conditions for intra-frequency cell re-selection in FR2

| Parameter  | Angle of arrival                     | NR operating bands | Minimum SSB <sub>RP</sub> <sup>Note 2, Note 3</sup> |            |                              |                           | SSB $\hat{E}_s/\text{lot}$                    |     |
|------------|--------------------------------------|--------------------|---|------------|------------------------------|---------------------------|---|-----|
|            |                                      |                    | dBm / SCS <sub>SSB</sub>                            |            |                              |                           | dB  |     |
|            |                                      |                    | SCS <sub>SSB</sub> = 120 kHz                        |            | SCS <sub>SSB</sub> = 240 kHz |                           |   |     |
|            |                                      |                    | UE Power class                                      |            | UE Power class               |                           |   |     |
| 1          | 2                                    | 3                  | 4   | 1, 2, 3, 4 |                              |                           |   |     |
| Conditions | Rx Beam Peak                         | n257               | -<br>125.3+Y <sub>1</sub>                           | -110.8     | -109.1                       | -<br>124.8+Y <sub>4</sub> | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥-4 |
|            |                                      | n258               | -<br>125.3+Y <sub>1</sub>                           | -110.8     | -109.1                       | -<br>124.8+Y <sub>4</sub> |   |     |
|            |                                      | n259               |   |            | -105.5                       |                           |   |     |
|            |                                      | n260               | -<br>122.3+Y <sub>1</sub>                           |            | -106.5                       | -<br>122.8+Y <sub>4</sub> |   |     |
|            |                                      | n261               | -<br>125.3+Y <sub>1</sub>                           | -110.8     | -109.1                       | -<br>124.8+Y <sub>4</sub> |   |     |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -<br>117.3+Z <sub>1</sub>                           | -99.8      | -98.2                        | -<br>115.8+Z <sub>4</sub> | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥-4 |
|            |                                      | n258               | -<br>117.3+Z <sub>1</sub>                           | -99.8      | -98.2                        | -<br>115.8+Z <sub>4</sub> |   |     |
|            |                                      | n259               |   |            | -92.7                        |                           |   |     |
|            |                                      | n260               | -<br>114.3+Z <sub>1</sub>                           |            | -93.9                        | -<br>110.8+Z <sub>4</sub> |   |     |
|            |                                      | n261               | -<br>117.3+Z <sub>1</sub>                           | -99.8      | -98.2                        | -<br>115.8+Z <sub>4</sub> |   |     |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SSB  $\hat{E}_s/\text{lot}$ , with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta\text{MB}_{P,n}$  and Spherical coverage values are increased by  $\Delta\text{MB}_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.1.2-2:

- The value of Y for Power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for Power classes 1 and 4 respectively

### B.1.3 Conditions for measurements on NR inter-frequency cells for cell re-selection

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB<sub>RP</sub> and SSB  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

The conditions defined in Table B.1.2-2 for FR2 NR intra-frequency cell re-selection shall also apply for FR2 NR inter-frequency cells in this clause.

## B.2 Conditions for UE measurements procedures and performance requirements in RRC\_CONNECTED state

### B.2.1 Introduction

#### B.2.1.1 General

In Annex B.2, the following conditions are specified:

- The conditions for RRC connection release with redirection to NR requirements in clause 6.2.3.2.1,
- The conditions for UE transmit timing adjustment in clause 7.1
- UE conditions which shall apply for UE intra-frequency measurements procedures and requirements in clause 9, UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in clause 9,
- UE conditions which shall apply for UE intra-frequency measurements performance requirements in clause 10,
- UE conditions which shall apply for UE inter-frequency measurements performance requirements in clause 10.

#### B.2.1.2 Derivation of Minimum SSB\_RP values for FR1

[FFS]

#### B.2.1.3 Derivation of Minimum SSB\_RP values for FR2

*Editor's note:*

- *The Assumption for UE beams (fine or rough) in Annex A RRM test cases is defined based on power class 3, and unless otherwise stated also applies for other UE power classes*

##### B.2.1.3.1 Minimum SSB\_RP values for Rx Beam Peak angle of arrival

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on Reference sensitivity for the Operating band and for the UE power class, taking a baseline of UE Power class 3 in Band n260 with 50 MHz channel bandwidth.

Minimum SSB\_RP = Reference sensitivity<sub>PC3, n260, 50MHz</sub> + Y - 10Log<sub>10</sub>(PRB<sub>Refsens</sub> x 12) - SNR<sub>Refsens</sub> + SSB Ês/Iot + ΔMB<sub>P,n</sub>

where:

Reference sensitivity<sub>PC3, n260, 50MHz</sub> is the reference sensitivity value in dBm specified for power class 3 in Band n260 for 50 MHz Channel bandwidth in Table 7.3.2.3-1 of TS 38.101-2 [19];

Y is the gain difference between fine and rough beams, which is defined in Table B.2.1.3.1-1;

**Table B.2.1.3.1-1: Gain difference Y between fine and rough beams, Rx beam peak direction**

| Value "Y" in dB, for each UE power class |     |     |     |
|--|-----|-----|-----|
| 1  | 2   | 3   | 4   |
| FFS                                      | 9.0 | 7.0 | FFS |

PRB<sub>Refsens</sub> is N<sub>RB</sub> associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32;

12 is the number of subcarriers in a PRB;

SNR<sub>Refsens</sub> is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1 dB;

$\hat{E}_s/I_{ot}$  is the minimum value required by the UE to perform measurements, and is -6 dB for intra-frequency measurements and -4 dB for inter-frequency measurements. The only contribution to  $I_{ot}$  is the UE internal noise;

$\Delta MB_{P,n}$  is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE power class 3 in Band n260 is  $(-109.5 + \Delta MB_{P,n})$  dBm/120kHz for intra-frequency measurements and  $(-107.5 + \Delta MB_{P,n})$  dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band\_Y) is used:

For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) =  $-109.5$  dBm/120kHz + Refsens<sub>PC\_X, Band\_Y, 50MHz</sub> – Refsens<sub>PC3, n260, 50MHz</sub> +  $Y_{PC_X} - Y_{PC3} + \Delta MB_{P,n}$ ,

For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) =  $-107.5$  dBm/120kHz + Refsens<sub>PC\_X, Band\_Y, 50MHz</sub> – Refsens<sub>PC3, n260, 50MHz</sub> +  $Y_{PC_X} - Y_{PC3} + \Delta MB_{P,n}$ .

### B.2.1.3.2 Minimum SSB\_RP values for angle of arrival within Spherical coverage

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on EIS spherical coverage for the Operating band and for the UE power class, taking a baseline of UE power class 3 in Band n260 with 50 MHz channel bandwidth.

Minimum SSB\_RP = EIS spherical coverage<sub>PC3, n260, 50MHz</sub> +  $Z - 10 \log_{10}(\text{PRB}_{\text{Refsens}} \times 12) - \text{SNR}_{\text{Refsens}} + \hat{E}_s/I_{ot} + \Delta MB_{S,n}$

where:

EIS spherical coverage<sub>PC3, n260, 50MHz</sub> is the EIS spherical coverage value in dBm specified for power class 3 in Band n260 for 50MHz Channel bandwidth in TS 38.101-2 [19] Table 7.3.4.3-1;

Z is the gain difference between fine and rough beams, and is defined in Table B.2.1.3.2-1;

**Table B.2.1.3.2-1: Gain difference Z between fine and rough beams, Spherical coverage directions**

| Value "Z" in dB, for each UE power class |     |     |     |
|--|-----|-----|-----|
| 1  | 2   | 3   | 4   |
| FFS                                      | 9.0 | 7.0 | FFS |

$\text{PRB}_{\text{Refsens}}$  is  $N_{RB}$  associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32;

12 is the number of subcarriers in a PRB;

$\text{SNR}_{\text{Refsens}}$  is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1 dB;

$\hat{E}_s/I_{ot}$  is the minimum value required by the UE to perform measurements, and is -6 dB for intra-frequency measurements and -4 dB for inter-frequency measurements. The only contribution to  $I_{ot}$  is the UE internal noise;

$\Delta MB_{S,n}$  is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE power class 3 in Band n260 is  $(-96.9 + \Delta MB_{S,n})$  dBm/120kHz for intra-frequency measurements and  $(-94.9 + \Delta MB_{S,n})$  dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band\_Y) is used:

For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) =  $-96.9$  dBm/120kHz + EIS spherical coverage<sub>PC\_X, Band\_Y, 50MHz</sub> – EIS spherical coverage<sub>PC3, n260, 50MHz</sub> +  $Z_{PC_X} - Z_{PC3} + \Delta MB_{S,n}$

For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) =  $-94.9$  dBm/120kHz + EIS spherical coverage<sub>PC\_X, Band\_Y, 50MHz</sub> – EIS spherical coverage<sub>PC3, n260, 50MHz</sub> +  $Z_{PC_X} - Z_{PC3} + \Delta MB_{S,n}$

### B.2.1.4 Gain to SS-RSRP and CSI-RSRP measurement point for FR1

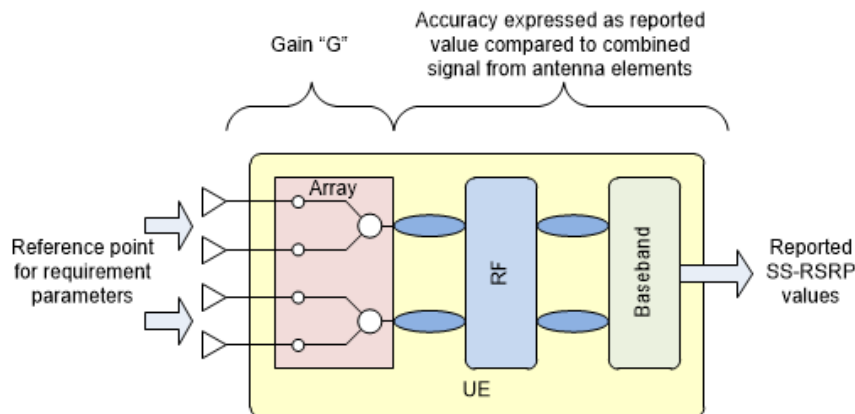
In FR1 conducted requirements are specified at the UE antenna connector, which is also the SS-RSRP and CSI-RSRP measurement point.

### B.2.1.5 Gain to SS-RSRP and CSI-RSRP measurement point for FR2

#### B.2.1.5.1 Gain to SS-RSRP and CSI-RSRP measurement point for Rx Beam Peak angle of arrival

In clause 5.1.1 of TS 38.215 [4] SS-RSRP and CSI-RSRP is defined to be measured based on the combined signal from antenna elements corresponding to a given receiver branch. The reference point for requirement parameters from the UE perspective is the input of the UE antenna array. The gain “G” relates the combined signal from antenna elements corresponding to a given receiver branch to the reference point for requirement parameters.

The gain “G” affects absolute signal level values reported by the UE.



**Figure B.2.1.5.1-1: Gain and Reference point for requirement parameters**

The gain range for each power class is specified in Table B.2.1.5.1-1.

**Table B.2.1.5.1-1: UE gain G, Rx beam peak direction**

|              | UE Power class |     |     |     |
|--------------|----------------|-----|-----|-----|
|              | 1              | 2   | 3   | 4   |
| Minimum, dBi | FFS            | FFS | -10 | FFS |
| Maximum, dBi | FFS            | FFS | +20 | FFS |

Gain range in spherical coverage directions may be lower than in Rx beam peak direction, according to the difference between the EIS spherical coverage value specified in TS 38.101-2 [19] clause 7.3.4 and the Reference sensitivity level specified in TS 38.101-2 [19] clause 7.3.2.

### B.2.1.6 Gain to PRS-RSRP measurement point for FR2

#### B.2.1.6.1 Gain to PRS-RSRP measurement point for Rx Beam Peak angle of arrival

In clause 5.1.28 of TS 38.215 [4] PRS-RSRP is defined to be measured based on the combined signal from antenna elements corresponding to a given receiver branch. The reference point for requirement parameters from the UE perspective is the input of the UE antenna array. The gain “G” relates the combined signal from antenna elements corresponding to a given receiver branch to the reference point for requirement parameters.

The gain “G” affects absolute signal level values reported by the UE.

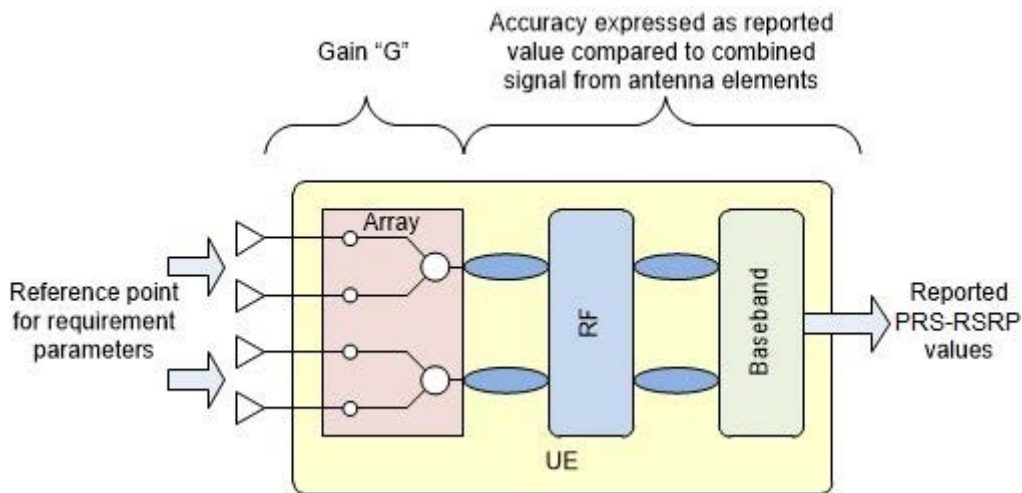


Figure B.2.1.6.1-1: Gain and Reference point for requirement parameters

The gain range for each power class is specified in Table B.2.1.61-1.

Table B.2.1.6.1-1: UE gain G, Rx beam peak direction

|              | UE Power class |     |     |     |
|--------------|----------------|-----|-----|-----|
|              | 1              | 2   | 3   | 4   |
| Minimum, dBi | FFS            | FFS | -10 | FFS |
| Maximum, dBi | FFS            | FFS | +20 | FFS |

Gain range in spherical coverage directions may be lower than in Rx beam peak direction, according to the difference between the EIS spherical coverage value specified in TS 38.101-2 [19] clause 7.3.4 and the Reference sensitivity level specified in TS 38.101-2 [19] clause 7.3.2.

## B.2.2 Conditions for NR intra-frequency measurements

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB<sub>RP</sub> and SSB  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.2-2 for FR2 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB <sub>RP</sub>   |                             | SSB $\hat{E}_s/\text{lot}$ |
|------------|---|-----------------------------|-----------------------------|----------------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             |                            |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz | dB                         |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A  | -127                        | -124                        | ≥ -6                       |
|            | NR_FDD_FR1_B                              | -126.5                      | -123.5                      |                            |
|            | NR_TDD_FR1_C                              | -126                        | -123                        |                            |
|            | NR_FDD_FR1_D, NR_TDD_FR1_D                | -125.5                      | -122.5                      |                            |
|            | NR_FDD_FR1_E, NR_TDD_FR1_E                | -125                        | -122                        |                            |
|            | NR_FDD_FR1_F                              | -124.5                      | -121.5                      |                            |
|            | NR_FDD_FR1_G                              | -124                        | -121                        |                            |
|            | NR_FDD_FR1_H                              | -123.5                      | -120.5                      |                            |

NOTE 1: NR operating band groups are defined in clause 3.5.2.



Table B.2.2-2: Conditions for intra-frequency measurements in FR2

| Parameter  | Angle of arrival                        | NR operating bands | Minimum SSB <sub>RP</sub> <sup>Note 2, Note 3</sup> |        |        |                              | SSB $\hat{E}_s/\text{lot}$                    |            |
|------------|---|--------------------|---|--------|--------|------------------------------|---|------------|
|            |   |                    | dBm / SCS <sub>SSB</sub>                            |        |        |                              | dB  |            |
|            |   |                    | SCS <sub>SSB</sub> = 120 kHz                        |        |        | SCS <sub>SSB</sub> = 240 kHz |   |            |
|            |   |                    | UE power class                                      |        |        | UE power class               |   |            |
|            |   |                    | 1   | 2      | 3      | 4                            |   | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak                            | n257               | -<br>128.3+Y <sub>1</sub>                           | -113.8 | -112.1 | -<br>127.8+Y <sub>4</sub>    | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥-6        |
|            |   | n258               | -<br>128.3+Y <sub>1</sub>                           | -113.8 | -112.1 | -<br>127.8+Y <sub>4</sub>    |   |            |
|            |   | n259               | -   | -      | -108.5 | -                            |   |            |
|            |   | n260               | -<br>125.3+Y <sub>1</sub>                           | -      | -109.5 | -<br>125.8+Y <sub>4</sub>    |   |            |
|            |   | n261               | -<br>128.3+Y <sub>1</sub>                           | -113.8 | -112.1 | -<br>127.8+Y <sub>4</sub>    |   |            |
|            | Spherical coverage<br><sup>Note 1</sup> | n257               | -<br>120.3+Z <sub>1</sub>                           | -102.8 | -101.2 | -<br>118.8+Z <sub>4</sub>    | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥-6        |
|            |   | n258               | -<br>120.3+Z <sub>1</sub>                           | -102.8 | -101.2 | -<br>118.8+Z <sub>4</sub>    |   |            |
|            |   | n259               | -   | -      | -95.7  | -                            |   |            |
|            |   | n260               | -<br>117.3+Z <sub>1</sub>                           | -      | -96.9  | -<br>113.8+Z <sub>4</sub>    |   |            |
|            |   | n261               | -<br>120.3+Z <sub>1</sub>                           | -102.8 | -101.2 | -<br>118.8+Z <sub>4</sub>    |   |            |

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum SSB  $\hat{E}_s/\text{lot}$ , with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta\text{MB}_{P,n}$  and spherical coverage values are increased by  $\Delta\text{MB}_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.2-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

## B.2.3 Conditions for NR inter-frequency measurements

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB<sub>RP</sub> and SSB  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

**Table B.2.3-1: Conditions for inter-frequency measurements in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB <sub>RP</sub>   |                             | SSB $\hat{E}$ s/lot |
|------------|---|-----------------------------|-----------------------------|---------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             |                     |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz | dB                  |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A  | -125                        | -122                        | ≥ -4                |
|            | NR_FDD_FR1_B                              | -124.5                      | -121.5                      |                     |
|            | NR_TDD_FR1_C                              | -124                        | -121                        |                     |
|            | NR_FDD_FR1_D, NR_TDD_FR1_D                | -124.5                      | -120.5                      |                     |
|            | NR_FDD_FR1_E, NR_TDD_FR1_E                | -123                        | -120                        |                     |
|            | NR_FDD_FR1_F                              | -122.5                      | -119.5                      |                     |
|            | NR_FDD_FR1_G                              | -122                        | -119                        |                     |
|            | NR_FDD_FR1_H                              | -121.5                      | -118.5                      |                     |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.3-2: Conditions for inter-frequency measurements in FR2**

| Parameter  | Angle of arrival                     | NR operating bands   | Minimum SSB <sub>RP</sub> <sup>Note 2, Note 3</sup> |                      |                      |                              | SSB $\hat{E}$ s/lot                           |            |
|------------|--------------------------------------|----------------------|---|----------------------|----------------------|------------------------------|---|------------|
|            |                                      |                      | dBm / SCS <sub>SSB</sub>                            |                      |                      |                              |   |            |
|            |                                      |                      | SCS <sub>SSB</sub> = 120 kHz                        |                      |                      | SCS <sub>SSB</sub> = 240 kHz | dB  |            |
|            |                                      |                      | UE power class                                      |                      |                      | UE power class               |   |            |
|            |                                      |                      | 1   | 2                    | 3                    | 4                            |   | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak                         | n257                 | -   | -111.8               | -110.1               | -                            | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥ -4       |
|            |                                      |                      | 126.3+Y <sub>1</sub>                                |                      |                      | 125.8+Y <sub>4</sub>         |   |            |
|            |                                      | n258                 | -   | -111.8               | -110.1               | -                            |   |            |
|            |                                      |                      | 126.3+Y <sub>1</sub>                                |                      |                      | 125.8+Y <sub>4</sub>         |   |            |
|            |                                      | n259                 | -   |                      | -106.5               | -                            |   |            |
|            | n260                                 | -                    |   | -107.5               | -                    |                              |   |            |
|            |                                      | 123.3+Y <sub>1</sub> |   |                      | 123.8+Y <sub>4</sub> |                              |   |            |
|            | n261                                 | -                    | -111.8  | -110.1               | -                    |                              |   |            |
|            |                                      | 126.3+Y <sub>1</sub> |   |                      | 125.8+Y <sub>4</sub> |                              |   |            |
|            | Spherical coverage <sup>Note 1</sup> | n257                 | -   | -100.8               | -99.2                | -                            | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥ -4       |
|            |                                      | 118.3+Z <sub>1</sub> |   |                      | 116.8+Z <sub>4</sub> |                              |   |            |
| n258       |                                      | -                    | -100.8  | -99.2                | -                    |                              |   |            |
|            |                                      | 118.3+Z <sub>1</sub> |   |                      | 116.8+Z <sub>4</sub> |                              |   |            |
| n259       |                                      | -                    |   | -93.7                | -                    |                              |   |            |
| n260       | -                                    |                      | -94.9   | -                    |                      |                              |   |            |
|            | 115.3+Z <sub>1</sub>                 |                      |   | 111.8+Z <sub>4</sub> |                      |                              |   |            |
| n261       | -                                    | -100.8               | -99.2   | -                    |                      |                              |   |            |
|            | 118.3+Z <sub>1</sub>                 |                      |   | 116.8+Z <sub>4</sub> |                      |                              |   |            |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SSB  $\hat{E}$ s/lot, with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta MB_{P,n}$  and Spherical coverage values are increased by  $\Delta MB_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.3-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub>, and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

## B.2.4 Conditions for NR L1-RSRP reporting

### B.2.4.1 Conditions for SSB based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs: SSB\_RP and SSB  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.1-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.1-2 for FR2 NR cells.

**Table B.2.4.1-1: Conditions for SSB based L1-RSRP measurements in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB_RP              |                             | SSB $\hat{E}_s/\text{lot}$ |
|------------|---|-----------------------------|-----------------------------|----------------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             | dB                         |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |                            |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A  | -124                        | -121                        | ≥ -3                       |
|            | NR_FDD_FR1_B                              | -123.5                      | -120.5                      |                            |
|            | NR_TDD_FR1_C                              | -123                        | -120                        |                            |
|            | NR_FDD_FR1_D, NR_TDD_FR1_D                | -122.5                      | -119.5                      |                            |
|            | NR_FDD_FR1_E, NR_TDD_FR1_E                | -122                        | -119                        |                            |
|            | NR_FDD_FR1_F                              | -121.5                      | -118.5                      |                            |
|            | NR_FDD_FR1_G                              | -121                        | -118                        |                            |
|            | NR_FDD_FR1_H                              | -120.5                      | -117.5                      |                            |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.4.1-2: Conditions for SSB based L1-RSRP measurements in FR2**

| Parameter  | Angle of arrival                     | NR operating bands | Minimum SSB_RP <sup>Note 2, Note 3</sup> |        |                              |                      | SSB $\hat{E}_s/\text{lot}$                    |      |
|------------|--------------------------------------|--------------------|--|--------|------------------------------|----------------------|---|------|
|            |                                      |                    | dBm / SCS <sub>SSB</sub>                 |        |                              |                      | dB  |      |
|            |                                      |                    | SCS <sub>SSB</sub> = 120 kHz             |        | SCS <sub>SSB</sub> = 240 kHz |                      |   |      |
|            |                                      |                    | UE power class                           |        | UE power class               |                      |   |      |
|            |                                      | 1                  | 2  | 3      | 4                            | 1, 2, 3, 4           |   |      |
| Conditions | Rx Beam Peak                         | n257               | -  | -110.8 | -109.1                       | -                    | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥ -3 |
|            |                                      | n258               | 125.3+Y <sub>1</sub>                     | -110.8 | -109.1                       | 124.8+Y <sub>4</sub> |   |      |
|            |                                      | n259               |  |        | -105.5                       |                      |   |      |
|            |                                      | n260               | 122.3+Y <sub>1</sub>                     |        | -106.5                       | 122.8+Y <sub>4</sub> |   |      |
|            |                                      | n261               | 125.3+Y <sub>1</sub>                     | -110.8 | -109.1                       | 124.8+Y <sub>4</sub> |   |      |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -  | -99.8  | -98.2                        | -                    | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥ -3 |
|            |                                      | n258               | 117.3+Z <sub>1</sub>                     | -99.8  | -98.2                        | 115.8+Z <sub>4</sub> |   |      |
|            |                                      | n259               |  |        | -92.7                        |                      |   |      |
|            |                                      | n260               | 114.3+Z <sub>1</sub>                     |        | -93.9                        | 110.8+Z <sub>4</sub> |   |      |
|            |                                      | n261               | 117.3+Z <sub>1</sub>                     | -99.8  | -98.2                        | 115.8+Z <sub>4</sub> |   |      |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SSB  $\hat{E}_s/\text{lot}$ , with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta\text{MB}_{P,n}$  and Spherical coverage values are increased by  $\Delta\text{MB}_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

*Editor's notes for Table B.2.4.1-2:*

- The value of  $Y$  for power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of  $Z$  for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

### B.2.4.2 Conditions for CSI-RS based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on CSI-RS: CSI-RS<sub>RP</sub> and CSI-RS  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.2-2 for FR2 NR cells.

**Table B.2.4.2-1: Conditions for CSI-RS based L1-RSRP measurements in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup>      | Minimum CSI-RS <sub>RP</sub>   |                                |                                | CSI-RS $\hat{E}_s/\text{lot}$ |
|------------|--|--------------------------------|--------------------------------|--------------------------------|-------------------------------|
|            |  | dBm / SCS <sub>CSI-RS</sub>    |                                |                                | dB                            |
|            |  | SCS <sub>CSI-RS</sub> = 15 kHz | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |                               |
| Conditions | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -124                           | -121                           | -118                           | ≥ -3                          |
|            | NR_FDD_FR1_B                                   | -123.5                         | -120.5                         | -117.5                         |                               |
|            | NR_TDD_FR1_C                                   | -123                           | -120                           | -117                           |                               |
|            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -122.5                         | -119.5                         | -116.5                         |                               |
|            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -122                           | -119                           | -116                           |                               |
|            | NR_FDD_FR1_F                                   | -121.5                         | -118.5                         | -115.5                         |                               |
|            | NR_FDD_FR1_G                                   | -121                           | -118                           | -115                           |                               |
|            | NR_FDD_FR1_H                                   | -120.5                         | -117.5                         | -114.5                         |                               |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.4.2-2: Conditions for CSI-RS based L1-RSRP measurements in FR2**

| Parameter  | Angle of arrival                     | NR operating bands | Minimum CSI-RS_RP <sup>Note 2, Note 3</sup> |            |        |                   |  | CSI-RS $\hat{E}_s/\text{lot}$ |
|------------|--------------------------------------|--------------------|---|------------|--------|-------------------|--|-------------------------------|
|            |                                      |                    | dBm / $SCS_{\text{CSI-RS}}$                 |            |        |                   |  | dB                            |
|            |                                      |                    | $SCS_{\text{CSI-RS}} = 60 \text{ kHz}$      |            |        |                   | $SCS_{\text{CSI-RS}} = 120 \text{ kHz}$                  |                               |
|            |                                      |                    | UE power class                              |            |        |                   | UE power class   |                               |
| 1          | 2                                    | 3                  | 4   | 1, 2, 3, 4 |        |                   |  |                               |
| Conditions | Rx Beam Peak                         | n257               | -<br>128.3+ $Y_1$                           | -113.8     | -112.1 | -<br>127.8+ $Y_4$ | (Value for $SCS_{\text{CSI-RS}} = 60 \text{ kHz}$ ) +3dB | $\geq -3$                     |
|            |                                      | n258               | -<br>128.3+ $Y_1$                           | -113.8     | -112.1 | -<br>127.8+ $Y_4$ |  |                               |
|            |                                      | n259               |   |            | -108.5 |                   |  |                               |
|            |                                      | n260               | -<br>125.3+ $Y_1$                           |            | -109.5 | -<br>125.8+ $Y_4$ |  |                               |
|            |                                      | n261               | -<br>128.3+ $Y_1$                           | -113.8     | -112.1 | -<br>127.8+ $Y_4$ |  |                               |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -<br>120.3+ $Z_1$                           | -102.8     | -101.2 | -<br>118.8+ $Z_4$ | (Value for $SCS_{\text{CSI-RS}} = 60 \text{ kHz}$ ) +3dB | $\geq -3$                     |
|            |                                      | n258               | -<br>120.3+ $Z_1$                           | -102.8     | -101.2 | -<br>118.8+ $Z_4$ |  |                               |
|            |                                      | n259               |   |            | -95.7  |                   |  |                               |
|            |                                      | n260               | -<br>117.3+ $Z_1$                           |            | -96.9  | -<br>113.8+ $Z_4$ |  |                               |
|            |                                      | n261               | -<br>120.3+ $Z_1$                           | -102.8     | -101.2 | -<br>118.8+ $Z_4$ |  |                               |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.  
 NOTE 2: Values specified at the Reference point to give minimum CSI-RS  $\hat{E}_s/\text{lot}$ , with no applied noise.  
 NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta MB_{P,n}$  and Spherical coverage values are increased by  $\Delta MB_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

*Editor’s notes for Table B.2.4.2-2:*

- The value of Y for power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

## B.2.5 Conditions for RRC connection release with redirection to NR

This clause defines the following conditions for RRC connection release with redirection to NR: SSB\_RP and SSB  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.5-1 for FR1 NR cells.

The conditions are defined in Table B.2.5-2 for FR2 NR cells.

**Table B.2.5-1: Conditions for RRC connection release with redirection to NR in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB <sub>RP</sub>   |                             | SSB $\hat{E}$ s/lot |
|------------|---|-----------------------------|-----------------------------|---------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             | dB                  |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |                     |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A                | -125                        | -122                        | ≥ -4                |
|            | NR_FDD_FR1_B                              | -124.5                      | -121.5                      |                     |
|            | NR_TDD_FR1_C                              | -124                        | -121                        |                     |
|            | NR_FDD_FR1_D, NR_TDD_FR1_D                | -124.5                      | -120.5                      |                     |
|            | NR_FDD_FR1_E, NR_TDD_FR1_E                | -123                        | -120                        |                     |
|            | NR_FDD_FR1_F                              | -122.5                      | -119.5                      |                     |
|            | NR_FDD_FR1_G                              | -122                        | -119                        |                     |
|            | NR_FDD_FR1_H                              | -121.5                      | -118.5                      |                     |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.5-2: Conditions for RRC connection release with redirection to NR in FR2**

| Parameter  | Angle of arrival | NR operating bands                   | Minimum SSB <sub>RP</sub> <sup>Note 2, Note 3</sup> |        |                              |                      | SSB $\hat{E}$ s/lot                           |   |
|------------|------------------|--------------------------------------|---|--------|------------------------------|----------------------|---|---|
|            |                  |                                      | dBm / SCS <sub>SSB</sub>                            |        |                              |                      | dB  |   |
|            |                  |                                      | SCS <sub>SSB</sub> = 120 kHz                        |        | SCS <sub>SSB</sub> = 240 kHz |                      |   |   |
|            |                  |                                      | UE power class                                      |        | UE power class               |                      |   |   |
|            |                  | 1                                    | 2   | 3      | 4                            | 1, 2, 3, 4           |   |   |
| Conditions | Rx Beam Peak     | n257                                 | -   | -111.8 | -110.1                       | -                    | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥-4   |
|            |                  |                                      | 126.3+Y <sub>1</sub>                                |        |                              | 125.8+Y <sub>4</sub> |   |   |
|            |                  | n258                                 | -   | -111.8 | -110.1                       | -                    |   |   |
|            |                  |                                      | 126.3+Y <sub>1</sub>                                |        |                              | 125.8+Y <sub>4</sub> |   |   |
|            |                  | n259                                 | -   |        | -106.5                       | -                    |   |   |
|            | n260             | -                                    |   | -107.5 | -                            |                      |   |   |
|            |                  | 123.3+Y <sub>1</sub>                 |   |        | 123.8+Y <sub>4</sub>         |                      |   |   |
|            | n261             | -                                    | -111.8  | -110.1 | -                            |                      |   |   |
|            |                  | 126.3+Y <sub>1</sub>                 |   |        | 125.8+Y <sub>4</sub>         |                      |   |   |
|            |                  | Spherical coverage <sup>Note 1</sup> | n257  | -      | -100.8                       | -99.2                | -   | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB |
|            |                  |                                      | 118.3+Z <sub>1</sub>                                |        |                              | 116.8+Z <sub>4</sub> |   |   |
|            | n258             | -                                    | -100.8  | -99.2  | -                            |                      |   |   |
|            |                  |                                      | 118.3+Z <sub>1</sub>                                |        |                              | 116.8+Z <sub>4</sub> |   |   |
|            | n259             | -                                    |   | -93.7  | -                            |                      |   |   |
|            | n260             | -                                    |   | -94.9  | -                            |                      |   |   |
|            |                  | 115.3+Z <sub>1</sub>                 |   |        |                              | 111.8+Z <sub>4</sub> |   |   |
|            | n261             | -                                    | -100.8  | -99.2  | -                            |                      |   |   |
|            |                  | 118.3+Z <sub>1</sub>                 |   |        |                              | 116.8+Z <sub>4</sub> |   |   |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.  
 NOTE 2: Values specified at the Reference point to give minimum SSB  $\hat{E}$ s/lot, with no applied noise.  
 NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta MB_{P,n}$  and spherical coverage values are increased by  $\Delta MB_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.5.2-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine

## B.2.6 Void

### B.2.6.1 Void

**Table B.2.6.1-1: Void**

Table B.2.6.1-2: Void

## B.2.6.2 Void

## B.2.7 Conditions for SRS-RSRP measurements

This clause defines the following conditions for SRS-RSRP measurement and corresponding procedures performed based on SRSs: SRS\_RP and SRS  $\hat{E}$ s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.7-1 for FR1 NR cells.

The conditions are defined in Table B.2.7-2 for FR2 NR cells.

Table B.2.7-1: Conditions for SRS-RSRP measurements in FR1

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SRS_RP              |                             |                             | SRS $\hat{E}$ s/Iot |
|------------|---|-----------------------------|-----------------------------|-----------------------------|---------------------|
|            |   | dBm / SCS <sub>SRS</sub>    |                             |                             |                     |
|            |   | SCS <sub>SRS</sub> = 15 kHz | SCS <sub>SRS</sub> = 30 kHz | SCS <sub>SRS</sub> = 60 kHz | dB                  |
| Conditions | NR_TDD_FR1_A                              | -120                        | -117                        | -114                        | ≥ 1                 |
|            | NR_TDD_FR1_C                              | -119                        | -116                        | -113                        |                     |
|            | NR_TDD_FR1_D                              | -118.5                      | -115.5                      | -112.5                      |                     |
|            | NR_TDD_FR1_E                              | -118                        | -115                        | -112                        |                     |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

Table B.2.7-2: Conditions for SRS-RSRP measurements in FR2

| Parameter  | Angle of arrival                     | NR operating bands | Minimum SRS_RP <sup>Note 2, Note 3</sup> |        |        |                              | SRS $\hat{E}$ s/Iot                          |                |
|------------|--------------------------------------|--------------------|--|--------|--------|------------------------------|--|----------------|
|            |                                      |                    | dBm / SCS <sub>SRS</sub>                 |        |        |                              |  |                |
|            |                                      |                    | SCS <sub>SRS</sub> = 60 kHz              |        |        | SCS <sub>SRS</sub> = 120 kHz | dB   |                |
|            |                                      |                    | UE Power class                           |        |        |                              |  | UE Power class |
|            |                                      |                    | 1  | 2      | 3      | 4                            |  | 1, 2, 3, 4     |
| Conditions | Rx Beam Peak                         | n257               | -124.5                                   | -119.0 | -115.3 | -124.0                       | (Value for SCS <sub>SRS</sub> = 60 kHz) +3dB | ≥1             |
|            |                                      | n258               | -124.5                                   | -119.0 | -115.3 | -124.0                       |  |                |
|            |                                      | n260               | -121.5                                   |        | -112.7 | -122.0                       |  |                |
|            |                                      | n261               | -124.5                                   | -119.0 | -115.3 | -124.0                       |  |                |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -116.5                                   | -108.0 | -104.4 | -115.0                       | (Value for SCS <sub>SRS</sub> = 60 kHz) +3dB | ≥1             |
|            |                                      | n258               | -116.5                                   | -108.0 | -104.4 | -115.0                       |  |                |
|            |                                      | n260               | -113.5                                   |        | -100.1 | -110.0                       |  |                |
|            |                                      | n261               | -116.5                                   | -108.0 | -104.4 | -115.0                       |  |                |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SRS  $\hat{E}$ s/Iot, with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta MB_{P,n}$  and Spherical coverage values are increased by  $\Delta MB_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

## B.2.8 Conditions for NR L1-SINR reporting

### B.2.8.1 Conditions for L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

This clause defines the following conditions for NR L1-SINR measurement reporting and corresponding procedures performed based on CSI-RSs: CSI-RS\_RP and CSI-RS  $\hat{E}$ s/Iot, applicable for a corresponding operating band.

The conditions are defined in Tables B.2.8.1-1 for FR1 NR cells.

The conditions are defined in Tables B.2.8.1-2 for FR2 NR cells.

Table B.2.8.1-1: Conditions for L1-SINR measurements with CSI-RS based CMR only in FR1

| Parameter  | NR operating band groups <sup>Note 1</sup>     | Minimum CSI-RS_RP                      |  |  | CSI-RS CMR $\hat{E}_s/\text{lot}$ |
|------------|--|--|--|--|-----------------------------------|
|            |  | dBm / $SCS_{\text{CSI-RS}}$            |  |  | dB                                |
|            |  | $SCS_{\text{CSI-RS}} = 15 \text{ kHz}$ | $SCS_{\text{CSI-RS}} = 30 \text{ kHz}$ | $SCS_{\text{CSI-RS}} = 60 \text{ kHz}$ |                                   |
| Conditions | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -124                                   | -121                                   | -118                                   | $\geq -3$                         |
|            | NR_FDD_FR1_B                                   | -123.5                                 | -120.5                                 | -117.5                                 |                                   |
|            | NR_TDD_FR1_C                                   | -123                                   | -120                                   | -117                                   |                                   |
|            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -122.5                                 | -119.5                                 | -116.5                                 |                                   |
|            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -122                                   | -119                                   | -116                                   |                                   |
|            | NR_FDD_FR1_F                                   | -121.5                                 | -118.5                                 | -115.5                                 |                                   |
|            | NR_FDD_FR1_G                                   | -121                                   | -118                                   | -115                                   |                                   |
|            | NR_FDD_FR1_H                                   | -120.5                                 | -117.5                                 | -114.5                                 |                                   |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

Table B.2.8.1-2: Conditions for L1-SINR measurements with CSI-RS based CMR only in FR2

| Parameter  | Angle of arrival                     | NR operating bands | Minimum CSI-RS_RP <sup>Note 2, Note 3</sup> |        |        |   | CSI-RS CMR $\hat{E}_s/\text{lot}$ |
|------------|--------------------------------------|--------------------|---|--------|--------|---|-----------------------------------|
|            |                                      |                    | dBm / $SCS_{\text{CSI-RS}}$                 |        |        |   | dB                                |
|            |                                      |                    | $SCS_{\text{CSI-RS}} = 60 \text{ kHz}$      |        |        | $SCS_{\text{CSI-RS}} = 120 \text{ kHz}$ |                                   |
|            |                                      |                    | UE power class                              |        |        |   | UE power class                    |
|            |                                      |                    | 1   | 2      | 3      | 4                                       | 1, 2, 3, 4                        |
| Conditions | Rx Beam Peak                         | n257               | -128.3+Y <sub>1</sub>                       | -113.8 | -112.1 | -127.8+Y <sub>4</sub>                   | $\geq -3$                         |
|            |                                      | n258               | -128.3+Y <sub>1</sub>                       | -113.8 | -112.1 | -127.8+Y <sub>4</sub>                   |                                   |
|            |                                      | n259               |   |        | -108.5 |   |                                   |
|            |                                      | n260               | -125.3+Y <sub>1</sub>                       |        | -109.5 | -125.8+Y <sub>4</sub>                   |                                   |
|            |                                      | n261               | -128.3+Y <sub>1</sub>                       | -113.8 | -112.1 | -127.8+Y <sub>4</sub>                   |                                   |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -120.3+Z <sub>1</sub>                       | -102.8 | -101.2 | -118.8+Z <sub>4</sub>                   | $\geq -3$                         |
|            |                                      | n258               | -120.3+Z <sub>1</sub>                       | -102.8 | -101.2 | -118.8+Z <sub>4</sub>                   |                                   |
|            |                                      | n259               |   |        | -95.7  |   |                                   |
|            |                                      | n260               | -117.3+Z <sub>1</sub>                       |        | -96.9  | -113.8+Z <sub>4</sub>                   |                                   |
|            |                                      | n261               | -120.3+Z <sub>1</sub>                       | -102.8 | -101.2 | -118.8+Z <sub>4</sub>                   |                                   |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum CSI-RS  $\hat{E}_s/\text{lot}$ , with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta\text{MB}_{P,n}$  and Spherical coverage values are increased by  $\Delta\text{MB}_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

## B.2.8.2 Conditions for L1-SINR reporting with SSB based CMR and dedicated IMR configured

### B.2.8.2.1 L1-SINR reporting with SSB based CMR and dedicated ZP-IMR configured

This clause defines the following conditions for NR L1-SINR measurement reporting and corresponding procedures performed based on SSBs and ZP-IMRs: SSB\_RP and SSB  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Tables B.2.8.2.1-1 for FR1 NR cells.

The conditions are defined in Tables B.2.8.2.1-2 for FR2 NR cells.



**Table B.2.8.2.1-1: Conditions for L1-SINR measurements with SSB based CMR and ZP-IMR in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup>      | Minimum SSB <sub>RP</sub>   |                             | SSB-CMR $\hat{E}_s/\text{lot}$ |
|------------|--|-----------------------------|-----------------------------|--------------------------------|
|            |  | dBm / SCS <sub>SSB</sub>    |                             |                                |
|            |  | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz | dB                             |
| Conditions | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -124                        | -121                        | ≥ -3                           |
|            | NR_FDD_FR1_B                                   | -123.5                      | -120.5                      |                                |
|            | NR_TDD_FR1_C                                   | -123                        | -120                        |                                |
|            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -122.5                      | -119.5                      |                                |
|            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -122                        | -119                        |                                |
|            | NR_FDD_FR1_F                                   | -121.5                      | -118.5                      |                                |
|            | NR_FDD_FR1_G                                   | -121                        | -118                        |                                |
|            | NR_FDD_FR1_H                                   | -120.5                      | -117.5                      |                                |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.8.2.1-2: Conditions for L1-SINR measurements with SSB based CMR and ZP-IMR in FR2**

| Parameter  | Angle of arrival                     | NR operating bands | Minimum SSB <sub>RP</sub> <sup>Note 2, Note 3</sup> |        |        |                              | SSB-CMR $\hat{E}_s/\text{lot}$                |            |
|------------|--------------------------------------|--------------------|---|--------|--------|------------------------------|---|------------|
|            |                                      |                    | dBm / SCS <sub>SSB</sub>                            |        |        |                              |   |            |
|            |                                      |                    | SCS <sub>SSB</sub> = 120 kHz                        |        |        | SCS <sub>SSB</sub> = 240 kHz | dB  |            |
|            |                                      |                    | UE power class                                      |        |        | UE power class               |   |            |
|            |                                      |                    | 1   | 2      | 3      | 4                            |   | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak                         | n257               | -125.3+Y <sub>1</sub>                               | -110.8 | -109.1 | -124.8+Y <sub>4</sub>        | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥ -3       |
|            |                                      | n258               | -125.3+Y <sub>1</sub>                               | -110.8 | -109.1 | -124.8+Y <sub>4</sub>        |   |            |
|            |                                      | n259               |   |        | -105.5 |                              |   |            |
|            |                                      | n260               | -122.3+Y <sub>1</sub>                               |        | -106.5 | -122.8+Y <sub>4</sub>        |   |            |
|            |                                      | n261               | -125.3+Y <sub>1</sub>                               | -110.8 | -109.1 | -124.8+Y <sub>4</sub>        |   |            |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -117.3+Z <sub>1</sub>                               | -99.8  | -98.2  | -115.8+Z <sub>4</sub>        | (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB | ≥ -3       |
|            |                                      | n258               | -117.3+Z <sub>1</sub>                               | -99.8  | -98.2  | -115.8+Z <sub>4</sub>        |   |            |
|            |                                      | n259               |   |        | -92.7  |                              |   |            |
|            |                                      | n260               | -114.3+Z <sub>1</sub>                               |        | -93.9  | -110.8+Z <sub>4</sub>        |   |            |
|            |                                      | n261               | -117.3+Z <sub>1</sub>                               | -99.8  | -98.2  | -115.8+Z <sub>4</sub>        |   |            |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SSB  $\hat{E}_s/\text{lot}$ , with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta MB_{P,n}$  and Spherical coverage values are increased by  $\Delta MB_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

**B.2.8.2.2 L1-SINR reporting with SSB based CMR and dedicated NZP-IMR configured**

This clause defines the following conditions for NR L1-SINR measurement reporting and corresponding procedures performed based on SSBs and NZP-IMRs: SSB<sub>RP</sub>, SSB  $\hat{E}_s/\text{lot}$  and NZP-IMR  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Tables B.2.8.2.2-1 for FR1 NR cells.

The conditions are defined in Tables B.2.8.2.2-2 for FR2 NR cells. Table B.2.8.2.2-1: Conditions for L1-SINR measurements with SSB based CMR and NQP-IMR in FR1

| Parameter  | NR operating band groups <sup>Note1</sup>      | Minimum SSB_RP              |                             | SSB-CMR | NQP-IMR |
|------------|--|-----------------------------|-----------------------------|---------|---------|
|            |  | dBm / SCS <sub>SSB</sub>    |                             | Ēs/lot  | Ēs/lot  |
|            |  | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz | dB      | dB      |
| Conditions | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                        | -118                        | ≥ 0     | ≥ 0     |
|            | NR_FDD_FR1_B                                   | -120.5                      | -117.5                      |         |         |
|            | NR_TDD_FR1_C                                   | -120                        | -117                        |         |         |
|            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                      | -116.5                      |         |         |
|            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                        | -116                        |         |         |
|            | NR_FDD_FR1_F                                   | -118.5                      | -115.5                      |         |         |
|            | NR_FDD_FR1_G                                   | -118                        | -115                        |         |         |
|            | NR_FDD_FR1_H                                   | -117.5                      | -114.5                      |         |         |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

Table B.2.8.2.2-2: Conditions for L1-SINR measurements with SSB based CMR and NQP-IMR in FR2

| Parameter  | Angle of arrival                     | NR operating bands | Minimum SSB_RP <sup>Note 2, Note 3</sup> |        |        |                              | SSB-CMR        | NQP-IMR |
|------------|--------------------------------------|--------------------|--|--------|--------|------------------------------|----------------|---------|
|            |                                      |                    | dBm / SCS <sub>SSB</sub>                 |        |        |                              | dB             | dB      |
|            |                                      |                    | SCS <sub>SSB</sub> = 120 kHz             |        |        | SCS <sub>SSB</sub> = 240 kHz |                |         |
|            |                                      |                    | UE power class                           |        |        |                              | UE power class |         |
|            |                                      |                    | 1  | 2      | 3      | 4                            | 1, 2, 3, 4     |         |
| Conditions | Rx Beam Peak                         | n257               | -122.3+Y <sub>1</sub>                    | -107.8 | -106.1 | -121.8+Y <sub>4</sub>        | ≥ 0            | ≥ 0     |
|            |                                      | n258               | -122.3+Y <sub>1</sub>                    | -107.8 | -106.1 | -121.8+Y <sub>4</sub>        |                |         |
|            |                                      | n259               |  |        | -102.5 |                              |                |         |
|            |                                      | n260               | -119.3+Y <sub>1</sub>                    |        | -103.5 | -119.8+Y <sub>4</sub>        |                |         |
|            |                                      | n261               | -122.3+Y <sub>1</sub>                    | -107.8 | -106.1 | -121.8+Y <sub>4</sub>        |                |         |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -114.3+Z <sub>1</sub>                    | -96.8  | -95.2  | -112.8+Z <sub>4</sub>        | ≥ 0            | ≥ 0     |
|            |                                      | n258               | -114.3+Z <sub>1</sub>                    | -96.8  | -95.2  | -112.8+Z <sub>4</sub>        |                |         |
|            |                                      | n259               |  |        | -89.7  |                              |                |         |
|            |                                      | n260               | -111.3+Z <sub>1</sub>                    |        | -90.9  | -107.8+Z <sub>4</sub>        |                |         |
|            |                                      | n261               | -114.3+Z <sub>1</sub>                    | -96.8  | -95.2  | -112.8+Z <sub>4</sub>        |                |         |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.  
 NOTE 2: Values specified at the Reference point to give minimum SSB Ēs/lot, with no applied noise.  
 NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΔMB<sub>P,n</sub> and Spherical coverage values are increased by ΔMB<sub>S,n</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor’s notes for Table B.2.8.2.2-1 and B.2.8.2.2-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

### B.2.8.3 Conditions for L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

#### B.2.8.3.1 L1-SINR reporting with CSI-RS based CMR and dedicated ZP-IMR configured

This clause defines the following conditions for NR L1-SINR measurement reporting and corresponding procedures performed based on CSI-RSs and ZP-IMRs: CSI-RS<sub>RP</sub> and CSI-RS  $\hat{E}$ s/lot, applicable for a corresponding operating band.

The conditions defined in Table B.2.8.3.1-1 for FR1 NR cells.

The conditions defined in Table B.2.8.3.1-2 for FR2 NR cells.

**Table B.2.8.3.1-1: Conditions for L1-SINR measurements with CSI-RS based CMR and ZP-IMR in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum CSI-RS <sub>RP</sub>   |                                |                                | CSI-RS CMR $\hat{E}$ s/lot |
|------------|---|--------------------------------|--------------------------------|--------------------------------|----------------------------|
|            |   | dBm / SCS <sub>CSI-RS</sub>    |                                |                                | dB                         |
|            |   | SCS <sub>CSI-RS</sub> = 15 kHz | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |                            |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A  | -124                           | -121                           | -118                           | ≥ -3                       |
|            | NR_FDD_FR1_B                              | -123.5                         | -120.5                         | -117.5                         |                            |
|            | NR_TDD_FR1_C                              | -123                           | -120                           | -117                           |                            |
|            | NR_FDD_FR1_D, NR_TDD_FR1_D                | -122.5                         | -119.5                         | -116.5                         |                            |
|            | NR_FDD_FR1_E, NR_TDD_FR1_E                | -122                           | -119                           | -116                           |                            |
|            | NR_FDD_FR1_F                              | -121.5                         | -118.5                         | -115.5                         |                            |
|            | NR_FDD_FR1_G                              | -121                           | -118                           | -115                           |                            |
|            | NR_FDD_FR1_H                              | -120.5                         | -117.5                         | -114.5                         |                            |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.8.3.1-2: Conditions for L1-SINR measurements with CSI-RS based CMR and ZP-IMR in FR2**

| Parameter  | Angle of arrival                     | NR operating bands | Minimum CSI-RS <sub>RP</sub> <sup>Note 2, Note 3</sup> |        |        |                                 | CSI-RS CMR $\hat{E}$ s/lot |
|------------|--------------------------------------|--------------------|--|--------|--------|---------------------------------|----------------------------|
|            |                                      |                    | dBm / SCS <sub>CSI-RS</sub>                            |        |        |                                 | dB                         |
|            |                                      |                    | SCS <sub>CSI-RS</sub> = 60 kHz                         |        |        | SCS <sub>CSI-RS</sub> = 120 kHz |                            |
|            |                                      |                    | UE power class   |        |        |                                 | UE power class             |
|            |                                      |                    | 1  | 2      | 3      | 4                               | 1, 2, 3, 4                 |
| Conditions | Rx Beam Peak                         | n257               | -128.3+Y <sub>1</sub>                                  | -113.8 | -112.1 | -127.8+Y <sub>4</sub>           | ≥ -3                       |
|            |                                      | n258               | -128.3+Y <sub>1</sub>                                  | -113.8 | -112.1 | -127.8+Y <sub>4</sub>           |                            |
|            |                                      | n259               |  |        | -108.5 |                                 |                            |
|            |                                      | n260               | -125.3+Y <sub>1</sub>                                  |        | -109.5 | -125.8+Y <sub>4</sub>           |                            |
|            |                                      | n261               | -128.3+Y <sub>1</sub>                                  | -113.8 | -112.1 | -127.8+Y <sub>4</sub>           |                            |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -120.3+Z <sub>1</sub>                                  | -102.8 | -101.2 | -118.8+Z <sub>4</sub>           | ≥ -3                       |
|            |                                      | n258               | -120.3+Z <sub>1</sub>                                  | -102.8 | -101.2 | -118.8+Z <sub>4</sub>           |                            |
|            |                                      | n259               |  |        | -95.7  |                                 |                            |
|            |                                      | n260               | -117.3+Z <sub>1</sub>                                  |        | -96.9  | -113.8+Z <sub>4</sub>           |                            |
|            |                                      | n261               | -120.3+Z <sub>1</sub>                                  | -102.8 | -101.2 | -118.8+Z <sub>4</sub>           |                            |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum CSI-RS  $\hat{E}$ s/lot, with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta MB_{P,n}$  and Spherical coverage values are increased by  $\Delta MB_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

**B.2.8.3.2 L1-SINR reporting with CSI-RS based CMR and dedicated NZP-IMR configured**

This clause defines the following conditions for NR L1-SINR measurement reporting and corresponding procedures performed based on CSI-RSs and NZP-IMRs: CSI-RS<sub>RP</sub>, CSI-RS  $\hat{E}_s/\text{lot}$  and NZP-IMR  $\hat{E}_s/\text{lot}$ , applicable for a corresponding operating band.

The conditions are defined in Tables B.2.8.3.2-1 for FR1 NR cells. The conditions are defined in Tables B.2.8.3.2-2 for FR2 NR cells.

**Table B.2.8.3.2-1: Conditions for L1-SINR measurements with CSI-RS based CMR and NZP-IMR in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup>      | Minimum CSI-RS <sub>RP</sub>   |                                |                                | CSI-RS CMR $\hat{E}_s/\text{lot}$ | NZP-IMR $\hat{E}_s/\text{lot}$ |
|------------|--|--------------------------------|--------------------------------|--------------------------------|-----------------------------------|--------------------------------|
|            |  | dBm / SCS <sub>CSI-RS</sub>    |                                |                                |                                   |                                |
|            |  | SCS <sub>CSI-RS</sub> = 15 kHz | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz | dB                                | dB                             |
| Conditions | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -121                           | -118                           | -115                           | ≥ 0                               | ≥ 0                            |
|            | NR_FDD_FR1_B                                   | -120.5                         | -117.5                         | -114.5                         |                                   |                                |
|            | NR_TDD_FR1_C                                   | -120                           | -117                           | -114                           |                                   |                                |
|            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -119.5                         | -116.5                         | -113.5                         |                                   |                                |
|            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -119                           | -116                           | -113                           |                                   |                                |
|            | NR_FDD_FR1_F                                   | -118.5                         | -115.5                         | -112.5                         |                                   |                                |
|            | NR_FDD_FR1_G                                   | -118                           | -115                           | -112                           |                                   |                                |
|            | NR_FDD_FR1_H                                   | -117.5                         | -114.5                         | -111.5                         |                                   |                                |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.8.3.2-2: Conditions for L1-SINR measurements with CSI-RS based CMR and NZP-IMR in FR2**

| Parameter  | Angle of arrival                     | NR operating bands | Minimum CSI-RS <sub>RP</sub> <sup>Note 2, Note 3</sup> |            |        |                                 | CSI-RS CMR $\hat{E}_s/\text{lot}$ | NZP-IMR $\hat{E}_s/\text{lot}$ |
|------------|--------------------------------------|--------------------|--|------------|--------|---------------------------------|-----------------------------------|--------------------------------|
|            |                                      |                    | dBm / SCS <sub>CSI-RS</sub>                            |            |        |                                 |                                   |                                |
|            |                                      |                    | SCS <sub>CSI-RS</sub> = 60 kHz                         |            |        | SCS <sub>CSI-RS</sub> = 120 kHz | dB                                | dB                             |
|            |                                      |                    | UE power class   |            |        | UE power class                  |                                   |                                |
| 1          | 2                                    | 3                  | 4  | 1, 2, 3, 4 |        |                                 |                                   |                                |
| Conditions | Rx Beam Peak                         | n257               | -125.3+Y <sub>1</sub>                                  | -110.8     | -109.1 | -124.8+Y <sub>4</sub>           | ≥ 0                               | ≥ 0                            |
|            |                                      | n258               | -125.3+Y <sub>1</sub>                                  | -110.8     | -109.1 | -124.8+Y <sub>4</sub>           |                                   |                                |
|            |                                      | n259               |  |            | -105.5 |                                 |                                   |                                |
|            |                                      | n260               | -122.3+Y <sub>1</sub>                                  |            | -106.5 | -122.8+Y <sub>4</sub>           |                                   |                                |
|            |                                      | n261               | -125.3+Y <sub>1</sub>                                  | -110.8     | -109.1 | -124.8+Y <sub>4</sub>           |                                   |                                |
|            | Spherical coverage <sup>Note 1</sup> | n257               | -117.3+Z <sub>1</sub>                                  | -99.8      | -98.2  | -115.8+Z <sub>4</sub>           | ≥ 0                               | ≥ 0                            |
|            |                                      | n258               | -117.3+Z <sub>1</sub>                                  | -99.8      | -98.2  | -115.8+Z <sub>4</sub>           |                                   |                                |
|            |                                      | n259               |  |            | -92.7  |                                 |                                   |                                |
|            |                                      | n260               | -114.3+Z <sub>1</sub>                                  |            | -93.9  | -110.8+Z <sub>4</sub>           |                                   |                                |
|            |                                      | n261               | -117.3+Z <sub>1</sub>                                  | -99.8      | -98.2  | -115.8+Z <sub>4</sub>           |                                   |                                |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum CSI-RS  $\hat{E}_s/\text{lot}$ , with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta\text{MB}_{P,n}$  and Spherical coverage values are increased by  $\Delta\text{MB}_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Tables B.2.8.3.2-1 and B.2.8.3.2-2:

- The value of  $Y$  for power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of  $Z$  for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine

## B.2.9 Conditions for NR intra-frequency measurements under CCA

This clause defines the following conditions for NR intra-frequency measurements under CCA and corresponding procedures performed based on SSBs: SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.9-1 for NR cells under CCA.

**Table B.2.9-1: Conditions for intra-frequency measurements under CCA**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB <sub>RP</sub>   |                             | SSB $\hat{E}_s/I_{ot}$ |
|------------|---|-----------------------------|-----------------------------|------------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             |                        |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz | dB                     |
| Conditions | NR_CCA_FR1_I                              | -123                        | -120                        | ≥ -6                   |
|            | NR_CCA_FR1_J                              | -122.5                      | -119.5                      |                        |

NOTE 1: NR operating band groups are as defined in clause 3.5.2.

## B.2.10 Conditions for NR inter-frequency measurements under CCA

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.10-1 for NR cells under CCA.

**Table B.2.10-1: Conditions for inter-frequency measurements under CCA**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB <sub>RP</sub>   |                             | SSB $\hat{E}_s/I_{ot}$ |
|------------|---|-----------------------------|-----------------------------|------------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             |                        |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz | dB                     |
| Conditions | NR_CCA_FR1_I                              | -121                        | -118                        | ≥ -4                   |
|            | NR_CCA_FR1_J                              | -120.5                      | -117.5                      |                        |

NOTE 1: NR operating band groups are as defined in clause 3.5.2.

## B.2.11 Conditions for NR L1-RSRP reporting under CCA

### B.2.11.1 Conditions for SSB based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs under CCA: SSB<sub>RP</sub> and SSB  $\hat{E}_s/I_{ot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.11.1-1 for NR cells under CCA.

**Table B.2.11.1-1: Conditions for SSB based L1-RSRP measurements under CCA**

| Parameter  | NR operating band groups <sup>Note1</sup> | Minimum SSB <sub>RP</sub>   |                             | SSB $\bar{E}_s$ /lot |
|------------|---|-----------------------------|-----------------------------|----------------------|
|            |   | dBm / SCS <sub>SSB</sub>    |                             | dB                   |
|            |   | SCS <sub>SSB</sub> = 15 kHz | SCS <sub>SSB</sub> = 30 kHz |                      |
| Conditions | NR_CCA_FR1_I                              | -120                        | -117                        | ≥ -3                 |
|            | NR_CCA_FR1_J                              | -119.5                      | -116.5                      |                      |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

## B.2.12 Conditions for NR CSI-RS based intra-frequency measurements

This clause defines the following conditions for NR CSI-RS based intra-frequency measurements and corresponding procedures performed based on CSI-RS: CSI<sub>RP</sub> and CSI-RS  $\bar{E}_s$ /lot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.12-1 for FR1 NR cells.

The conditions are defined in Table B.2.12-2 for FR2 NR cells.

**Table B.2.12-1: Conditions for CSI-RS based intra-frequency measurements in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup>      | Minimum CSI <sub>RP</sub>      |                                |                                | CSI-RS $\bar{E}_s$ /lot |
|------------|--|--------------------------------|--------------------------------|--------------------------------|-------------------------|
|            |  | dBm / SCS <sub>CSI-RS</sub>    |                                |                                | dB                      |
|            |  | SCS <sub>CSI-RS</sub> = 15 kHz | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz |                         |
| Conditions | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -127                           | -124                           | -121                           | ≥ -6                    |
|            | NR_FDD_FR1_B                                   | -126.5                         | -123.5                         | -120.5                         |                         |
|            | NR_TDD_FR1_C                                   | -126                           | -123                           | -120                           |                         |
|            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -125.5                         | -122.5                         | -119.5                         |                         |
|            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -125                           | -122                           | -119                           |                         |
|            | NR_FDD_FR1_F                                   | -124.5                         | -121.5                         | -118.5                         |                         |
|            | NR_FDD_FR1_G                                   | -124                           | -121                           | -118                           |                         |
|            | NR_FDD_FR1_H                                   | -123.5                         | -120.5                         | -117.5                         |                         |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.12-2: Conditions for CSI-RS based intra-frequency measurements in FR2**

| Parameter  | Angle of arrival                         | NR operating bands | Minimum CSI <sub>RP</sub> <small>Note 2, Note 3</small> |        |        |                                | CSI-RS $\hat{E}_s/I_{ot}$                         |            |
|------------|--|--------------------|---|--------|--------|--------------------------------|---|------------|
|            |  |                    | dBm / SCS <sub>CSI-RS</sub>                             |        |        |                                | dB  |            |
|            |  |                    | SCS <sub>CSI-RS</sub> = 120 kHz                         |        |        | SCS <sub>CSI-RS</sub> = 60 kHz |   |            |
|            |  |                    | UE power class  |        |        | UE power class                 |   |            |
|            |  |                    | 1   | 2      | 3      | 4                              |   | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak                             | n257               | -<br>128.3+Y <sub>1</sub>                               | -113.8 | -112.1 | -<br>127.8+Y <sub>4</sub>      | (Value for SCS <sub>CSI-RS</sub> = 120 kHz) - 3dB | ≥-6        |
|            |  | n258               | -<br>128.3+Y <sub>1</sub>                               | -113.8 | -112.1 | -<br>127.8+Y <sub>4</sub>      |   |            |
|            |  | n259               |   |        | -108.5 |                                |   |            |
|            |  | n260               | -<br>125.3+Y <sub>1</sub>                               |        | -109.5 | -<br>125.8+Y <sub>4</sub>      |   |            |
|            |  | n261               | -<br>128.3+Y <sub>1</sub>                               | -113.8 | -112.1 | -<br>127.8+Y <sub>4</sub>      |   |            |
|            | Spherical coverage <small>Note 1</small> | n257               | -<br>120.3+Z <sub>1</sub>                               | -102.8 | -101.2 | -<br>118.8+Z <sub>4</sub>      | (Value for SCS <sub>CSI-RS</sub> = 120 kHz) - 3dB | ≥-6        |
|            |  | n258               | -<br>120.3+Z <sub>1</sub>                               | -102.8 | -101.2 | -<br>118.8+Z <sub>4</sub>      |   |            |
|            |  | n259               |   |        | -95.7  |                                |   |            |
|            |  | n260               | -<br>117.3+Z <sub>1</sub>                               |        | -96.9  | -<br>113.8+Z <sub>4</sub>      |   |            |
|            |  | n261               | -<br>120.3+Z <sub>1</sub>                               | -102.8 | -101.2 | -<br>118.8+Z <sub>4</sub>      |   |            |

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.  
 Note 2: Values specified at the Reference point to give minimum CSI-RS  $\hat{E}_s/I_{ot}$ , with no applied noise.  
 Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta MB_{P,n}$  and spherical coverage values are increased by  $\Delta MB_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

*Editor’s notes for Table B.2.12-2:*

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

### B.2.13 Conditions for NR CSI-RS based inter-frequency measurements

This clause defines the following conditions for NR CSI-RS based inter-frequency measurements and corresponding procedures performed based on CSI-RS: CSI<sub>RP</sub> and CSI-RS  $\hat{E}_s/I_{ot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.13-1 for FR1 NR cells.

The conditions are defined in Table B.2.13-2 for FR2 NR cells.

**Table B.2.13-1: Conditions for CSI-RS based inter-frequency measurements in FR1**

| Parameter  | NR operating band groups<br><small>Note 1</small> | Minimum CSI <sub>RP</sub><br>dBm / SCS <sub>CSI-RS</sub> |                                |                                | CSI-RS $\hat{E}_s/\text{lot}$ |
|------------|---|--|--------------------------------|--------------------------------|-------------------------------|
|            |   | SCS <sub>CSI-RS</sub> = 15 kHz                           | SCS <sub>CSI-RS</sub> = 30 kHz | SCS <sub>CSI-RS</sub> = 60 kHz | dB                            |
|            |   |  |                                |                                |                               |
| Conditions | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A    | -125   | -122                           | -119                           | ≥ -6                          |
|            | NR_FDD_FR1_B                                      | -124.5   | -121.5                         | -118.5                         |                               |
|            | NR_TDD_FR1_C                                      | -124   | -121                           | -118                           |                               |
|            | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                     | -124.5   | -120.5                         | -117.5                         |                               |
|            | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                     | -123   | -120                           | -117                           |                               |
|            | NR_FDD_FR1_F                                      | -122.5   | -119.5                         | -116.5                         |                               |
|            | NR_FDD_FR1_G                                      | -122   | -119                           | -116                           |                               |
|            | NR_FDD_FR1_H                                      | -121.5   | -118.5                         | -115.5                         |                               |

NOTE 1: NR operating band groups are defined in clause 3.5.2.

**Table B.2.13-2: Conditions for CSI-RS based inter-frequency measurements in FR2**

| Parameter  | Angle of arrival                            | NR operating bands | Minimum CSI <sub>RP</sub> <small>Note 2, Note 3</small><br>dBm / SCS <sub>CSI-RS</sub> |        |        |                                | CSI-RS $\hat{E}_s/\text{lot}$                     |            |
|------------|---|--------------------|--|--------|--------|--------------------------------|---|------------|
|            |   |                    |  |        |        |                                | dB  |            |
|            |   |                    | SCS <sub>CSI-RS</sub> = 120 kHz  |        |        | SCS <sub>CSI-RS</sub> = 60 kHz |   |            |
|            |   |                    | UE power class   |        |        | UE power class                 |   |            |
|            |   |                    | 1  | 2      | 3      | 4                              |   | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak                                | n257               | -<br>126.3+Y <sub>1</sub>  | -111.8 | -110.1 | -<br>125.8+Y <sub>4</sub>      | (Value for SCS <sub>CSI-RS</sub> = 120 kHz) - 3dB | ≥ -4       |
|            |   | n258               | -<br>126.3+Y <sub>1</sub>  | -111.8 | -110.1 | -<br>125.8+Y <sub>4</sub>      |   |            |
|            |   | n259               | -  | -      | -106.5 | -                              |   |            |
|            |   | n260               | -<br>123.3+Y <sub>1</sub>  | -      | -107.5 | -<br>123.8+Y <sub>4</sub>      |   |            |
|            |   | n261               | -<br>126.3+Y <sub>1</sub>  | -111.8 | -110.1 | -<br>125.8+Y <sub>4</sub>      |   |            |
|            | Spherical coverage<br><small>Note 1</small> | n257               | -<br>118.3+Z <sub>1</sub>  | -100.8 | -99.2  | -<br>116.8+Z <sub>4</sub>      | (Value for SCS <sub>CSI-RS</sub> = 120 kHz) - 3dB | ≥ -4       |
|            |   | n258               | -<br>118.3+Z <sub>1</sub>  | -100.8 | -99.2  | -<br>116.8+Z <sub>4</sub>      |   |            |
|            |   | n259               | -  | -      | -93.7  | -                              |   |            |
|            |   | n260               | -<br>115.3+Z <sub>1</sub>  | -      | -94.9  | -<br>111.8+Z <sub>4</sub>      |   |            |
|            |   | n261               | -<br>118.3+Z <sub>1</sub>  | -100.8 | -99.2  | -<br>116.8+Z <sub>4</sub>      |   |            |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.  
 NOTE 2: Values specified at the Reference point to give minimum CSI-RS  $\hat{E}_s/\text{lot}$ , with no applied noise.  
 NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta\text{MB}_{P,n}$  and Spherical coverage values are increased by  $\Delta\text{MB}_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor’s notes for Table B.2.13-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub>, and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively.



## B.2.14 Conditions for NR PRS-based measurements

This clause defines the following conditions for NR PRS-based measurements and corresponding procedures performed based on PRS: PRP and PRS  $\hat{E}_s/I_{ot}$ , applicable for a corresponding operating band.

The conditions are defined in Table B.2.14-1 for FR1 NR cells.

The conditions are defined in Table B.2.14-2 for FR2 NR cells.

**Table B.2.14-1: Conditions for NR PRS-based measurements in FR1**

| Parameter  | NR operating band groups <sup>Note1</sup>      | Minimum PRP <sub>1,2</sub>     |                                |                                | PRS $\hat{E}_s/I_{ot}$  |
|--|--|--------------------------------|--------------------------------|--------------------------------|---|
|  |  | dBm / SCS <sub>PRS</sub>       |                                |                                | dB  |
|  |  | SCS <sub>PRS</sub><br>= 15 kHz | SCS <sub>PRS</sub><br>= 30 kHz | SCS <sub>PRS</sub><br>= 60 kHz |   |
| Conditions   | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A | -127                           | -124                           | -121                           | $\geq -6$ <sup>Note2</sup><br>$\geq -13$ <sup>Note3</sup><br>$\geq -3$ <sup>Note4</sup> |
|  | NR_FDD_FR1_B                                   | -126.5                         | -123.5                         | -120.5                         |   |
|  | NR_TDD_FR1_C                                   | -126                           | -123                           | -120                           |   |
|  | NR_FDD_FR1_D,<br>NR_TDD_FR1_D                  | -125.5                         | -122.5                         | -119.5                         |   |
|  | NR_FDD_FR1_E,<br>NR_TDD_FR1_E                  | -125                           | -122                           | -119                           |   |
|  | NR_FDD_FR1_F                                   | -124.5                         | -121.5                         | -118.5                         |   |
|  | NR_FDD_FR1_G                                   | -124                           | -121                           | -118                           |   |
|  | NR_FDD_FR1_H                                   | -123.5                         | -120.5                         | -117.5                         |   |
| NOTE 1: NR operating band groups are defined in clause 3.5.2.  |  |                                |                                |                                |   |
| NOTE 2: PRS $\hat{E}_s/I_{ot}$ for RSTD measurement reference cell PRS resource.   |  |                                |                                |                                |   |
| NOTE 3: PRS $\hat{E}_s/I_{ot}$ for RSTD measurement neighbor cell PRS resource, PRS-RSRP measurement and UE Rx-Tx time difference measurement. |  |                                |                                |                                |   |
| NOTE 4: PRS $\hat{E}_s/I_{ot}$ for PRS-RSRP measurement and UE Rx-Tx time difference measurement.  |  |                                |                                |                                |   |

Table B.2.14-2: Conditions for NR PRS-based measurements in FR2

| Parameter  | Angle of arrival                        | NR operating bands | Minimum PRP <sub>1,2</sub> <sup>Note 2, Note 3</sup> |            |                             |                           | PRS $\hat{E}_s/\text{lot}$                     |   |
|------------|---|--------------------|--|------------|-----------------------------|---------------------------|--|---|
|            |   |                    | dBm / SCS <sub>PRS</sub>                             |            |                             |                           | dB   |   |
|            |   |                    | SCS <sub>PRS</sub> = 120 kHz                         |            | SCS <sub>PRS</sub> = 60 kHz |                           |  |   |
|            |   |                    | UE power class                                       |            |                             |                           |  | UE power class  |
| 1          | 2                                       | 3                  | 4  | 1, 2, 3, 4 |                             |                           |  |   |
| Conditions | Rx Beam Peak                            | n257               | -<br>128.3+Y <sub>1</sub>                            | -113.8     | -112.1                      | -<br>127.8+Y <sub>4</sub> | (Value for SCS <sub>PRS</sub> = 120 kHz) - 3dB | $\geq -6$ <sup>Note4</sup><br>$\geq -13$ <sup>Note5</sup><br>$\geq -3$ <sup>Note6</sup> |
|            |   | n258               | -<br>128.3+Y <sub>1</sub>                            | -113.8     | -112.1                      | -<br>127.8+Y <sub>4</sub> |  |   |
|            |   | n259               | -  |            | -108.5                      | -                         |  |   |
|            |   | n260               | -<br>125.3+Y <sub>1</sub>                            |            | -109.5                      | -<br>125.8+Y <sub>4</sub> |  |   |
|            |   | n261               | -<br>128.3+Y <sub>1</sub>                            | -113.8     | -112.1                      | -<br>127.8+Y <sub>4</sub> |  |   |
|            | Spherical coverage<br><sup>Note 1</sup> | n257               | -<br>120.3+Z <sub>1</sub>                            | -102.8     | -101.2                      | -<br>118.8+Z <sub>4</sub> | (Value for SCS <sub>PRS</sub> = 120 kHz) - 3dB | $\geq -6$ <sup>Note4</sup><br>$\geq -13$ <sup>Note5</sup><br>$\geq -3$ <sup>Note6</sup> |
|            |   | n258               | -<br>120.3+Z <sub>1</sub>                            | -102.8     | -101.2                      | -<br>118.8+Z <sub>4</sub> |  |   |
|            |   | n259               | -  |            | -95.7                       | -                         |  |   |
|            |   | n260               | -<br>117.3+Z <sub>1</sub>                            |            | -96.9                       | -<br>113.8+Z <sub>4</sub> |  |   |
|            |   | n261               | -<br>120.3+Z <sub>1</sub>                            | -102.8     | -101.2                      | -<br>118.8+Z <sub>4</sub> |  |   |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum PRS  $\hat{E}_s/\text{lot}$ , with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Delta\text{MB}_{P,n}$  and spherical coverage values are increased by  $\Delta\text{MB}_{S,n}$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

NOTE 4: PRS  $\hat{E}_s/\text{lot}$  for RSTD measurement reference cell PRS resource.

NOTE 5: PRS  $\hat{E}_s/\text{lot}$  for RSTD measurement neighbor cell PRS resource, PRS-RSRP measurement and UE Rx-Tx time difference measurement.

NOTE 6: PRS  $\hat{E}_s/\text{lot}$  for PRS-RSRP measurement and UE Rx-Tx time difference measurement.

Editor's notes for Table B.2.14-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub> and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

## B.3 RRM Requirements Exceptions

### B.3.1 Introduction

Annex B.3 covers exceptions for side conditions based on receiver sensitivity for CA, DC, and SUL.

### B.3.2 Receiver sensitivity relaxation for CA

#### B.3.2.1 Receiver sensitivity relaxation for UE supporting CA in FR1

For a UE supporting inter-band carrier aggregation configuration with uplink in NR band, if there is a relaxation of receiver sensitivity  $\Delta\text{R}_{\text{IB},c} > 0$  dB as defined in clause 7.3A.3 of TS 38.101-1 [18], the relevant side conditions specifying

received power levels (SSB<sub>RP</sub> and I<sub>o</sub>) shall be increased by the amount  $\Delta=\Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

For a UE supporting CA configuration in FR1, the requirement in this clause applies for both SC and CA operation.

## B.3.2.2 Receiver sensitivity relaxation for UE configured with CA in FR1

### B.3.2.2.1 Inter-band carrier aggregation

For a UE configured with inter-band carrier aggregation with active uplink in NR band, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c}>0$  dB as defined in clause 7.3A.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB<sub>RP</sub> and I<sub>o</sub>) shall be increased by the amount  $\Delta=\Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

#### B.3.2.2.2 Reference sensitivity exceptions due to UL harmonic interference for CA

In this clause, requirements exceptions are described for the UE configured with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same CA configuration.

A relevant side condition (SSB<sub>RP</sub> and I<sub>o</sub>) in a requirement shall be increased by the amount  $\Delta=L2-L1$ , where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3A.4 of TS 38.101-1 [18], when the following conditions are fulfilled,

- corresponding downlink component carriers on different NR bands are configured with CA and active,
- the uplink is configured in the NR low operating band and is active,
- the uplink configuration is as specified in clause 7.3A.4 of TS 38.101-1 [18], and
- the exception requirements specified in clause 7.3A.4 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

#### B.3.2.2.3 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

In this clause, requirements exceptions are described for the UE with an inter-band carrier aggregation with uplink assigned to two NR bands.

A relevant side condition (SSB<sub>RP</sub> and I<sub>o</sub>) in a requirement shall be increased by the amount  $\Delta=L2-L1$ , where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3A.5 of TS 38.101-1 [18], when the following conditions are fulfilled,

- corresponding downlink component carriers on different bands are configured with CA and active,
- uplinks are assigned to two NR bands,
- the exception requirements specified in clause 7.3A.5 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

## B.3.2.3 Receiver sensitivity relaxation for UE supporting CA in FR2

## B.3.2.4 Receiver sensitivity relaxation for UE configured with CA in FR2

### B.3.2.4.1 Intra-band contiguous carrier aggregation

For a UE configured with intra-band contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity  $\Delta R_{IB}>0$  dB as defined in clause 7.3A.2.1 of TS 38.101-2 [19] depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB<sub>RP</sub> and I<sub>o</sub>) shall be increased by the amount  $\Delta=\Delta R_{IB}$  defined for the corresponding downlink NR bands.

#### B.3.2.4.2 Intra-band non-contiguous carrier aggregation

For a UE configured with intra-band non-contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity  $\Delta R_{IB} > 0$  dB as defined in clause 7.3A.2.1 of TS 38.101-2 [19] depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta = \Delta R_{IB}$  defined for the corresponding downlink NR bands.

### B.3.3 Receiver sensitivity relaxation for DC

#### B.3.3.1 Receiver sensitivity relaxation for EN-DC

Editor's note: TBD

#### B.3.3.2 Receiver sensitivity relaxation for NE-DC

Editor's note: TBD

### B.3.4 Receiver sensitivity relaxation for SUL

#### B.3.4.1 Receiver sensitivity relaxation for UE supporting SUL in FR1

For a UE supporting a SUL configuration in FR1, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c} > 0$  dB as defined in clause 7.3C.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta = \Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

For a UE supporting a SUL configuration in FR1, the requirement in this clause applies for both SC and SUL operation.

#### B.3.4.2 Receiver sensitivity relaxation for UE configured with SUL in FR1

##### B.3.4.2.1 Reference sensitivity exceptions due to UL harmonic interference for SUL

In this clause, requirements exceptions are described for the UE with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same SUL configuration.

A relevant side condition (SSB\_RP and Io) in a requirement shall be increased by the amount  $\Delta = L2 - L1$ , where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3C.2 of TS 38.101-1 [18], when the following conditions are fulfilled,

- a downlink component carrier is configured in NR band and is active,
- the uplink is configured in the NR low operating band and is active,
- the uplink configuration is as specified in clause 7.3C.2 of TS 38.101-1 [18], and
- the exception requirements specified in clause 7.3C.2 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.4.1 should not be applied.

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## B.4 Conditions for V2X

### B.4.1 Test parameters for GNSS signals

This clause defines the reference signal power levels of generated satellites for a corresponding GNSS, which will be used in V2X test cases.

**Table B.4.1-1: GNSS Reference Signal Power Parameters**

| System             | Parameters                                      | Unit | Value  |
|--------------------|---|------|--------|
|                    | Number of generated satellites per system       | -    | 6      |
| GPS <sup>(1)</sup> | Reference signal power level for all satellites | dBm  | -128.5 |
| Galileo            | Reference signal power level for all satellites | dBm  | -127   |
| GLONASS            | Reference signal power level for all satellites | dBm  | -131   |
| BDS                | Reference signal power level for all satellites | dBm  | -133   |

NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities.  
NOTE 2: The DUT UE does not need to support all systems. The DUT UE shall support at least one system and will be test for the supported systems.

## B.4.2 Conditions for PSBCH-RSRP Accuracy Requirements

This clause defines the following conditions for PSBCH-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.2-1 for FR1.

**Table B.4.2-1: Conditions for PSBCH-RSRP measurements in FR1**

| Parameter | NR V2X operating band groups <sup>Note1</sup> | Minimum S-SSB <sub>RP</sub>  |                              |                              | S-SSB $\hat{E}_s/\text{lot}$ |
|-----------|---|------------------------------|------------------------------|------------------------------|------------------------------|
|           |   | dBm/SCS <sub>S-SSB</sub>     |                              |                              | dB                           |
|           |   | SCS <sub>S-SSB</sub> = 15kHz | SCS <sub>S-SSB</sub> = 30kHz | SCS <sub>S-SSB</sub> = 60kHz |                              |
|           | NR_TDD_FR1_B                                  | -126.5                       | -123.5                       | -120.5                       | ≥ -6                         |
|           | NR_TDD_FR1_J                                  | -122.5                       | -119.5                       | -116.5                       |                              |

NOTE 1: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.

## B.4.3 Conditions for Selection/Reselection to Intra-frequency SyncRef UE

This clause defines the S-SSB<sub>RP</sub> and S-SSB  $\hat{E}_s/\text{lot}$  applicable for a corresponding operating band.

The conditions for selection/reselection to intra-frequency SyncRef UE are defined in Table B.4.3-1 for FR1.

**Table B.4.3-1: V2X synchronization measurements in FR1**

| Parameter | NR V2X operating band groups <sup>Note1</sup> | Minimum S-SSB <sub>RP</sub>  |                              |                              | S-SSB $\hat{E}_s/\text{lot}$ |
|-----------|---|------------------------------|------------------------------|------------------------------|------------------------------|
|           |   | dBm/SCS <sub>S-SSB</sub>     |                              |                              | dB                           |
|           |   | SCS <sub>S-SSB</sub> = 15kHz | SCS <sub>S-SSB</sub> = 30kHz | SCS <sub>S-SSB</sub> = 60kHz |                              |
|           | NR_TDD_FR1_B                                  | -120.5                       | -117.5                       | -114.5                       | ≥ 0                          |
|           | NR_TDD_FR1_J                                  | -116.5                       | -113.5                       | -110.5                       | ≥ 0                          |

NOTE 1: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.  
NOTE 2: The SyncRef UE transmission frequency shall be accurate to within ±5 PPM compared to the absolute frequency.

## B.4.4 Conditions for L1 SL-RSRP Accuracy Requirements

This clause defines the following conditions for L1 SL-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.4-1 for FR1.

Table B.4.4-1: Conditions for L1 SL-RSRP measurements in FR1

| Parameter | NR V2X operating band groups <sup>Note1</sup> | Minimum L1 SL-RSRP |               |                | $\hat{E}_s/\text{lot}$ |
|-----------|---|--------------------|---------------|----------------|------------------------|
|           |   | dBm/SCS            |               |                | dB                     |
|           |   | SCS=<br>15kHz      | SCS=<br>30kHz | SCS =<br>60kHz |                        |
|           | NR_TDD_FR1_B                                  | -120.5             | -117.5        | -114.5         | $\geq 0$               |
|           | NR_TDD_FR1_J                                  | -116.5             | -113.5        | -110.5         |                        |

NOTE 1: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.  
NOTE 2: The parameter  $\hat{E}_s/\text{lot}$  is the  $\hat{E}_s/\text{lot}$  of PSCCH-DMRS and/or PSSCH-DMRS.  
NOTE 3: The SCS is for PSCCH and/or PSSCH.

## Annex C (informative): Change history

| Change history |               |            |      |     |     |   |             |
|----------------|---------------|------------|------|-----|-----|---|-------------|
| Date           | Meeting       | TDoc       | CR   | Rev | Cat | Subject/Comment   | New version |
| 2017-05        | RAN4#83       | R4-1706324 |      |     |     | Specification skeleton  | 0.0.1       |
| 2017-09        |               |            |      |     |     | Email approved  | 0.1.0       |
| 2017-09        | RAN4-NR AH #3 | R4-1709413 |      |     |     | Capture TPs approved in the meeting   | 0.2.0       |
| 2017-10        | RAN4#84 -Bis  | R4-1711985 |      |     |     | Capture TPs approved in the meeting   | 0.3.0       |
| 2017-12        | RAN4#85       | R4-1714546 |      |     |     | Capture TPs approved in RAN4#85   | 0.4.0       |
| 2017-12        | RAN#78        | RP-172407  |      |     |     | v1.0.0 submitted for plenary approval   | 1.0.0       |
| 2017-12        | RAN#78        |            |      |     |     | Approved by plenary – Rel-15 spec under change control  | 15.0.0      |
| 2018-03        | RAN#79        | RP-180264  | 0032 |     | B   | CR to TS38.133  | 15.1.0      |
| 2018-06        | RAN#80        | RP-181075  | 0037 |     | B   | CR to TS 38.133: Implementation of endorsed draft CRs from RAN4 #86bis and RAN4 #87   | 15.2.0      |
| 2018-09        | RAN#81        | RP-181896  | 0043 |     | B   | CR to TS 38.133: Implementation of endorsed draft CRs from RAN4-AH-1807 and RAN4 #88  | 15.3.0      |
| 2018-12        | RAN#82        | RP-182763  | 0057 | 3   | B   | CR to TS 38.133: Implementation of endorsed draft CRs from RAN4-88bis and RAN4-89   | 15.4.0      |
| 2019-03        | RAN#83        | RP-190569  | 0064 | 1   | B   | CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#90  | 15.5.0      |
| 2019-06        | RAN#84        | RP-191240  | 0072 | 1   | F   | CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#90bis and RAN4#91   | 15.6.0      |
| 2019-06        | RAN#84        | RP-191248  | 0066 |     | B   | Introduction of band n48  | 16.0.0      |
| 2019-06        | RAN#84        | RP-191242  | 0067 |     | B   | Introduction of band n14 - CR to TS 38.133  | 16.0.0      |
| 2019-06        | RAN#84        | RP-191246  | 0068 |     | B   | Introduction of band n30 - CR to TS 38.133  | 16.0.0      |
| 2019-06        | RAN#84        | RP-191244  | 0069 |     | B   | introduce n18 into TS38.133   | 16.0.0      |
| 2019-06        | RAN#84        | RP-191250  | 0070 | 1   | B   | n65 introduction to 38.133  | 16.0.0      |
| 2019-09        | RAN#85        | RP-192034  | 0077 |     | B   | n29 introduction to 38.133  | 16.1.0      |
| 2019-09        | RAN#85        | RP-192022  | 0085 |     | A   | CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#92 (Rel-16)<br>- Mirrors changes in R4-1910356 for Rel-15 TS 38.133 | 16.1.0      |
| 2019-12        | RAN#86        | RP-192997  | 0093 |     | A   | Specification of UE antenna gain range  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192992  | 0095 | 1   | A   | Add RRM Test case setup for 1 AoA in Rx beam peak and 1 in non Rx beam peak   | 16.2.0      |
| 2019-12        | RAN#86        | RP-192997  | 0097 |     | A   | Update of Parameters, Test case A.7.7.1.1 FR2 Intra-frequency SS-RSRP accuracy  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192997  | 0099 |     | A   | Update of Parameters, Test case A.5.7.1.1 FR2 Intra-frequency SS-RSRP accuracy  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192997  | 0101 |     | A   | Update of Parameters, Test case A.7.7.1.2 FR2 Inter-frequency SS-RSRP accuracy  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192997  | 0103 |     | A   | Update of Parameters, Test case A.5.7.1.2 FR2 Inter-frequency SS-RSRP accuracy  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192992  | 0105 |     | A   | Correction to Random access test case in FR1 for PSCell in EN-DC  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193040  | 0107 |     | A   | CR on handover 38.133 - R16   | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0112 | 1   | A   | CR on the BWP switch test cases EN-DC FR1 (clause A.4.5.6)  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0113 | 1   | A   | CR on the BWP switch test cases EN-DC FR2 (clause A.5.5.6)  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0114 | 1   | A   | CR on the BWP switch test cases SA FR1 (clause A.6.5.6)   | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0115 | 1   | A   | CR on the BWP switch test cases SA FR2 (clause A.7.5.6)   | 16.2.0      |
| 2019-12        | RAN#86        | RP-193042  | 0117 |     | A   | CR to TS38.133 on correction for BWP switching with SCS changing (Section 8.2.1.2.7, 8.2.2.2.5 and 8.6.2)                           | 16.2.0      |
| 2019-12        | RAN#86        | RP-193040  | 0121 |     | A   | CR on handover RRM requirement (clause 6.1.1.5) (R16)   | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0123 |     | A   | CR on test cases for EN-DC FR2 inter-frequency measurement (clause A.5.6.2) (R16)   | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0127 | 1   | A   | CR on test cases for Redirection from NR in FR2 to NR in FR2 (clause A.7.3.2.3) (R16)   | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0129 | 1   | A   | CR on test cases for FR2 handover (clause A.7.3.1) (R16)  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193042  | 0131 |     | A   | CR to 38.133 on TCI state switching (Section 8.10) (R16)  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193009  | 0133 |     | F   | CR on measurement gap applicability requirement for SRVCC   | 16.2.0      |
| 2019-12        | RAN#86        | RP-192994  | 0137 |     | A   | CR on TC with monitoring PDCCH not in first 3 OFDM symbols R16  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193021  | 0139 |     | F   | CR to add n90 in the NR operating bands in FR1 (3.5.2)  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193040  | 0148 | 1   | A   | CR on inter-RAT measurement in TS38.133 (clause 9.4.2, 9.4.3)   | 16.2.0      |
| 2019-12        | RAN#86        | RP-193042  | 0151 |     | A   | CR to 38.133 R16 Add the missing units to DRX cycle values (Cat A)  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193005  | 0152 | 1   | B   | CR for Abbreviations for cross link interference (clause 3)   | 16.2.0      |
| 2019-12        | RAN#86        | RP-193005  | 0153 | 1   | B   | CR for cross link interference measurements (clause 9)  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193041  | 0156 |     | A   | CR on NR MTTD and MRTD definition for R16   | 16.2.0      |
| 2019-12        | RAN#86        | RP-193042  | 0157 | 1   | A   | Editorial correction for SCell activation and deactivation delay  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193039  | 0159 |     | A   | CR for SCell activation delay in FR2  | 16.2.0      |
| 2019-12        | RAN#86        | RP-193040  | 0161 |     | A   | CR for scheduling restriction due to L1-RSRP measurement  | 16.2.0      |
| 2019-12        | RAN#86        | RP-192993  | 0167 |     | A   | CR on SSB setting for new gap and SMTC setting (Section A.3.10)   | 16.2.0      |



|         |        |           |      |   |   |   |        |
|---------|--------|-----------|------|---|---|---|--------|
| 2019-12 | RAN#86 | RP-192995 | 0169 |   | A | CR on TS38.133 for EN-DC SS-SINR tests with PSCell in FR1 (Section A.4.7.3)               | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0171 |   | A | CR on TS38.133 for SA SS-SINR tests with PCell in FR1 (Section A.6.7.3)                   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0185 |   | A | CR on cell-reselection test cases for NR SA FR2 R16                                       | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0187 |   | A | endorsed CR on intra-frequency measurement and reporting for EN-DC FR2 R16                | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0189 |   | A | endorsed CR on intra-frequency measurement and reporting for NR SA FR2 R16                | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0191 |   | A | endorsed CR on RLM scheduling restrictions for EN-DC FR2 R16                              | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0193 |   | A | endorsed CR on RLM scheduling restrictions for NR SA FR2 R16                              | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0201 |   | A | Correction to PRACH configuration index in test cases_r16                                 | 16.2.0 |
| 2019-12 | RAN#86 | RP-193009 | 0205 |   | B | CR on UMTS inter-RAT measurement requirements   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193009 | 0206 |   | B | CR on CSSF for SRVCC  | 16.2.0 |
| 2019-12 | RAN#86 | RP-193009 | 0207 |   | B | CR on measurement capability for NR- UMTS for SRVCC                                       | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0209 |   | A | Correction on the TCI state switching (clause 8.10)                                       | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0219 |   | A | CR for 38133 editorial for clause 8.1,8.8,8.9,8.10,8.11 in Rel-16                         | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0220 |   | A | CR for 38133 editorial for clause 8.5 in Rel-16   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0221 |   | A | CR for 38133 editorial for clause 9.3 in Rel-16   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193040 | 0222 |   | A | CR on 38133 for removal the duplicated reference in clause 2                              | 16.2.0 |
| 2019-12 | RAN#86 | RP-193040 | 0223 |   | A | CR on 38133 for clause 11 in Rel-16   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192994 | 0225 | 1 | A | CR on TC of UE transmit timing (A.4.4.1.1, A.5.4.1.1, A.6.4.1.1, A.7.4.1.1) Rel-16        | 16.2.0 |
| 2019-12 | RAN#86 | RP-193042 | 0230 |   | A | Update on requirements related to inter-band EN-DC and NE-DC synchronous requirements     | 16.2.0 |
| 2019-12 | RAN#86 | RP-193008 | 0231 | 1 | B | MRTD and MTTD requirements for asynchronous NR-NR DC                                      | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0233 | 1 | A | Editorial corrections to measurement accuracy tests                                       | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0235 |   | A | Corrections to SS-RSRQ and SS-SINR OTA tests with SA                                      | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0237 | 1 | A | Corrections to SS-RSRQ and SS-SINR OTA tests with EN-DC                                   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193042 | 0239 | 1 | A | Editorial corrections to clause 9.2   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193009 | 0240 |   | B | Introduction of handover requirements for SRVCC in clause 6.1.2                           | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0242 |   | A | Corrections to band applicability of measurement accuracy tests                           | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0244 |   | A | Introduction of bandwidth limited OCN for OTA testing                                     | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0248 |   | A | Corrections to test cases for SA FR2 inter-frequency measurement (clause A.7.6.2)         | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0250 |   | A | CR to 38.133 NR reporting criteria  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0264 |   | A | CR on correcting CSI-RS based BFD and link recovery tests for EN-DC in FR1                | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0266 |   | A | CR on correcting CSI-RS based BFD and link recovery tests for SA in FR1                   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0268 |   | A | CR on correcting CSI-RS based BFD and link recovery tests for EN-DC in FR2                | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0270 |   | A | CR on correcting CSI-RS based BFD and link recovery tests for SA in FR2                   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193004 | 0274 | 1 | B | CR on introducing L1-SINR mapping in TS38.133 R16   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193040 | 0276 |   | A | CR on delay uncertainty of RRC Release with redirection requirements in TS 38.133 (Cat A) | 16.2.0 |
| 2019-12 | RAN#86 | RP-193040 | 0278 |   | A | CR on known condition of PSCell addition requirement in NE-DC (Cat A)                     | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0280 |   | A | CR on known condition of PSCell addition requirement in NR DC (Cat A)                     | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0282 |   | A | CR on RRC Re-establishment requirements in TS 38.133 (Cat A)                              | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0284 |   | A | CR on scope of interruption requirements of EN-DC in TS 38.133 (Cat A)                    | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0286 |   | A | CR on scope of MTTD requirements in TS 38.133 (Cat A)                                     | 16.2.0 |
| 2019-12 | RAN#86 | RP-192994 | 0288 |   | A | CR on SSB-based RLM test case for EN-DC FR1 (Cat A)                                       | 16.2.0 |
| 2019-12 | RAN#86 | RP-192994 | 0290 |   | A | CR on SSB-based RLM test case for NR SA FR1 (Cat A)                                       | 16.2.0 |
| 2019-12 | RAN#86 | RP-193042 | 0292 |   | A | Editorial CR on clause 8.2 (Cat A)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0296 |   | A | CR on NR inter-frequency identification (Cat A)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0298 |   | A | CR on NR intra-frequency measurements (Cat A)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0312 |   | A | Correction on CSSF within measurement gap (clause 9.1.5.2) (cat-A)                        | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0314 |   | A | CR on RLM scheduling restriction (clause 8.1.7) (cat-A)                                   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0316 |   | A | CR on SCell activation requirements (clause 8.3.2) (cat-A)                                | 16.2.0 |
| 2019-12 | RAN#86 | RP-193042 | 0318 |   | A | CR to add QCL definition (clause 3.6) (cat-A)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0320 |   | A | CR on power offset in TRS RMC (A.3.17) (cat-A)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0322 |   | A | CR to introduce new PDCCH RMC (A.3.1.3.2) (cat-A)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192997 | 0324 |   | A | Maintenance CR for measurement accuracy (clause 10.1) (cat-A)                             | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0326 |   | A | FR1 CSI-RS RLM test OOS/IS non-DRX for EN-DC (clause A.4.5.1) (cat-A)                     | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0328 |   | A | FR2 CSI-RS RLM test OOS/IS non-DRX for EN-DC (clause A.4.5.1) (cat-A)                     | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0330 |   | A | FR1 CSI-RS RLM test OOS/IS non-DRX for SA (clause A.6.5.1) (cat-A)                        | 16.2.0 |

|         |        |           |      |   |   |   |        |
|---------|--------|-----------|------|---|---|---|--------|
| 2019-12 | RAN#86 | RP-192996 | 0332 |   | A | FR2 CSI-RS RLM test OOS/IS non-DRX for SA (clause A.6.5.1) (cat-A)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192997 | 0334 |   | A | L1-RSRP delay test FR1 EN-DC (clause A.4.6.3) (cat-A)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192997 | 0336 |   | A | L1-RSRP delay test FR2 EN-DC (clause A.5.6.3) (cat-A)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192997 | 0338 |   | A | L1-RSRP delay test FR1 SA (clause A.6.6.4) (cat-A)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192997 | 0340 |   | A | L1-RSRP delay test FR2 SA (clause A.7.6.3) (cat-A)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0344 |   | A | L1-RSRP accuracy test FR2 EN-DC (clause A.5.7.4) (cat-A)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192996 | 0346 |   | A | L1-RSRP accuracy test FR2 SA (clause A.7.7.4) (cat-A)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193005 | 0347 | 1 | B | CR to introduce CLI measurement accuracy requirements   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193008 | 0348 |   | B | CR on measurement gap interruption due to async NR-DC   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193008 | 0349 |   | B | CR on Interruptions at PSCell/SCell addition/release in async NR-DC   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193008 | 0350 |   | B | Introducing euCA related interruption requirements for EN-DC in 38.133 (clause 8.2.1)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193008 | 0351 |   | B | Introducing euCA related interruption requirements for NE-DC in 38.133 (clause 8.2.3)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193008 | 0352 | 1 | B | CR on direct SCell activation delay   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0358 |   | A | CR 38.133 (8.3.2) Amendment of requirements depending on T_SMTTC_Max  | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0360 |   | A | CR 38.133 (8.3.3) Correction of SCell deactivation delay  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0362 | 1 | A | CR 38.133 (A.7.5.7) TCs for PSCell addition and release delay   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0366 |   | A | CR to TS 38.133: New common clause with OTA related definitions for FR2 testing (Rel-16)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0368 |   | A | CR to TS 38.133: Configuration of NR FR1 cell in NR FR1-FR2 tests (Rel-16)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0370 |   | A | CR to TS 38.133: Clarificatins to Antenna Configurations for FR2 (Rel-16)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0372 |   | A | CR to TS 38.133: Corrections to CORESET RMCs (Rel-16)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192995 | 0374 |   | A | CR to TS 38.133: Corrections to FR2 test configurations (Rel-16)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-193042 | 0376 | 1 | A | Editorial updates (clause 9.4)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0378 |   | A | Correction in interruption requirements (clause 8.2)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-193042 | 0380 | 1 | A | Editorial updates (Annex B)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193040 | 0382 |   | A | CR on 38133 for MRTD and MTTD in intra-band EN-DC   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193039 | 0390 |   | A | Correction to the starting point of the DRX cycle length interval   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0391 |   | A | CR for MAC-CE based TCI State switch for ENDC (Section A.5.5.8)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0392 |   | A | CR for MAC-CE based TCI State switch for NR SA (Section A.7.5.7)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0393 |   | A | CR for RRC based TCI State switch for NR SA (Section A.7.5.7)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192993 | 0394 |   | A | CR for RRC based TCI State switch for EN-DC (Section A.5.5.8)   | 16.2.0 |
| 2019-12 | RAN#86 | RP-192992 | 0395 |   | A | CR for FR1 handover test cases (Section A.6.3.1.1, A.6.3.1.2, A.6.3.1.3)  | 16.2.0 |
| 2019-12 | RAN#86 | RP-193041 | 0396 |   | A | CR on MTTD for intra-band EN-DC   | 16.2.0 |
| 2019-12 | RAN#86 | RP-193040 | 0398 |   | A | CR on corrections on NR intra frequency measurement reporting requirements (Section 9.2.4)  | 16.2.0 |
| 2020-03 | RAN#87 | RP-200401 | 0405 | 1 | A | [CR] handover requirements 38.133 R16 (Cat A)   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0412 | 1 | A | [CR] SCell activation delay 38.133 R16 (Cat A)  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0417 |   | A | Corrections to RRM Test case A.7.1.1.2  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0419 |   | A | Correction to Active UL BWP for SA intra-frequency event triggered reporting with per-UE gaps                                     | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0421 |   | A | Correction to FR1-E-UTRA Inter-RAT cell re-selection test cases   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0423 |   | A | Removal of Time offset between PCell and PSCell in SA RRM Test cases  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0425 |   | A | Correction to SRS periodicity and Offset for UL transit timing with DRx config  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0427 |   | A | Update of Test Requirements, FR2 Intra-frequency SS-RSRP accuracy Test cases  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0429 |   | A | Update of Test requirements, FR2 Inter-frequency SS-RSRP accuracy Test cases  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0439 | 1 | A | CR on test cases for SA FR2 inter-frequency measurement R16 (section A.7.6.2)   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0441 |   | A | Editorial corrections for 38.133 Core Part R16 (Cat A)  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0445 | 1 | A | Editorial corrections for 38.133 Perf Part R16 (Cat A)  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0454 |   | A | Editorial correction for active TCI state switching delay   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0462 | 1 | A | Corrections for BWP switch delay R16 (Cat A)  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0464 |   | A | CR for reference correction on L1-RSRP measurement period (section 9.5.3)   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0466 |   | A | CR for measurement restriction in FR2 across CCs (section 8.1.2.3, 8.1.3.3, 8.5.2.3, 8.5.3.3, 8.5.5.3, 8.5.6.3, 9.5.5.1, 9.5.5.2) | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0468 |   | A | CR for SSB based candidate beam detection (section 8.5.5.2)   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0488 |   | A | CR to TS 38.133: Corrections to FR1-FR2 event triggered test cases Annex A.5 (Rel-16)   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0490 |   | A | CR to TS 38.133: Corrections to FR1-FR2 event triggered test cases Annex A.7 (Rel-16)   | 16.3.0 |

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| 2020-03 | RAN#87 | RP-200401 | 0492 |   | A | CR to TS 38.133: Clarifications to AoA setup and AoA cell assignment Annex A.5 (Rel-16) | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0494 |   | A | CR to TS 38.133: Clarifications to AoA setup Annex A.8 (Rel-16)                         | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0496 |   | A | CR to TS 38.133: Addition of TC A.4.7.2.2 (Rel-16)                                      | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0500 |   | A | Editorial correction of EN-DC FR1 L1-RSRP measurement for beam reporting                | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0502 |   | A | Editorial correction of NR SA FR1 L1-RSRP measurement for beam reporting                | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0509 |   | A | CR on removing one-shot timing adjustment requirements (Cat A)                          | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0516 |   | A | Correction to BWP switching delay_r16   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0518 |   | A | Correction to inter-RAT measurement on LTE serving carrier_r16                          | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0520 |   | A | Correction to configurations for TRS_r16  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0522 |   | A | Correction to FR1 SA inter-RAT measurement TCs_r16                                      | 16.3.0 |
|         |        |           |      |   |   | NOTE The CR is not implemented because the corresponding Cat F CR is not implementable. |        |
| 2020-03 | RAN#87 | RP-200401 | 0524 |   | A | Correction to interruption TCs_r16  | 16.3.0 |
|         |        |           |      |   |   | NOTE The CR is not implemented because the corresponding Cat F CR is not implementable. |        |
| 2020-03 | RAN#87 | RP-200401 | 0528 |   | A | Correction to RF channels configuration_r16   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0530 |   | A | Correction to RRC release with redirection TCs_r16                                      | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0532 |   | A | Correction to UL reconfiguration delay TCs_r16  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0538 |   | A | CR on SSB RLM test cases EN-DC R16  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0540 |   | A | CR on SSB RLM test cases SA R16   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0542 |   | A | CR on cell reselection test cases for FR2 SA R16  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0544 |   | A | OCNG pattern for TDM-ed SSB R16   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0564 |   | A | NR editorial correction   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0580 |   | A | CR 38.133 (8.11) Corrections to PSCell change delay requirements                        | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0587 |   | A | PRACH configurations in FR1 SSB based RLM tests   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0589 |   | A | PRACH configurations in FR1 SSB based BFR tests   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200375 | 0437 | 1 | B | CR for Conditional PSCell addition/change RRM requirement                               | 16.3.0 |
| 2020-03 | RAN#87 | RP-200381 | 0440 |   | B | n26 introduction to 38.133  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200374 | 0452 | 1 | B | CR on interruption requirements for NR V2X  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200372 | 0455 |   | B | CR on RRM requirement for maximum MIMO layer adaptation                                 | 16.3.0 |
| 2020-03 | RAN#87 | RP-200389 | 0460 | 1 | F | introduce n18 into TS38.133   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200374 | 0473 | 1 | B | CR of NR V2X RRM(introduction & reliability of GNSS signal)                             | 16.3.0 |
| 2020-03 | RAN#87 | RP-200374 | 0476 | 2 | B | CR on NR V2X initiation SLSS 38.133 -R16  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0479 |   | F | CR to 38.133 NR reporting criteria  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200382 | 0486 |   | B | Introduction of n53 into 38.133   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200371 | 0498 |   | B | Updates to SA NR interruption requirements for NR-U                                     | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0510 |   | F | CR on inter-band EN-DC and NE-DC synchronous requirements                               | 16.3.0 |
| 2020-03 | RAN#87 | RP-200375 | 0511 | 1 | B | CR on DAPS handover requirements  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200374 | 0512 |   | B | CR on introducing UE sidelink timing requirements for NR V2X                            | 16.3.0 |
| 2020-03 | RAN#87 | RP-200370 | 0545 | 1 | F | CR on CLI measurement requirements  | 16.3.0 |
| 2020-03 | RAN#87 | RP-200370 | 0546 | 1 | F | CR on CLI measurement accuracy requirements   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200406 | 0547 |   | B | CR on Interruptions at SCell activation/deactivation in async NR-DC                     | 16.3.0 |
| 2020-03 | RAN#87 | RP-200406 | 0548 | 1 | F | CR on direct SCell activation delay   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200376 | 0551 | 1 | F | Correction on handover requirements for SRVCC   | 16.3.0 |
| 2020-03 | RAN#87 | RP-200371 | 0558 | 1 | B | CR to 38.133 to address NR-U inter-RAT measurements                                     | 16.3.0 |
| 2020-03 | RAN#87 | RP-200401 | 0578 |   | F | CR 38.133 (8.3.2) Correction of error in Rel-16 SCell activation                        | 16.3.0 |
| 2020-03 | RAN#87 | RP-200370 | 0582 |   | B | CR for conditions for cross link interference measurements (section B)                  | 16.3.0 |
| 2020-06 | RAN#88 | RP-200987 | 0595 |   | A | [CR] Editorial corrections for 38.133 R16 Core Part - Cat A                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0596 |   | F | [CR] Editorial corrections for 38.133 R16 Core Part - Cat F                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0598 |   | A | [CR] Editorial corrections for 38.133 R16 Perf Part - Cat A                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200966 | 0599 |   | F | [CR] Delay requirements for direct SCell activation                                     | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0600 |   | F | [CR] Editorial corrections for 38.133 R16 Perf Part - Cat F                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0602 |   | A | CR to Intra-frequency handover from FR1 to FR1  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0606 |   | A | CR to A.6.1.2.1 Cell reselection to higher priority E-UTRAN                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0608 |   | A | Correction to General test parameters in A.6.6.1.2                                      | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0620 |   | A | CR on CSSF correction for R16 TS38.133  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0625 | 1 | B | CR on multiple SCell activation deactivation requirement for R16                        | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0626 | 1 | B | CR on multiple SCell activation interruption requirement for R16                        | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0629 |   | A | CR on Active TCI State Switching requirements - Rel16                                   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201055 | 0632 | 2 | F | Rapporteur CR for TS38.133  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201048 | 0635 | 2 | B | CR on minimum requirement at transition period for UE power saving                      | 16.4.0 |
| 2020-06 | RAN#88 | RP-200958 | 0636 | 1 | F | CR on interruption requirements for NR V2X  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200975 | 0641 | 1 | B | CR on cell identification requirements for NR HST                                       | 16.4.0 |

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| 2020-06 | RAN#88 | RP-201044 | 0642 | 2 | B | CR on PRS-RSRP measurement report mapping   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201044 | 0645 | 1 | B | CR on SRS RSRP measurement report mapping   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200973 | 0646 | 2 | B | CR to TS38.133 on introduction of L1-SINR Measurement Requirement (Section 3.3 and 9)   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200973 | 0648 | 1 | B | CR to TS38.133 on introduction of SCell BFRQ Procedure (Section 8.5)  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0651 |   | A | Add UE Beam assumption for RRM Test cases in A.7.3, A.7.4, A.7.7  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0653 |   | A | Add UE Beam assumption for RRM Test cases in A.5.3, A.5.4, A.5.7  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0655 |   | A | Update of FR2 RLM Test cases with 2 Angles of Arrival   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0657 |   | F | Update of Tx Timing Test cases  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0659 |   | A | Update of FR2 RLM and BFD-LR Test cases   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0661 |   | A | Update of FR2 SS-RSRP Test cases  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0663 | 1 | A | CR on TCI state switch  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0665 |   | A | CR on PDSCH RMC   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0668 | 1 | B | CR on active spatial relation switch  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200976 | 0671 | 1 | B | CR to TS 38.133: CHO RRM requirement  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0672 | 1 | B | CR to TS 38.133: RRM requirement for UE-specific CBW change delay   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0673 |   | B | CR to TS 38.133: RRM requirement for interruption due to UE-specific CBW change   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200969 | 0678 | 1 | B | CR to TS 38.133: introducing 2-step RACH core requirements  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0680 |   | A | Correction of CFRA RSRP threshold   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200970 | 0682 |   | B | CR for event triggered reporting tests for CLI  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200958 | 0685 |   | B | CR of NR V2X abbreviations  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200958 | 0686 | 1 | B | CR of interruption for switching between NR SL and LTE SL   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200958 | 0687 | 2 | F | CR of NR V2X editorial correction   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200971 | 0689 | 1 | B | 38.133 CR on cell re-selection requirements for Rel-16 NR HST   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0690 | 1 | B | CR on introducing inter-frequency measurements without measurement gap (9.1.5, 9.1.6, 9.3.1, 9.3.4, 9.3.5)  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0696 |   | A | CR on SMTC period for beam management requirements  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0698 |   | A | CR for CSI-RS based L1-RSRP measurement period  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0700 |   | A | CR on RACH test cases with CSI-RS resource R16  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0704 |   | A | CR on TS38.133 for modification of the layer 3 and layer 1 measurement sharing factor when both SSB and RSSI symbol to be measured are considered | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0706 |   | A | CR on TS38.133 for modification on number of cells and number of SSB to be measured for FR2 intra-frequency measurement                           | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0708 |   | A | [CR] TCI state switch delay 38.133 R16 Cat A  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0709 | 1 | F | LTE CGI measurements with autonomous gaps for 38.133  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0710 | 3 | B | Updates to general section for NR-U in 38.133   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200976 | 0711 | 1 | F | Correction to DAPS HO requirements in 38.133  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201049 | 0712 | 2 | F | SRVCC test case for event triggered reporting   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201049 | 0713 |   | F | Gap applicability errors corrected for SRVCC  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0715 |   | A | Correction of NR SA FR2 inter-freq measurement reporting  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200968 | 0717 |   | F | NTA_offset setting for NR coexistence with NB-IoT   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0718 | 2 | B | CR to TS 38.133: adding NR-U Handover.  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200975 | 0723 | 1 | B | CR on cell re-selection requirement for NR-EUTRAN measurement in TS38.133   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0725 | 1 | B | CR: Introduction of L1-RSRP measurement requirements with CCA   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0727 |   | A | CR: Correction of L1-RSRP measurement period  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0729 |   | A | CR to TS 38.133: Correction to CSI-RS configurations in A.3.14 (Rel-16)   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0731 |   | A | CR to TS 38.133: Correction to SMTC configuration in measurement accuracy tests (Rel-16)  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0733 |   | A | CR to TS 38.133: Clarifications to AoA setup Annex A.5 (Rel-16)   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0735 |   | A | CR to TS 38.133: Clarifications to AoA setup Annex A.7 (Rel-16)   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201048 | 0736 |   | F | CR for maximum MIMO layer adaptation  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0738 | 1 | F | Applicability of QCL  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0741 | 1 | B | CR to 38.133 on SRS carrier switching interruption requirements   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0742 | 1 | B | CR to 38.133 on impact to measurement requirements due to LTE SRS carrier switching   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200969 | 0743 | 1 | B | CR to 38.133 on UE transmit timing requirements for 2-step RACH   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0744 | 1 | F | CR to 38.133 on intra frequency measurements without gaps   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0748 |   | A | CR on Psharingfactor_r16  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0750 |   | A | CR on E-UTRAN Serving Cell Parameters_r16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0752 |   | A | CR on Modified parameters for BFD TCs with 4Rx antenna_r16  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0754 |   | A | CR on BFD TCs_r16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0756 |   | A | CR on UL carrier RRC reconfiguration Delay TC_r16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0758 |   | A | CR to FR1 SCell activation delay test cases_r16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0760 |   | A | CR to inter-frequency measurement TCs_r16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0762 | 1 | F | CR to interruption TCs_r16  | 16.4.0 |

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| 2020-06 | RAN#88 | RP-200987 | 0763 | 1 | F | CR to FR1 SA inter-RAT measurement TCs_r16  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0764 | 1 | B | CR on introduction of RRM requirements for BWP switching delay on multiple CCs        | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0767 | 1 | B | CR on introduction of Active TCI state switching delay with CCA Requirements for NR-U | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0768 | 2 | B | CR on introduction of reporting criteria for NR-U                                     | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0770 | 1 | B | CR on introduction of RRC_INACTIVE state mobility requirements for NR-U               | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0775 |   | A | CR on interruption due to Active BWP switch (Cat A)                                   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0779 |   | A | CR on UE transmit timing (Cat A)  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0781 |   | A | Editorial CR on TS 38.133 Rel-16 (Cat A)  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0783 |   | A | CR on RRC Connection Release with Redirection (Cat A)                                 | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0785 |   | A | CR on RRC Re-establishment test cases (Cat A)   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0787 |   | A | CR on Timing advance test cases for EN-DC (Cat A)                                     | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0789 |   | A | CR on Timing test cases for NR SA (Cat A)   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201045 | 0792 | 1 | B | CR on DL interruption Tx switching between two uplink carriers                        | 16.4.0 |
| 2020-06 | RAN#88 | RP-200975 | 0796 | 1 | B | Cell identification in connected mode for NR-EUTRAN measurement in HST                | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0799 |   | A | Correction on TCI state switching R16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0801 |   | A | Accuracy of carrier aggregation in NR R16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201049 | 0802 | 1 | B | Test case for NR to UTRA FDD Inter-RAT handover                                       | 16.4.0 |
| 2020-06 | RAN#88 | RP-200976 | 0804 |   | F | CR on conditional PSCell change requirements  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200973 | 0806 | 1 | B | CR on SCell BFD and CBD requirements  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0808 | 1 | B | CR on interruption requirements for FR2 inter-band CA                                 | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0809 |   | B | CR on scaling factor CSSFoutside_gap for FR2 inter-band CA                            | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0810 | 1 | B | CR on scheduling availability requirements for FR2 inter-band CA                      | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0813 |   | A | CR 38.133 (8.10.5) Corrections to RRC-based TCI state change                          | 16.4.0 |
| 2020-06 | RAN#88 | RP-200966 | 0814 |   | F | CR 38.133 (8.3.4-5) Corrections to Direct SCell activation                            | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0816 |   | A | CR 38.133 (8.3.2) Corrections to SCell Activation delay requirements                  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200966 | 0817 | 1 | F | CR 38.133 (8.3.4-5) Addition of interruption windows for Direct SCell Activation      | 16.4.0 |
| 2020-06 | RAN#88 | RP-200978 | 0818 | 1 | B | CR to 38.133 for Introduction of band n259  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0819 | 1 | B | CR on SCell activation requirements for FR2 inter-band CA                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0821 |   | A | CR on FR2 measurement requirements outside gaps R16                                   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0823 |   | A | CR on inter-RAT RSTD requirements for NE-DC in 38.133 R16                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0825 |   | A | CR on SCell activation requirements R16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0827 |   | A | CR on SSB based L1-RSRP measurement R16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0829 |   | A | CR on L1-RSRP delay tests for FR2 R16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0831 |   | A | CR to L1-RSRP accuracy TC for FR2 EN-DC R16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0833 |   | A | CR to L1-RSRP accuracy TC for FR2 SA R16  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0835 |   | A | CR to TCI state switch TC R16   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200970 | 0836 |   | F | CR on CLI measurement requirements  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200970 | 0837 | 1 | F | CR on CLI measurement performance requirements  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200970 | 0838 |   | B | CR on test cases for SRS-RSRP measurement accuracy in FR1                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200970 | 0839 | 1 | B | CR on test cases for SRS-RSRP measurement accuracy in FR2                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200970 | 0840 |   | B | CR on test cases for CLI-RSSI measurement accuracy in FR1                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200970 | 0841 | 1 | B | CR on test cases for CLI-RSSI measurement accuracy in FR2                             | 16.4.0 |
| 2020-06 | RAN#88 | RP-200966 | 0843 |   | B | CR on interruption requirements for direct SCell activation for 38.133                | 16.4.0 |
| 2020-06 | RAN#88 | RP-200966 | 0844 | 1 | B | CR on delay requirements for SCell dormancy   | 16.4.0 |
| 2020-06 | RAN#88 | RP-200966 | 0845 | 1 | B | CR on interruption requirements for SCell dormancy                                    | 16.4.0 |
| 2020-06 | RAN#88 | RP-201044 | 0847 | 1 | B | CR for gNB Rx-Tx time difference and UL-RTOA report mapping                           | 16.4.0 |
| 2020-06 | RAN#88 | RP-201044 | 0849 | 1 | B | CR for AoA/ZoA report mapping   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201048 | 0854 | 2 | B | Measurement requirements for UEs under power saving mode                              | 16.4.0 |
| 2020-06 | RAN#88 | RP-201044 | 0857 | 1 | B | NR E-CID reporting criteria requirements  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201044 | 0858 | 1 | B | NR E-CID measurement requirements   | 16.4.0 |
| 2020-06 | RAN#88 | RP-201044 | 0862 | 1 | B | Positioning measurement accuracy requirements structure in section 10                 | 16.4.0 |
| 2020-06 | RAN#88 | RP-201044 | 0863 | 2 | B | Reporting criteria for NR RSTD  | 16.4.0 |
| 2020-06 | RAN#88 | RP-200987 | 0867 |   | A | Clarification on RLM  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0869 |   | B | BWP switching interruption requirement due to consistent UL failure in 38.133         | 16.4.0 |
| 2020-06 | RAN#88 | RP-200969 | 0871 | 1 | B | Applicability of 2-step RA and 4-step RA in RRM requirements in 38.133                | 16.4.0 |
| 2020-06 | RAN#88 | RP-200975 | 0874 | 1 | B | CR to TS 38.133: NR HST beam management requirements                                  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0875 | 1 | B | CR on 38133 interruption requirements for BWP switching on multiple CCs               | 16.4.0 |
| 2020-06 | RAN#88 | RP-200966 | 0879 | 1 | B | Big CR Introduction of UE requirement for MR-DC early measurement reporting in 38.133 | 16.4.0 |
| 2020-06 | RAN#88 | RP-201042 | 0885 |   | B | RRC release with redirection requirements in NR-U in 38.133                           | 16.4.0 |
| 2020-06 | RAN#88 | RP-200988 | 0886 | 1 | A | Rapporteur CR for TS38.133  | 16.4.0 |
| 2020-06 | RAN#88 | RP-201047 | 0887 |   | B | CR: mandatory gap pattern   | 16.4.0 |
| 2020-09 | RAN#88 | RP-201512 | 0889 |   | A | CR to Redirection from NR in FR1 to E-UTRAN   | 16.5.0 |

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| 2020-09 | RAN#88 | RP-201512 | 0891 |   | A | CR to timing advance adjustment accuracy in FR1   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0895 |   | A | CR to SS-RSRQ Intra-Frequency and Inter-frequency FR1 measurement accuracy  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0897 |   | A | Update to FR2 240kHz SSB Configurations   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0899 |   | A | Update of FR2 Random Access Test cases  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0901 |   | A | Update to FR2 event-triggered reporting RRM Test cases in A.5.6 and A.7.6   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0903 |   | A | Update to FR2 SS-RSRP RRM Test cases in A.5.7 and A.7.7   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0905 |   | A | CR to EN-DC timing advance adjustment accuracy in FR2   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0907 |   | A | CR to configuration of CSI-RS for tracking  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0909 |   | A | Update of RRC-based Active BWP Switch test cases  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0911 |   | A | Update to FR2 Annex B RRM side conditions   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0913 |   | A | Add UE Beam assumption for RRM Test cases in A.5.5  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201496 | 0914 | 1 | B | Introduction of the P-MPR 2 bits report mapping in 38.133   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0922 |   | A | Add UE Beam assumption for RRM Test cases in A.7.5 Rel-16   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201489 | 0924 | 1 | F | Maintenance CR for 2-step RA  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 0925 | 2 | B | CR to TS 38.133: PRS RSTD requirements  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 0928 | 1 | F | CR on capabilities for support of event triggering and reporting criteria   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0931 |   | F | CR for TS38.133 Rel-16, Corrcction for SCell activation delay requirement   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0933 |   | A | CR for TS38.133 Rel-16, Correction for RRM core requirements  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0935 |   | A | CR for TS38.133 Rel-16, Correction for test cases of BWP switching  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 0937 | 1 | B | CR on CSI-RS based intra-frequency measurement requirement (Introduction, requirement applicability and number of cell and beams) | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 0939 | 1 | B | CR on uplink spatial relation switch delay (section 8.12)   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 0940 | 1 | B | Introduction of SCell activation/deactivation delay requirements for SCells operating with CCA                                    | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 0941 | 2 | B | Revision of CSSF within gap to include NR positioning measurements with gap sharing   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 0942 | 3 | B | Introduction of new MG patterns for NR positioning  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 0943 | 2 | B | Introduction of UE Rx-Tx time difference measurement requirements for NR positioning  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0946 |   | A | CR on TS38.133 for handover test cases  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0948 |   | A | CR on TS38.133 for introducing the PDSCH RMC configuration in cell re-selection test cases  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201493 | 0950 | 2 | F | CR on TS38.133 for dual active protocol stack handover (Section 6.1.3)  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201507 | 0952 |   | F | CR on TS38.133 for intra-frequency measurement definition (Section 9.2.1)   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0956 |   | A | CR on FR2 measurement capability for R16  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 0957 |   | B | CR on UE measurement capability of NR-U for R16   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201507 | 0958 | 1 | B | CR on RRM requirement based on dual DRX for FR1+FR2 CA  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 0959 |   | F | Update NR Frequency Band Groups to include Band n30   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 0960 |   | F | Update NR Frequency Band Groups to include Band n14   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 0961 |   | F | CR for Table number mismatch for CLI performance tests  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0963 |   | A | CR on Inter-RAT RSTD measurements (section 9.4.4)   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0965 |   | A | CR on active BWP switch in R16  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 0968 | 1 | F | CR on multiple SCells activation (section 8.3.7)  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201496 | 0969 | 1 | F | CR on MRTD and MTTD for FR2 inter-band CA   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 0970 | 1 | B | CR on MRTD for FR2 inter-band CA  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 0971 | 1 | B | 38.133 CR on UE measurement capability on the number of frequency layers to be monitored for CSI-RS measurement                   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201497 | 0972 |   | F | 38.133 CR on cell re-selection requirements for Rel-16 NR HST   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201492 | 0973 | 1 | F | CR of missed requirements based on the agreed CRs in RAN4#95-e  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201492 | 0974 | 1 | F | CR of interruption requirements   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 0976 | 1 | F | CR on definition of inter-frequency measurements without measurement gap (9.3.1)  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 0984 |   | F | CR on BWP switch on multiple CCs  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0986 |   | A | CR for SCell activation delay in FR2 in R16   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 0988 |   | A | CR on TCI state switch delay in R16   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 0991 | 1 | B | CR for timing requirement for NR-U  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201488 | 0992 | 1 | B | CR for introduction of pathloss reference signal switching delay  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201488 | 0993 | 1 | F | CR for L1-SINR requirement  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 0996 | 2 | B | CR on introduction, applicability and capability for CSI-RS inter-frequency measurement requirements                              | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 0999 | 1 | B | Impact of CGI reading on L1 and L3 measurement  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 1003 | 1 | B | 38.133 CR on introduction of CSI-RS based measurement   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201488 | 1006 |   | F | Correction of L1-SINR reporting requirements  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1007 | 2 | B | CR: Beam management requirements with CCA   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201507 | 1008 |   | F | [CR] Corrections to DAPS Handover   | 16.5.0 |

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| 2020-09 | RAN#88 | RP-201500 | 1010 | 2 | F | CR for FR2 inter-band CA requirements  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1011 | 1 | D | CR to TS 38.133 - Handover requirements in NR-U  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1012 | 2 | B | CR to TS 38.133 to address NR-U inter-frequency measurements   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1015 | 1 | F | CR 38.133 (8.3.2-3) Corrections to SCell activation delay requirements                               | 16.5.0 |
| 2020-09 | RAN#88 | RP-201494 | 1016 | 1 | B | CR 38.133 (8.3.9-8.3.11) Direct SCell activation delay for multiple downlink SCells                  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201494 | 1017 | 2 | F | CR 38.133 SCell dormancy switching of multiple SCells  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201494 | 1018 |   | B | CR on delay requirements for SCell dormancy  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 1020 | 1 | B | CR on inter-frequency CSI-RS L3 measurement requirements   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1023 |   | A | Clarification of SNR values in RLM Test cases  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1025 |   | A | CR to TS 38.133: Corrections to CSI-RS configurations in A.3.14 (Rel-16)                             | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1027 |   | A | CR to TS 38.133: Corrections to event triggered test cases (Rel-16)                                  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1029 |   | A | CR to TS 38.133: Corrections to inter-RAT test cases (Rel-16)  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1031 |   | A | CR to TS 38.133: Corrections to AoA setup information in some test cases (Rel-16)                    | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1033 |   | A | CR on maintaining handover tests in Rel-16   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 1039 | 1 | F | CR on maintaining measurement restriction requirements for NR CA                                     | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 1041 | 3 | F | CR on BWP switching delay on multiple CCs  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1042 | 2 | F | CR on active TCI state switching for NR-U  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1043 | 2 | B | CR on introduction of intra-frequency measurements requirements for NR-U                             | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1044 | 1 | B | CR on introduction of Active BWP switching delay requirements for NR-U                               | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1045 | 1 | B | CR on introduction of RRC_IDLE state mobility requirements for NR-U                                  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1046 | 1 | B | Discussion on RRC re-establishment for NR-U  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1048 |   | A | CR on reporting criteria for EN-DC in 38.133 R15   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1050 |   | A | CR on test cases for Active TCI state switch delay R15   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1052 |   | A | Addition of new default configurations for RMC scheduling_r16  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1054 |   | A | Correction to beam failure detection and link recovery test cases_r16                                | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1056 |   | A | Correction to BWP switching delay test cases_r16   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1058 |   | A | Correction to FR1 intra-frequency measurement with gap test cases_r16                                | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1060 |   | A | Correction to inter-RAT HO test cases_r16  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 1064 | 2 | B | CR on CSI-RS based intra-frequency measurement requirements  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 1066 | 1 | F | Correction on the interruption requirements due to SRS carrier switching                             | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 1067 | 1 | F | CSSF for inter-frequency measurement without gap in FR2 inter-band CA scenario                       | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1070 |   | A | CR on correction to CSSF within gap R16  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1072 |   | A | CR on SCell activation requirements R16  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1075 |   | A | CR on UL BWP configuration for RRM test cases R16  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1077 |   | A | CR to add UE beam assumption for TC in A.5.6 R16   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1078 |   | F | CR on reporting criteria for CLI   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201494 | 1080 | 1 | B | CR on direct SCell activation  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201494 | 1081 | 2 | F | CR on requirements for SCell dormancy  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 1082 | 1 | B | CR for general applicability of PRS measurement requirements   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 1083 | 2 | B | CR for measurement requirements for PRS-RSRP   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 1085 | 2 | B | CR to add CSI-RS related reporting criteria for ECID   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201490 | 1088 | 2 | F | Correction CR to Rel-16 UE power saving requirements   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1090 |   | F | Correction to RACH delay in RRC release requirements in NR-U in 38.133                               | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1097 |   | A | CR to 38.133 correction to RRC based BWP switch delay requirements                                   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1099 |   | A | CR to 38.133 correction to interruption requirements for per-FR gap in FR2                           | 16.5.0 |
| 2020-09 | RAN#88 | RP-201500 | 1100 |   | B | CR to 38.133 on CGI reading of NR cell   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201497 | 1101 |   | F | CR to TS 38.133: Corrections to Table 9.4.3.3-2 in subclause 9.4.3.3 (Requirements when DRX is used) | 16.5.0 |
| 2020-09 | RAN#88 | RP-201506 | 1102 | 2 | B | Introduction of RLM requirements for NR-U  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 1103 | 2 | B | Measurement report mapping and additional path reporting for UE Rx-Tx                                | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 1104 | 2 | B | Measurement report mapping and additional path reporting for RSTD                                    | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 1106 | 1 | F | Reporting criteria for NR positioning measurements   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201491 | 1107 |   | F | General introduction of NR positioning measurements  | 16.5.0 |
| 2020-09 | RAN#88 | RP-201498 | 1108 | 1 | B | CR on scheduling restriction for CSI-RS based intra-frequency measurement                            | 16.5.0 |

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| 2020-09 | RAN#88 | RP-201507 | 1111 |   | F | [CR] Replacing x in references with correct numbers (Core R16 Cat F)   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1113 |   | A | [CR] Replacing x in references with correct numbers (Core R16 Cat A)   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1114 |   | A | [CR] Replacing x in references with correct numbers (Perf R16 Cat A)   | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1116 |   | A | Fine/rough beam assumption for idle mode and measurement procedure test case                                       | 16.5.0 |
| 2020-09 | RAN#88 | RP-201512 | 1117 |   | A | CR on BWP switching delay requirements R16   | 16.5.0 |
| 2020-12 | RAN#90 | RP-202433 | 1108 | 4 | B | CR on scheduling restriction for CSI-RS based intra-frequency measurement  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1119 |   | A | RB allocation and Noc level in RLM Test cases  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1121 |   | A | Update FR2 event-triggered reporting Test cases in A.5.6, A.7.6  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1123 |   | A | 240kHz SSB SCS Configuration for FR2 SS-RSRP Test cases  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1125 |   | A | Correct UE beam assumption for Test Cases in A.5.6   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1127 |   | A | Aggregation level of CORESET for RMC scheduling  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1129 |   | A | Claify FR1 NSA SS-SINR measurement TCs   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1131 |   | A | FR1 Inter-frequency Event triggered Reporting tests in DRX   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1133 |   | A | E-UTRAN  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202419 | 1138 |   | F | CR for DAPS HO test applicability  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1139 |   | F | Maintenance CR on SA inter-frequency event triggered reporting tests for FR1                                       | 16.6.0 |
| 2020-12 | RAN#90 | RP-202433 | 1140 | 1 | F | CR on CSSF with both CSI-RS and SSB  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1146 |   | A | CR on CSI-RS BW condition for BFD/CBD R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1148 |   | A | CR on AP-CSI-RS based L1-RSRP measurement R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202427 | 1152 | 1 | F | CR of NR V2X operating band group  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202436 | 1155 | 1 | F | CR on TS38.133 for dual active protocol stack handover   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202430 | 1156 | 2 | F | CR on TS38.133 interruption time for CA with non-aligned frame boundaries  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1158 |   | F | CR on TS38.133 for inter-frequency measurement requirement without gap   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1160 |   | A | CR on TS38.133 for cell activation and deactivation test case  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1162 |   | A | CR on TS38.133 for cell reselection test case  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1164 |   | A | CR on TS38.133 for active BWP switch test cases  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1165 |   | F | CR on TS38.133 for E-UTRAN   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202509 | 1166 |   | F | CR on TS38.133 for SCell activation and deactivation delay test cases  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1168 |   | A | CR for TS38.133 Rel-16, Correction for RRM core and test cases   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202433 | 1171 | 1 | F | CR on abbreviations about CSI-RS based measurement in 38.133.  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202442 | 1184 |   | F | CR to TS 38.133: Add information on the inter-band EN-DC and UL CA configurations with no DL interruption          | 16.6.0 |
| 2020-12 | RAN#90 | RP-202433 | 1186 | 1 | F | CR on R16 CSI-RS based L3 measurements   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202419 | 1187 | 2 | B | Intra-band Inter-frequency sync DAPS handover test in SA for FR1   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202427 | 1191 | 1 | F | CR: Interruption requirement for NR V2X synchronization source chang   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202432 | 1193 |   | F | Fine/rough beam assumption for CLI performance test cases  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202435 | 1194 | 1 | F | 38.133 CR on CSSFintra for measurement period for intra-frequency measurements in connected mode for Rel-16 NR HST | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1196 |   | A | CR on carrier frequency range of PCell/PSCell for the maximum number of RLM-RS resources                           | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1209 |   | A | Correction on beamFailureInstanceMaxCount for test cases of availability restriction during FR2 BFR in R16         | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1212 | 1 | F | Correction on unknown SCell activation in FR2.   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202415 | 1213 | 1 | B | Big CR on 2-step RA type RRM performance requirements  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202431 | 1214 | 1 | F | CR Maintenance 2-step RACH RRM requirements  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1216 |   | A | Correction of RRM tests  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202435 | 1217 | 1 | F | CR on IDLE state cell re-selection requirements for HST in 38.133  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1225 |   | A | Correction to types of requirements in annex A   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1227 |   | A | Corrections to frequency range in interfrequency measurement procedures tests                                      | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1230 |   | A | Correction on TBD values in FR1+FR2 interfrequency RSRP accuracy tests   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1232 |   | A | Addition of symbol definitions   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1236 |   | A | Square bracket removal in 38.133 section A.1 to A.5  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1238 |   | A | Square bracket removal in 38.133 section A.6 to A.8  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202419 | 1240 | 1 | B | Conditional handover test cases for NR   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1241 |   | B | Updates to general section for NR-U in 38.133  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1250 |   | A | CR on MO merge   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1252 | 1 | F | CR to TS 38.133 on DCI based BWP switch requirements for cross carrier scheduling                                  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202441 | 1254 | 1 | B | CR on PRS-RSRP report mapping  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1259 |   | A | Correction to CSI-RS RMC configuration R16   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1261 |   | A | Correction to cell reselection test cases R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1263 |   | A | Correction to inter-RAT handover test cases R16  | 16.6.0 |



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| 2020-12 | RAN#90 | RP-202487 | 1265 |   | A | Correction to NR measurement under LTE SA test cases R16   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1267 |   | A | Correction to inter-RAT SFTD measurement test cases R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1271 |   | A | CR on maintaining BFD/CBD measurements test cases in TS38.133 R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1273 |   | F | CR on maintaining L1-RSRP measurements test cases R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202446 | 1275 | 1 | F | Correction CR to Rel-16 UE power saving requirements   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202442 | 1276 |   | F | Correction on DL interruption on Tx Switching between two uplink carriers  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202433 | 1277 | 1 | F | CR on CSI-RS based intra-frequency measurement requirements  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1281 |   | F | Correction on RRC based spatial relation switch delay  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1282 |   | F | Correction on SA inter-RAT measurement FR1 test case   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1283 | 1 | F | CR on BWP switching delay on multiple CCs  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1284 | 1 | F | CR on interruption due to active BWP switching on multiple CCs   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1288 | 1 | F | CR on TCI state switching requirements for NR-U  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1291 |   | F | CR on intra-frequency measurement requirements for NR-U  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1296 |   | A | CR on RRC-based BWP switch requirements_R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1298 |   | A | CR on RRC-based active TCI state switch test case Rel-16   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202425 | 1299 |   | F | Update NR Frequency Band Groups to include Band n48  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202439 | 1300 |   | F | Update NR Frequency Band Groups to include Band n65  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202446 | 1305 |   | F | CR to 38.133: Correction to relaxed measurement requirements   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1306 | 1 | F | CR to 38.133: Correction to relaxed measurement requirements   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1307 | 1 | F | CR to 38.133: Correction to SRS carrier based switching requirements   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1308 | 1 | F | CR to 38.133: Correction to mandatory gap pattern  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202509 | 1309 |   | F | [CR] NR Perf Maintenance R16 Cat F   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1311 |   | A | [CR] Specify RRC processing delay in TCI state switching delay (Cat A)   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1317 |   | A | CR on SCell activation requirements R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1319 |   | A | CR on FR2 unknown SCell activation test cases R16  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1321 |   | A | CR on BWP in L1-RSRP delay and accuracy test cases R16   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202430 | 1322 | 1 | F | CR on BWP switching and SCell dormancy   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202441 | 1324 | 1 | F | CR to update PRS-RSRP measurement requirements   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1328 | 1 | F | CR on CGI reading requirements 38.133  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202509 | 1330 |   | F | [CR] Specify RRC processing delay in TCI state switching delay for R16 NR-U  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202442 | 1331 |   | F | Correction of CR0972 implementation  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1333 |   | F | CR: Correction of CFRA test in FR2 SA  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202434 | 1334 | 1 | F | CR: Clarification of L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured                          | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1336 |   | A | Introducing reference to the source of the Lmax and NRLM.  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202430 | 1338 | 2 | F | CR on UE requirement for MR-DC early measurement reporting in 38.133   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1340 |   | F | CR on measurement restrictions for FR2 inter-band CA   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1342 |   | A | CR to TS 38.133: Corrections to inter-RAT FR1 test cases (Rel-16)  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1344 |   | A | CR to TS 38.133: Corrections to inter-RAT FR2 test cases (Rel-16)  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202436 | 1346 |   | F | CR 38.133 Corrections to Conditional PSCell Change delay requirement   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1347 |   | F | CR 38.133 Removal of brackets for Multiple SCell activation  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202430 | 1348 | 1 | F | CR 38.133 Removal of brackets for SCell Dormancy and Direct SCell Activation                                       | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1350 |   | A | CR 38.133 Correction to test case for TCI state switching (Rel-16)   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202418 | 1358 | 1 | F | gNB timing positioning measurement report mapping update for k   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202446 | 1360 | 1 | F | Corrections to UE power saving requirements  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1364 |   | A | Removal of annex B.2.6 on one shot timing adjustment in 38.133   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1366 |   | F | Correction to NR FR1 DL active BWP switch of Cell with non-DRX in SA (A.6.5.6.2.1)                                 | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1367 | 1 | F | Correction to RRC based non-simultaneous multiple CC BWP   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1369 |   | F | Requirements for known cell in RRC re-establishment with CCA   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202435 | 1370 |   | F | CR to TS 38.133: Corrections to Tables 9.5.4.1-1 and 9.5.4.2-1.  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202486 | 1372 | 1 | A | CR to 38.133 on Active BWP switch and Active TCI State Switching requirements - Rel16                              | 16.6.0 |
| 2020-12 | RAN#90 | RP-202441 | 1375 | 2 | F | UE positioning measurements: RSTD  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1384 | 1 | F | Terminology updates for NR-U   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1387 |   | F | Clause numbering correction  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1390 | 1 | F | Measurement requirements for NR-U  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202444 | 1391 |   | F | Correction in NR SRS carrier-based switching requirements  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202419 | 1393 | 1 | B | Introduction of intra-frequency sync and async DAPS HO test cases in FR1   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202430 | 1400 | 1 | F | CR to Multi-SCell activation for FR1 intra-band contiguous CA  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202430 | 1401 |   | F | CR to Starting point of an Interruption window at Direct SCell activation  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202414 | 1403 | 1 | F | Interruption windows and applicability of SCell activation/deactivation requirements for SCells operating with CCA | 16.6.0 |
| 2020-12 | RAN#90 | RP-202419 | 1406 |   | B | CR on inter-band DAPS handover tests   | 16.6.0 |

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| 2020-12 | RAN#90 | RP-202414 | 1407 |   | F | Correction to timing requirements in NR-U   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202417 | 1409 |   | B | Big CR: Introduction of Rel-16 NR UE Power Saving RRM Performance requirements (TS 38.133)  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202421 | 1410 |   | B | Big CR: Introduction of Rel-16 NR FR1 RF Wl RRM performance requirements  | 16.6.0 |
| 2020-12 | RAN#90 | RP-202422 | 1411 |   | B | Big CR: NR HST RRM performance requirements   | 16.6.0 |
| 2020-12 | RAN#90 | RP-202487 | 1413 |   | A | [CR] NR Perf Maintenance R16 Cat A  | 16.6.0 |
| 2021-03 | RAN#91 | RP-210116 | 1417 |   | A | [CR] RRM test case maintenance R16 Cat A  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1423 |   | A | Update FR2 Reference channels and OCNG for FR2 RRM Test cases   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1426 |   | F | CR to FR1 SA SS-SINR measurement TCs  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1429 |   | A | CR on E-UTRA carrier for EN-DC event triggered reporting tests  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1432 |   | A | Add missing FR2 Test case setups and Beam assumptions   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1436 |   | F | [CR] Core maintenance for 38.133  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1445 |   | F | CR on maintenance for inter-band FR2 CA RRM R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1447 | 1 | F | CR on UE behavior for UE specific CBW change R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1449 | 1 | B | CR on IDLE/INACTIVE RRM requirement with SMTC2-LP R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210070 | 1455 | 1 | F | CR to 38.133 on Link Recovery requirements (R16)  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210070 | 1457 | 1 | F | CR to 38.133 on Pathloss activation delay requirements (R16)  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1464 | 1 | F | Interruption requirements maintenance in NR-DC (R16)  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210077 | 1466 | 1 | F | CR on HST core part maintenance   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210076 | 1470 | 1 | F | CR on CSI-RS based L3 measurement   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210081 | 1477 | 1 | F | CR on PRS RSTD measurement requirements   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1495 |   | A | Correction to cell reselection test case  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210066 | 1497 | 1 | F | Correction to cell reselection test case for UE Power saving  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210073 | 1501 |   | F | 2-step RACH RRM performance requirements corrections  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1504 |   | F | Update of DRX configuration in FR1 Event-triggered Test cases   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210072 | 1506 | 1 | B | Big CR-Introduction of NR V2X RRM performance requirements (Rel-16)   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210070 | 1510 |   | F | Correction on the measurement restriction for CSI-IM resource in R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1513 |   | A | Correction on PRACH configuration for FR2 Non-Contention based Random Access in R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1516 |   | A | Correction on PRACH configuration for Beam Failure Detection and Link Recovery Test in R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1519 |   | A | Correction on PRACH RMC for FR1 CSI-RS based Non-Contention based Random Access for BFR in R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1521 | 1 | F | Correction on scheduling availability and measurement restriction on FR2 inter-band CA in R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210077 | 1526 | 1 | F | CR on HST RRM requirements in connected mode  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210070 | 1533 | 1 | F | CR to TS38.133 on L1-SINR measurement requirement   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210064 | 1535 |   | B | Big CR: Introduction of Rel-16 NR eMIMO RRM performance requirements and test cases   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210117 | 1538 |   | A | CR on Scell activation delay maintenance (R16)  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1546 |   | A | CR for test requirements correction of SA event triggered reporting tests for FR1 inter-frequency measurements with SSB time index detection when DRX is used | 16.7.0 |
| 2021-03 | RAN#91 | RP-210117 | 1549 |   | A | CR on R15 remaining issues  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210072 | 1551 | 1 | B | CR on V2X interruption  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1555 | 1 | F | CR for measurement period requirements correction   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210122 | 1559 | 1 | F | Update on interruption test cases for Tx switching R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210076 | 1561 | 1 | F | Maintenance CR for CSI-RS based L3 measurement requirements R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1564 |   | A | Correction on the power of the first preamble for random access in EN-DC and SA in R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1567 |   | A | Correction on the time for Scell activation and CSI-report in R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1570 |   | A | Correction on the Noc level in TS38.133 in R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210079 | 1577 | 1 | F | CR on TS38.133 for Pcell change   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1585 | 1 | F | CR on TS38.133 for inter-frequency measurement requirement without gap  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210076 | 1596 | 2 | F | 38.133 CR on the CSI-RS based measurement requirements  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210122 | 1599 | 1 | B | Big CR: Introduction of Rel-16 NR RRM enhancements Wl performance requirements and test cases (Rel-16)  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1601 | 1 | B | CR: Introduction of random access requirements with CCA   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1603 | 1 | F | CR: Beam management requirements with CCA   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210117 | 1606 |   | A | CR on the filter for beam failure indications in 38.133   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210081 | 1608 | 1 | F | CR to TS 38.133 on UE Rx-Tx time difference measurements (section 9.9.4)  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1609 | 1 | F | Maintenance CR on interruption at EUTRA SRS carrier switching in 38.133   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1610 | 1 | F | Maintenance CR on SCell activation delay requirement in TS38.133  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1615 |   | A | Correction to Aperiodic CSI-RS configurations R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1618 |   | A | Correction to radio link monitoring test cases R16  | 16.7.0 |

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| 2021-03 | RAN#91 | RP-210116 | 1621 |   | A | Correction to beam failure recovery test cases R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1624 |   | A | Correction to L1-RSRP reporting delay test cases R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1630 |   | F | CR on measurement requirements for NR-U   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210122 | 1635 |   | A | CR on maintaining Antenna configurations in TS38.133 R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210122 | 1638 |   | A | CR on test requirements for measurement performance tests R16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210070 | 1642 | 1 | F | CR on maintaining L1-SINR measurement requirements Rel-16   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1647 |   | F | Correction on interruptions of SRS carrier switching  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1651 | 1 | F | UL spatial relation switching to an unknown DL RS   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1654 |   | A | Correction on test cases of inter-frequency Measurements R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210122 | 1659 | 1 | F | Correction on test cases of DL interruptions at switching between two uplink carriers   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210081 | 1669 | 2 | F | CR to 38.133 correction on CCSF for NR measurements for positioning   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210072 | 1671 |   | F | CR to 38.133 correction on reselection of V2X synchronization reference source requirements                                       | 16.7.0 |
| 2021-03 | RAN#91 | RP-210085 | 1673 | 1 | F | Correction on inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210066 | 1674 | 1 | F | Test case for cell reselection to FR2 intra-frequency NR case for UE configured with relaxed measurement                          | 16.7.0 |
| 2021-03 | RAN#91 | RP-210076 | 1678 |   | F | Correction on CSSFoutsidgap   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210077 | 1682 |   | F | Correction on inter-RAT measurement in high speed scenario  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1692 |   | F | Maintenance CR for NR-U core requirements   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1696 |   | F | Correction of band group notation for FR2   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210087 | 1698 |   | F | Correction to Idle Mode CA/DC Measurements for Inactive mode  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210087 | 1700 |   | F | CR clarifying the UE measurement requirements for an SCell with dormant BWP   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210087 | 1702 |   | F | Correction to simultaneous DCI based BWP switch delay on multiple CCs   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1713 |   | A | CR to TS 38.133: Redundant and incorrect TCI state in tests with TRS (Rel-16)   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1716 |   | A | CR to TS 38.133: Corrections to TC A.4.5.7.1 (Rel-16)   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1720 | 1 | F | CR 38.133 (8.6.2A) Clarification on DCI-triggered BWP switch on multiple CCs  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1722 | 1 | F | Updates in RLM requirements for NR-U  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1726 | 1 | F | Terminology updates for NR-U in 38.133  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210081 | 1732 | 2 | F | PRS-RSRP measurement requirements   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1738 |   | F | Applicability of RA with CCA on RRM requirements in NR-U in 38.133  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1743 |   | F | CR on Active TCI state switching for NR-U   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1745 |   | F | CR on maintenance on BWP switch requirements on multiple CCs  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1750 |   | A | CR on test cases for inter-RAT measurement r16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210117 | 1753 |   | A | CR on SCell activation delay, cell identification requirements on deactivated SCell and inter-RAT ECID requirements for NE-DC R16 | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1756 |   | A | CR on SCell activation TCs R16  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210087 | 1758 |   | F | CR on EMR requirement maintenance in 38.133   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210087 | 1760 | 1 | F | CR on SCell dormancy switching  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1770 | 1 | F | CR on multiple SCell activation requirements  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210071 | 1772 | 1 | F | CR on CGI reading requirements 38.133   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1780 |   | A | Cat-A CR to addition of TRS Configurations in Rel-16 Test Cases   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210091 | 1787 | 1 | F | Cat-F CR to addition of TRS Configurations in Rel-16 Test Case  | 16.7.0 |
| 2021-03 | RAN#91 | RP-210116 | 1789 |   | A | CR on correcting SSB and RACH configuration in CSI-RS based beam failure detection and link recovery tests                        | 16.7.0 |
| 2021-03 | RAN#91 | RP-210084 | 1791 | 1 | F | CR on Interruptions during SCell activation in NR-U   | 16.7.0 |
| 2021-03 | RAN#91 | RP-210076 | 1795 |   | F | CR on core requirement for CSI-RS L3 measurement  | 16.7.0 |
| 2021-06 | RAN#92 | RP-211083 | 1808 |   | F | CR to A.3.14 CSI-RS configurations for nzp-CSI-RS-ResourceId values   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211083 | 1811 |   | A | CR to Interruptions during measurements on deactivated NR SCC   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211083 | 1814 |   | A | CR to CSI-RS based L1-RSRP measurement on resource set with repetition off TCs  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211084 | 1817 |   | A | CR to the notation of SMTC in the general test parameters of Re-establishment TCs   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211084 | 1820 |   | A | CR to BWP configuration for interruption test case.   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211080 | 1826 | 1 | F | Update of DRX configuration in Event-triggered Test cases   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211084 | 1832 |   | A | Update RRM Test cases where 66RBs gives insufficient dB range   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211084 | 1835 |   | A | Update Reference channels and OCNG for FR2 240kHz SSB SCS RRM Test cases  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211084 | 1838 |   | A | Cat-A CR to Cell Reselection Tests with Async Cells in Rel-16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211081 | 1840 | 1 | F | Cat-F CR to Cell Reselection Tests with Async Cells in Rel-16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211085 | 1843 |   | A | Cat-A CR to FR2 CORESET and Search Space RMC in Rel-16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211085 | 1846 |   | A | Cat-A CR to PDSCH RMC in Rel-16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211085 | 1849 |   | A | Cat-A CR to TRS Configuration in Rel-16 Test Case   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211081 | 1851 | 1 | F | FR1 Single SCell activation requirement with TCI activation [FR1_SCell_TCI_Act]   | 16.8.0 |

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| 2021-06 | RAN#92 | RP-211085 | 1856 |   | A | Maintenance CR for test cases - R16 Cat A  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211102 | 1858 | 1 | F | Correction to cell reselection test case for HST   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211104 | 1860 |   | F | Correction to cell reselection test case for UE Power saving   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211085 | 1863 |   | A | CR on BFD and link recovery test cases   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 1865 | 1 | F | CR on CSI-RS intra-frequency requirement and scheduling restriction  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 1866 | 1 | F | CR on CSI-RS based measurement requirements  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 1869 |   | B | Big CR: Introduction of Rel-16 CSI-RS based L3 measurement RRM performance requirements  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211103 | 1870 |   | F | CR on PRS RSTD measurement requirements  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 1875 |   | F | CR for clarification on frequency layer merging R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211103 | 1877 | 1 | F | CR on legacy Rel-16 HST NR UE measurement requirements (R16)   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1879 | 1 | F | CR on RRC based BWP switching on multiple CCs of EN-DC for FR1 (R16)   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211104 | 1881 |   | F | Correction on the power of the first preamble for 2-step RACH  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211086 | 1886 |   | A | Maintenance on CSSF for EN-DC and deactivated SCell measurement R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 1888 | 1 | F | CR on reference cell availability for NR-U R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 1890 |   | F | CR on SCell activation requirement for NR-U R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1892 | 1 | F | CR on interruption for SCell addition/release R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211104 | 1901 |   | F | CR to 38.133 on Link recovery requirements - R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1905 | 1 | F | CR to 38.133 on Uplink Spatial relation switch for PUCCH - R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1906 | 2 | F | CR to introduce testcase for RRC based BWP switch on multiple CCs- SA in FR2 -R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 1909 |   | F | Terminology update for NR-U  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211102 | 1913 | 1 | F | CR on CSSFintra for HST measurement requirements   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 1920 |   | F | CR: RRM congestion control test cases for NR V2X   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1921 | 1 | F | CR: CGI reading test   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1922 | 1 | F | CR: UL spatial relation test   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1923 | 1 | F | CR for test cases for simultaneous DCI and Timer based BWP switch on multiple CCs for NR SA  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211081 | 1929 | 1 | A | Correction on the SS-RSRP difference value for SS-RSRP measurement TC in R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211081 | 1932 | 1 | A | Correction on the CSI-reporting period for SCell activation delay in R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211086 | 1939 |   | A | CR on scheduling restriction of UE during intra-frequency measurements on FR2 in R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 1941 | 1 | F | CR on TS38.133 for direct SCell activation   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1943 | 1 | D | CR on TS38.133 for typo modifications on intra frequency and inter frequency measurement requirement   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1945 | 1 | F | CR to 38.133 correction on SRS carrier based switching core requirements   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1947 | 1 | F | CR to 38.133 correction on SRS carrier based switching test cases  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211103 | 1953 | 1 | F | CR to 38.133 correction on CCSF for NR measurements for positioning  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211096 | 1955 |   | F | CR to 38.133 Introduction of Gain to PRS-RSRP measurement point for FR2 in Annex B   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 1958 | 1 | F | CR on TS38.133 inter-frequency without gap -r16<br>NOTE Part of the CR is not implemented because changes to clause 9.1.5.1 have no track marks. | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 1959 | 1 | F | CR to 38.133 Correction on core requirements for CSI-RS based measurement  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211105 | 1969 |   | F | CR to 38.133 Correction on the requirement of FR2 L1-SINR measurement accuracy (Rel-16)  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211102 | 1976 | 1 | F | CR on UE Rx-Tx time difference measurement period  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211087 | 1982 |   | A | CR to TS 38.133: Correction of TDD Configuration for several TCs (Rel-16)  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211087 | 1985 |   | A | CR to TS 38.133: Correction of OCN pattern for several TCs (Rel-16)  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211087 | 1988 |   | A | CR to TS 38.133: Correction of IRAT TCs (Rel-16)   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211087 | 1991 |   | A | CR to TS 38.133: Corrections to SS-RSRP/RSRQ/SINR accuracy TCs (Rel 16)  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211087 | 1994 |   | A | CR to TS 38.133: Several corrections to TCs (Rel 16)   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211087 | 1996 |   | F | CR on maintaining condition requirements in TS38.133 R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211102 | 1998 | 1 | F | CR on maintaining L1-SINR measurement accuracy requirements R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211106 | 2000 |   | F | CR on maintaining L1-SINR measurement accuracy tests R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211106 | 2002 |   | F | CR on maintaining L1-SINR measurement requirements R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2004 | 1 | F | CR on maintaining SCell activation and deactivation delay test for FR2 inter-band CA R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211103 | 2006 | 1 | F | CR on maintaining sync conditions for intra-band DAPS handover R16   | 16.8.0 |

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| 2021-06 | RAN#92 | RP-211106 | 2008 |   | F | CR on maintaining interruptions for intra-band DAPS handover R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2019 |   | F | CR on Active TCI state switching for NR-U R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2021 |   | F | CR on RLM requirements NR-U R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2023 |   | F | CR on beam management requirements for NR-U R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2025 |   | F | CR on measurement requirements for NR-U R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2027 |   | F | CR on CSSF for NR-U R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211098 | 2029 |   | F | CR on maintenance of BWP Switch on multiple CCs 38133 R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211087 | 2032 |   | A | CR on measurement on deactivated SCell and interruption to NR serving cells for measurements on deactivated NR SCell   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 2036 | 1 | F | CR on time validity of the detected associatedSSB  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211107 | 2040 |   | F | Correction on test cases for inter-RAT cell identification in connected mode for HST   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 2044 |   | F | Adding intra-frequency CSI-RS measurement in CSSF  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2046 | 1 | F | Correction on SRS carrier switching  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211109 | 2054 |   | F | Correction of test case of link recovery with link recovery requests   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211088 | 2057 |   | A | Correction to CSI-RS reference configuration_R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211088 | 2061 |   | A | Correction to reference configurations related to DLBWP.0.2_R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211089 | 2064 |   | A | Correction to TRS reference configuration_R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211089 | 2067 |   | A | Correction to FR1 test cases using DLBWP.0.2_R16   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211089 | 2073 |   | A | Correction to interruption during measurement on deactivated SCell test cases_R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211089 | 2075 |   | A | Correction of test parameters for SA inter-frequency event triggered reporting TCs   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211089 | 2077 |   | A | CR on Rel-15 SCell activation, SMTC determination and UL timing 38133 R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 2079 |   | F | CR on EMR requirements correction 38133  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 2081 |   | F | CR on direct SCell activation  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 2083 |   | F | CR on SCell dormancy requirements  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211109 | 2085 |   | F | CR on MG for PRS measurement 38.133 R16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211103 | 2093 | 1 | F | CR on CSSF and measurement capability for PRS measurement 38.133   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2095 | 1 | F | CR on SSB offset in multiple SCell activation  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2097 | 1 | F | CR on SMTC alignment in multiple SCell activation  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211101 | 2099 | 1 | F | CR on CSI-RS measurement window  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 2104 | 1 | F | Big CR 38.133: Introduction of Rel-16 MR-DC Direct SCell activation and SCell dormancy RRM performance requirements<br>NOTE Part of the CR is not implemented because CCR.2.3 TDD" are already exist | 16.8.0 |
| 2021-06 | RAN#92 | RP-211090 | 2110 |   | A | CR on NR-DC PSCell addition and release delay in Rel16 - Cat A   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211090 | 2113 |   | A | Maintenance CR for RRM test cases in Rel16 - Cat A   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2115 | 1 | F | CR on RRC-based BWP switch on multiple CCs in Rel16<br>NOTE The CR is not implemented because the corresponding Cat A CR is not implementable.   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211098 | 2116 |   | A | CR on RRC-based BWP switch on multiple CCs in Rel17 - Cat A<br>NOTE The CR is not implemented because the Cat A CR is not implementable.   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2117 | 1 | F | CR on test case for RRC-based BWP switch on multiple CCs - TC3   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211102 | 2122 | 1 | F | Changes to cell reselection tests under power saving   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 2126 | 1 | F | CR for Direct SCell activation delay   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211103 | 2128 | 1 | F | CR to TS 38.133: Adding conditions for L1-SINR reporting (Annex B.2)   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 2130 | 1 | F | CR Correction of activation delay for Direct activated Scell   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211091 | 2138 |   | A | Correction to AoA setup in FR2   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211081 | 2140 | 1 | F | Correction to AoA setup and beam assumptions in FR2 tests in Rel-16  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211102 | 2142 | 1 | F | Correction to beam assumptions in L1-SINR FR2 tests  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2144 | 1 | F | Correction to beam assumptions in FR2 tests on Rel-16 Mandatory gaps   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211097 | 2146 | 1 | F | Correction to beam assumptions in FR2 tests on UL spatial relation   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211110 | 2148 |   | F | Correction to HO tests in FR2 under mobility enhancements  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211102 | 2152 | 1 | F | PRS-RSRP measurement requirements  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2162 | 1 | F | Interruption during Scell activation requirements for SCells operating with CCA  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2164 | 1 | F | SI reading time in RRC mobility control  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2168 |   | F | Updates in SCell activation in NR-U  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2170 |   | F | NR-U bands   | 16.8.0 |
| 2021-06 | RAN#92 | RP-211095 | 2172 | 1 | F | Big CR: Introduction of Rel-16 NR-U RRM performance  | 16.8.0 |
| 2021-06 | RAN#92 | RP-211119 | 2174 |   | F | CR for core requirement maintenance on direct SCell activation R16   | 16.8.0 |

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| 2021-06 | RAN#92 | RP-211119 | 2176 |   | B | Big CR: Introduction of Rel-16 MR-DC EMR RRM performance requirements (TS 38.133)<br>NOTE Part of the CR is not implemented because new clause have no reference point | 16.8.0  |
| 2021-06 | RAN#92 | RP-211097 | 2178 | 1 | F | CR on introducing RRC based Active BWP Switch on multiple CCs in EN-DC FR2   | 16.8.0  |
| 2021-06 | RAN#92 | RP-211081 | 2180 |   | A | Core requirement maintenance on signal characteristics (R16)   | 16.8.0  |
| 2021-06 | RAN#92 | RP-211102 | 2181 |   | F | Introduce the SCell beam failure recovery without the dedicated PUCCH resource in R16  | 16.8.0  |
| 2021-06 | RAN#92 | RP-211096 | 2183 |   | B | Big CR: Introduction of Rel-16 NR Positioning RRM performance requirements and test cases  | 16.8.0  |
| 2021-09 | RAN#93 | RP-211922 | 2198 |   | F | Big CR to TS 38.133: NR_newRAT-Core maintenance (Rel-16)   | 16.9.0  |
| 2021-09 | RAN#93 | RP-211925 | 2201 |   | F | Big CR to TS 38.133: NR_newRAT-Perf maintenance Part 1 (Rel-16)  | 16.9.0  |
| 2021-09 | RAN#93 | RP-211925 | 2204 |   | F | Big CR to TS 38.133: NR_newRAT-Perf maintenance Part 2 (Rel-16)  | 16.9.0  |
| 2021-09 | RAN#93 | RP-211925 | 2207 |   | F | Big CR to TS 38.133: NR_newRAT-Perf maintenance Part 3 (Rel-16)  | 16.9.0  |
| 2021-09 | RAN#93 | RP-211890 | 2209 |   | F | Big CR to TS 38.133: NR_unlic maintenance Part 1 (Rel-16)  | 16.9.0  |
| 2021-09 | RAN#93 | RP-211890 | 2211 |   | F | Big CR to TS 38.133: NR_unlic maintenance Part 2 (Rel-16)  | 16.9.0  |
| 2021-09 | RAN#93 | RP-211893 | 2213 |   | F | Big CR to TS 38.133: NR_pos maintenance (Rel-16)   | 16.9.0  |
| 2021-09 | RAN#93 | RP-211891 | 2215 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 1 (Rel-16)  | 16.9.0  |
| 2021-09 | RAN#93 | RP-211893 | 2217 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 2 (Rel-16)  | 16.9.0  |
| 2021-12 | RAN#94 | RP-212854 | 2238 |   | A | Big CR to TS 38.133: NR_newRAT-Core maintenance (Rel-16)   | 16.10.0 |
| 2021-12 | RAN#94 | RP-212846 | 2241 |   | F | Big CR to TS 38.133: NR_newRAT-Perf maintenance (Rel-16)   | 16.10.0 |
| 2021-12 | RAN#94 | RP-212847 | 2243 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 1 (Rel-16)  | 16.10.0 |
| 2021-12 | RAN#94 | RP-212849 | 2245 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 2 (Rel-16)  | 16.10.0 |
| 2021-12 | RAN#94 | RP-212847 | 2247 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 3 (Rel-16)  | 16.10.0 |
| 2021-12 | RAN#94 | RP-212847 | 2249 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 4 (Rel-16)  | 16.10.0 |
| 2022-03 | RAN#95 | RP-220337 | 2271 |   | F | Big CR to TS 38.133: NR_newRAT-Core maintenance (Rel-16)   | 16.11.0 |
| 2022-03 | RAN#95 | RP-220337 | 2274 | 1 | F | Big CR to TS 38.133: NR_newRAT-Perf maintenance (Rel-16)   | 16.11.0 |
| 2022-03 | RAN#95 | RP-220334 | 2276 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 1 (Rel-16)  | 16.11.0 |
| 2022-03 | RAN#95 | RP-220339 | 2278 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 2 (Rel-16)  | 16.11.0 |
| 2022-03 | RAN#95 | RP-220339 | 2280 |   | F | Big CR to TS 38.133: Rel-16 WIs RRM maintenance Part 3 (Rel-16)  | 16.11.0 |
| 2022-06 | RAN#96 | RP-221655 | 2405 |   | F | Big CR for TS 38.133 Core Maintenance Part-1 (Rel-16)  | 16.12.0 |
| 2022-06 | RAN#96 | RP-221655 | 2408 |   | F | Big CR for TS 38.133 Core Maintenance Part-2 (Rel-16)  | 16.12.0 |
| 2022-06 | RAN#96 | RP-221660 | 2411 |   | F | Big CR for TS 38.133 Perf Maintenance Part-1 (Rel-16)  | 16.12.0 |
| 2022-06 | RAN#96 | RP-221660 | 2414 |   | F | Big CR for TS 38.133 Perf Maintenance Part-2 (Rel-16)  | 16.12.0 |

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# History

| <b>Document history</b> |                |             |
|-------------------------|----------------|-------------|
| V16.4.0                 | August 2020    | Publication |
| V16.5.0                 | December 2020  | Publication |
| V16.6.0                 | February 2021  | Publication |
| V16.7.0                 | June 2021      | Publication |
| V16.8.0                 | September 2021 | Publication |
| V16.9.0                 | December 2021  | Publication |
| V16.10.0                | April 2022     | Publication |
| V16.11.0                | May 2022       | Publication |
| V16.12.0                | July 2022      | Publication |